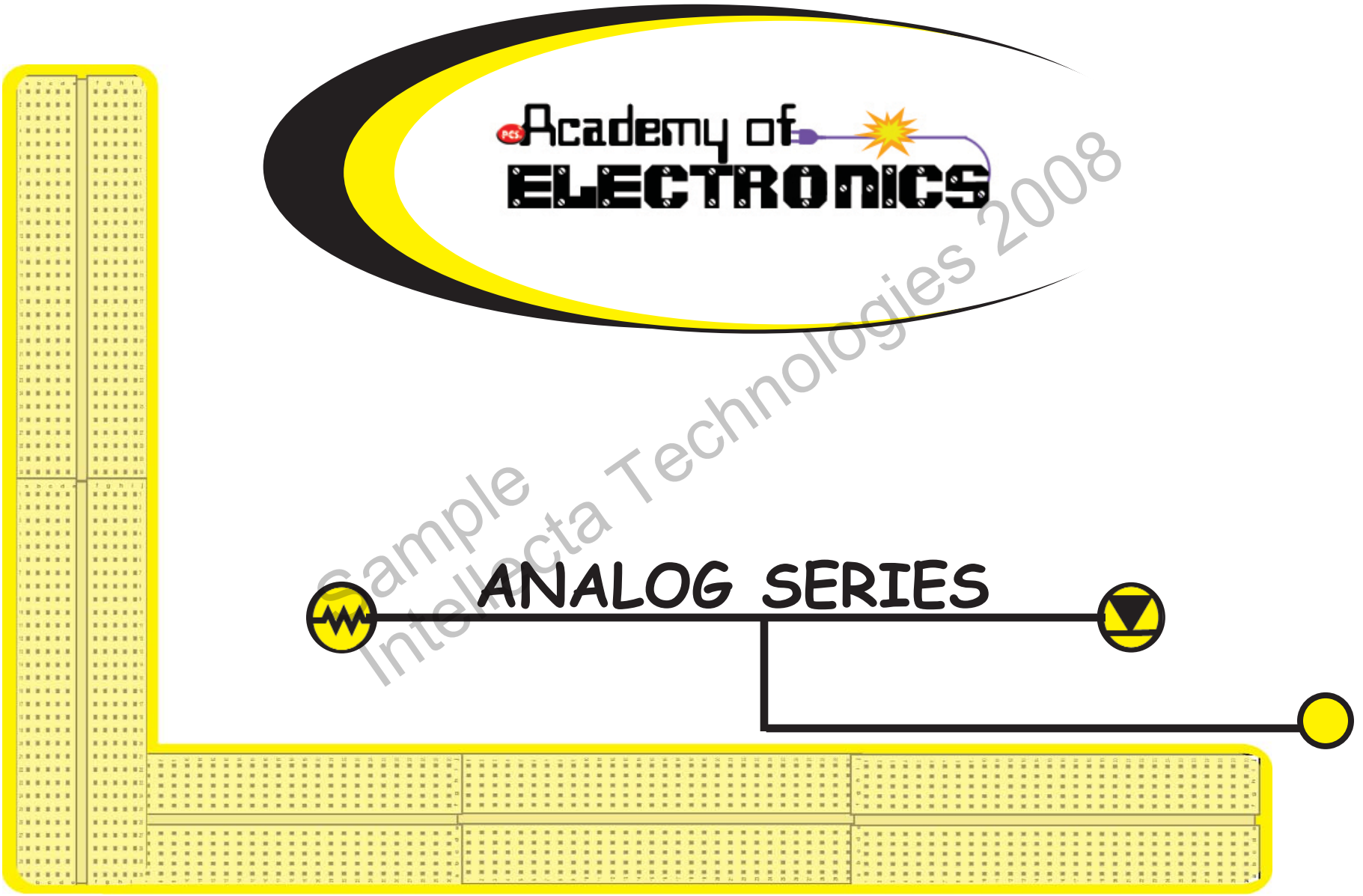


## ABOUT THE PCS ACADEMY OF ELECTRONICS LAB

### INTRODUCTION

The PCS Academy of Electronics Lab was developed to introduce basic electronic technology with a hands-on approach. The project-based Lab experiments build experiences using the components in electronic circuits. These activities are geared for students interested in careers in electronics, computers, or robotics.

### BEFORE YOU BEGIN

Setting up your lab materials properly is an important element for the program. Set up should take a few hours to complete, and includes unpacking materials, assembly and cleanup. Once all of the lab components are properly organized, it becomes easy for instructors and students to maintain the PCS Academy of Electronics Lab. Refer to the PCS Academy of Electronics Maintenance Manual.

### ORGANIZATION

Each project has several sections. The Teacher Guide is designed for the instructor, and includes information regarding standards, project objectives, necessary materials, project background information, observations, and key vocabulary. The Project Plans include the general steps for the project, an important fact, an inventory list, construction graphic, circuit schematic, step-by-step building instructions, procedures, and a "quick check box". The Student Activity Sheet is the written assessment for each project.

Projects are organized into the following themes:
Projects 1-4 Basic Electronic Lessons
Projects 5-15 Component Experiment Lessons
Projects 16-22 Basic DC Electronics Lessons
Projects 23-40 Electronic Projects Lessons
Projects 41-80 Build by Schematic Lessons

## CURRICULUM

This book has several sections. The Teacher Overview and the first page of each day titled Teacher Guide are designed for the instructor. The Student Activity Sheet is intended to be presented to student teams. The Project Plan and Student Activity Sheet should be filled out by each student team and stored in their team notebook.

The instructor can print out a master copy of the book for him/herself and copies of each Student Activity Sheet for the predicted number of student teams.The Student Activity Sheets provide structure and direction for student team activities. In addition, the instructor can use the sheets to document day-to-day student activity.

## PCS CLASS RULES

PCS has developed basic class rules for all Lab students to follow. Feel free to combine this list of rules with any "house rules" of your own to create an environment that is conducive to investigating, inventing, and learning.

### PCS Academy of Electronics Rules:

1. Wash your hands.
2. Treat lab materials with respect: Do not throw, melt, or eat lab equipment.
3. Put parts away if they are not currently a component of your project.
4. Take only the items that you need.
5. Use only the equipment you have been assigned.
6. Keep projects to a maximum of one at a time.
7. Completely disassemble your projects when putting materials away.
8. Be positive and helpful towards other people. We are all on the same team!
9. Remember the 3 Ps! Always create for *Practical *Positive *Peaceful Purposes!

## PCS ACADEMY OF ELECTRONICS SUGGESTIONS FOR TEACHING

### OBJECTIVES

Upon completion of this series, the student should be able to:
1. Recognize and identify the resistor values using the resistor color code.
2. Identify main electronic components including resistors.
3. Draw electronic schematics using electronic symbols.
4. Build and troubleshoot electronic circuits.
5. Recognize the available career choices with the area
6. Recall facts regarding the history of the evolution of electronics.

Each PCS Academy of Electronics unit has the same basic components. As you become more comfortable with the materials, the activities can be tailored to meet your teaching style and student needs.

### SUGGESTED SCHEDULE:

Each class project could be organized as follows:
(a) A short discussion or demonstration (approximately 10-30 minutes)
(b) Hands on project or activity (approximately 10-30 minutes)
(c) Project assessment and clean up time (approximately 10-20 minutes)
(d) End-of-class group review and discussion (approximately 10 minutes)

Projects should be performed in the order they are presented in the book. Advanced students can start projects 41-80. These projects are the same circuits constructed in projects 1-40, however they include only the schematic for the student to use as a basis to construct circuits.

The instructor is responsible for checking students completