

# WANT TO LEARN MORE ABOUT ELECTRONICS USING SNAP CIRCUITS®?

The project manuals include a brief description of how your parts work (the “About Your Snap Circuits® Parts” page) and the projects you build are great for learning about electricity, electronics, and science. But for anyone who wants to learn more Elenco® Electronics also offers a complete lesson in basic electronics, called the Student Guide.

The Student Guides for the Snap Circuits® product are a tool for opening the exciting world of electronics. Following the Learn by Doing® concept, electronics will be easy for students to understand by using Snap Circuits® to build circuits as they learn about them. The Student Guides emphasize the practical applications of electronics, without bogging down in mathematics. The lessons are as much about science as about electronics.

Why should students learn about electronics? Electronics plays an important and increasing role in their everyday lives, and so some basic knowledge of it is good for all of them. Learning about it teaches how to do scientific investigation, and the projects develop basic skills needed in today's world.

Several Student Guides are available, depending on which Snap Circuits® product you have. The table of contents for each is listed below, along with a sample page.

## Student Guides

Educational Series - Teaches about Basic Electricity & Electronics in the everyday world using our Learn By Doing® concept!

### Student Guide Junior

**753294 \$9.95**

48 full color pages

*(for use with SC-100 set)*

### Student Guide

**753307 \$24.95**

140 full color pages

*(for use with SC-300/500/750 sets)*

*[does not require Student Guide Jr.]*

These may be purchased using the Replacement Parts Order Form on the Snap Circuits® website ([www.snapcircuits.net](http://www.snapcircuits.net)).

# HERE IS THE TABLE OF CONTENTS FOR THE STUDENT GUIDES:

## TABLE OF CONTENTS for STUDENT GUIDE JUNIOR

(48 full color pages, for use with SC-100 set.)

### Preface

Chapter 1: Basic Components & Circuits - *Introduces electricity with the components and circuit types listed here. By building circuits using Snap Circuits®, students begin to understand the electrical world.*

- 1-1 Electricity
- 1-2 Wires
- 1-3 Batteries
- 1-4 Switches
- 1-5 Lamps
- 1-6 Base Grid - *project 1 is discussed*
- 1-7 Series and Parallel circuits - *two mini-circuits are discussed*
- 1-8 Short Circuits
- 1-9 Solder
- 1-10 Schematics
- Summary & quiz

Chapter 2: Motors & Electricity - *Students learn how electricity and magnetism are used in motors and generators, about the electricity that runs their homes, and about lightning.*

- 2-1 Motors - *project 2 is discussed*
- 2-2 Motor circuits - *projects 5, 6, 80, 11, 12, 13 are discussed*
- 2-3 Fuses - *project 14 is discussed*
- 2-4 Your electric company - *projects 55 and 56 are discussed*
- 2-5 Static Electricity
- 2-6 Types of lamps
- 2-7 Types of switches
- 2-8 Electricians
- Summary & quiz

Chapter 3: Resistance - *Students learn how resistors are used to limit and control the flow of electricity. They also learn the basic rules for understanding circuits, and receive an introduction to digital electronics.*

- 3-1 Resistors
- 3-2 LEDs - *projects 7 and 8 are discussed*
- 3-3 The Photoresistor - *one mini-circuit is discussed*
- 3-4 Resistors in series and parallel - *three mini-circuits are discussed*
- 3-5 Resistance - *project 9 is discussed*
- 3-6 Resistance of water - *projects 98 and 99 are discussed*
- 3-7 Introduction to logic - *projects 47, 48, 49, 50 are discussed*
- 3-8 Digital electronics
- Summary & quiz

Chapter 4: Electronic Sound and Integrated Circuits - *Students learn how electricity makes sound. They also learn about the integrated circuit modules included in Snap Circuits® and what is inside them. They have the opportunity to use ICs in many types of circuits.*

- 4-1 Electronic Sound - *three mini-circuits are discussed*
- 4-2 Whistle Chip - *one mini-circuit is discussed*
- 4-3 The ICs in snap circuits
- 4-4 Description of all projects using ICs  
*No projects are discussed in detail here but projects 38, 51, 58, 61, 81, and 83 are recommended.*

Summary & quiz

Summary of Components

Definition of Terms

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# TABLE OF CONTENTS for STUDENT GUIDE

(140 full color pages, for use with SC-300/500/750 sets. Does not require Student Guide Junior.)

## PART I

### Preface

Chapter 1: Basic Components & Circuits - *Introduces electricity with the components and circuit types listed here. By building circuits using Snap Circuits®, students begin to understand the electrical world.*

1-1 Electricity

1-2 Wires

1-3 Batteries

1-4 Switches

1-5 Lamps

1-6 Base Grid - *project 1 is discussed*

1-7 Series and Parallel circuits - *projects 152, 153, 103 are discussed*

1-8 Short Circuits

1-9 Solder

1-10 Schematics

Summary & quiz

Chapter 2: Motors & Electricity - *Students learn how electricity and magnetism are used in motors and generators, about the electricity that runs their homes, and about lightning.*

2-1 Motors - *project 2 is discussed*

2-2 Motor circuits - *projects 5, 6, 80, 262, 11, 12, 13 are discussed*

2-3 Fuses - *project 14 is discussed*

2-4 Your electric company

2-5 Static Electricity

2-6 Types of lamps

2-7 Types of switches

2-8 Electricians

Summary & quiz

Chapter 3: Resistance - *Students learn how resistors are used to limit and control the flow of electricity. They also learn the basic rules for understanding circuits, and receive an introduction to digital electronics.*

3-1 Resistors

3-2 LEDs - *projects 7, 8, 276, 174 are discussed*

3-3 Resistors in series and parallel - *project 173 is discussed*

3-4 Resistance - *project 9 is discussed*

3-5 Adjustable resistor - *project 172 is discussed*

3-6 Photoresistor - *project 272 is discussed*

3-7 Resistance of water - *projects 166, 167 are discussed*

3-8 Introduction to logic - *projects 47, 48, 49, 50 are discussed*

3-9 Digital electronics

Summary & quiz

Chapter 4: Capacitors - *Students learn about the different types of capacitors, how they store electric charge, and how they are used in circuits.*

4-1 Capacitors

4-2 Capacitor circuits - *projects 203, 235 are discussed*

4-3 Capacitors in series and parallel - *projects 165, 164, 296 are discussed*

Summary & quiz

Chapter 5: Transistors - *Students learn how transistors have changed their lives, how they work, and how they are used in many types of circuits.*

5-1 More about LEDs

5-2 Transistors

5-3 Transistor basics - *projects 215, 124, 125, 128, 129, 130, 131, 253 are discussed*

5-4 More transistor circuits - *projects 107, 261, 256, 252, 300, 302, 263, 225 are discussed*

5-5 Human resistor - *projects 246, 247 are discussed*

5-6 Motor as generator - *project 118 is discussed*

5-7 Microphone - *projects 273, 109 are discussed*

Summary & quiz

Chapter 6: Oscillators and Electronic Sound - *Students learn how electricity makes sound. They learn about oscillator circuits, and build some.*

6-1 Electronic sound

6-2 Oscillators - *projects 259, 236 are discussed*

6-3 Whistle chip - *project 199 is discussed*

6-4 Oscillator circuits - *projects 197, 198, 228, 185, 294 are discussed*

Summary & quiz

Chapter 7: Integrated circuits - *Students learn about the integrated circuit modules included in Snap Circuits® and what is inside them. They also have the opportunity to use them in many types of circuits.*

7-1 The ICs in Snap Circuits®

7-2 Description of all projects using ICs

*No projects are discussed in detail here but projects 38, 51, 58, 61, 81, 83, 119, 158, 178, 202, 237, 238, 242, 245, 250, 255, 272, 297 are recommended.*

Summary & quiz

Chapter 8: Electromagnetism and Radio - *Students learn how antennas are used to send radio signals through the air, how modulation is used to encode the information being sent, and about transformers. They build some radio circuits to demonstrate these concepts.*

8-1 AC - *projects 55, 56 are discussed*

8-2 Transformers

8-3 Inductance and antennas

8-4 Radio - *project 258 is discussed*

8-5 Radio circuits - *projects 242, 213 are discussed*

Summary & quiz

## PART II

(used only with SC-500/750 sets)

### Preface

Chapter 9: Meters, Transformers, & FM Radio - *Students learn how meters are used to measure current and voltage, about transformers and their magnetic properties, how transformers are used in oscillator circuits, about FM radio receivers, and learn how wires act as components at high frequencies.*

9-1 Meters

9-2 Meter Circuits - *projects 323-327, 506, and 508 are discussed*

9-3 More About Transformers - *projects 340, 358, and 359 are discussed*

9-4 Transformers in Oscillators - *project 477 and five new circuits are discussed*

9-5 More About FM Radio - *project 307 is discussed*

9-6 When Wires Are Not Wires

Summary & quiz

Chapter 10: Diodes & Applications - *The chapter teaches about different types of diodes. Students are also introduced to electronic memory and recording circuits.*

10-1 More About Diodes - *projects 360, 487, and three new circuits are discussed*

10-2 Digital Displays - *projects 329, 330, 396, and 488 are discussed*

10-3 Recording IC - *projects 384 and 428 are discussed*

Summary & quiz

Chapter 11: Electronic Switches - *Students learn about two types of electronic switches, relays and silicon controlled rectifiers. The course concludes with some basic principles for analyzing circuits.*

11-1 Relays - *projects 341-346, 353, 354, and 431 are discussed*

11-2 Silicon Controlled Rectifiers - *project 328 and two new circuits are discussed*

11-3 Voltage Dividers & Current Dividers

Summary & quiz

## **PART III**

(used only with SC-750 set)

### Preface

Chapter 12: Electromagnetism - *Students learn about magnetic fields and how electricity can make a magnet. They build circuits to show how electricity can use magnetism to move things, and control magnetic fields in ways ordinary magnets can't. They also learn more about motors and capacitors.*

12-1 Magnetism

12-2 An Electronic Magnet

12-3 Magnetic Fields - *projects 660-665 and a mini-circuit are discussed*

12-4 Electromagnet Oscillators - *projects 666, 669, 674, and 683 are discussed*

12-5 The Anti-Capacitor - *projects 531, 535, and 658 are discussed*

12-6 More About Motors - *projects 536 and 617 are discussed*

Summary & quiz

Chapter 13: Sun Power - *Students learn about solar energy, the benefits of it to our society, and how solar cells work. Circuits demonstrate the applications for solar electricity and the limitations of it.*

13-1 Born in the Space Program

13-2 How Your Solar Cell Works - *projects 549 and 555 are discussed*

13-3 More Solar Circuits - *projects 548, 550, and 559-561 are discussed*

13-4 Our Solar Future

Summary & quiz

Chapter 14: More Circuits & New Ways to Look at Them - *This chapter shows many of the diverse ways electricity is used, while reviewing what the students have learned. It also gives an introduction to the Snap Circuits® computer interface, which shows what electrical signals look like by simulating an oscilloscope and spectrum analyzer. Students see the benefits and limitations of using a computer to store measurements.*

14-1 Vibration Switch - *projects 684, 689, and 692 are discussed*

14-2 Other Applications - *many circuits are summarized, and projects 542-547 are recommended*

14-3 The Snap Circuits Computer Interface - *one new circuit is discussed*

Summary & quiz

### **Summary of Components**

#### **Definition of Terms**

## 2-1 Motors

Water flowing under pressure in a pipe or a fast-moving stream can be used to turn a paddlewheel. If the paddlewheel was linked to a fan blade then you could use the water pressure to turn the fan, perhaps to cool yourself on a hot day. If the water was flowing very fast due to high pressure, then you could get the fan moving fast enough it might create a strong airflow like a propeller on a plane.

A similar thing happens in a motor, with electricity instead of water. A motor converts electricity into mechanical motion.

## TYPICAL PAGE IN A STUDENT GUIDE



## Introducing New Parts

Snap Circuits® includes one motor, shown here with its symbol. Snap Circuits® also includes a fan, which is used with the motor. An electric current in the motor will turn the shaft and the motor blades, and the fan blade if it is on the motor.

Motor Symbol

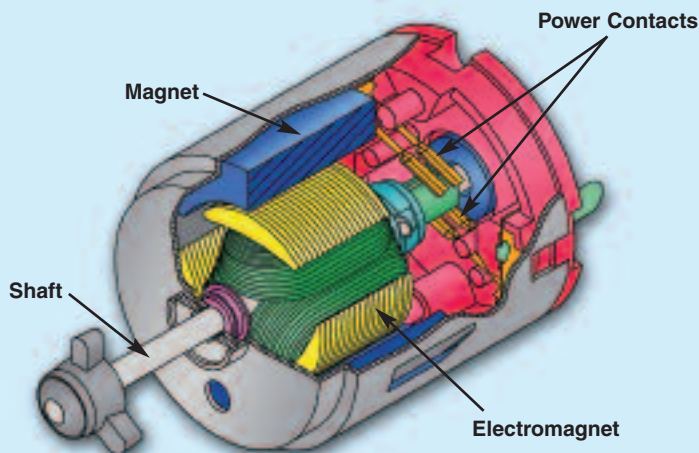


Motor (M1)



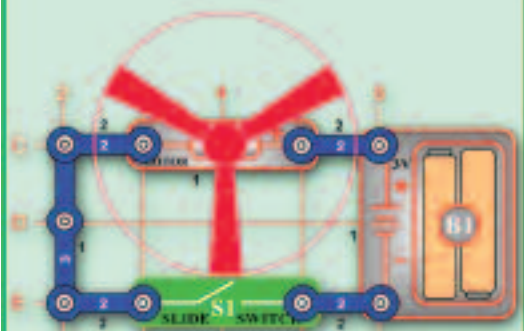
Fan Blade

How does electricity turn the shaft in the motor? The answer is magnetism. Electricity is closely related to magnetism, and an electric current flowing in a wire has a magnetic field similar to that of a very, very tiny magnet. Inside the motor is a coil of wire with many loops, if a large electric current flows through the loops the magnetic effects become concentrated enough to move a small magnet. The motor also has a small magnet, on a shaft. When electricity moves the magnet, the shaft spins. If the fan is on the motor shaft then its blades will create airflow.



## Experiments

Consider this circuit (which is project 2):



When the switch is on, current flows from the batteries through the motor making it spin. The fan blades will force air to move past the motor. Be careful not to touch the motor or fan when it is spinning at high speed.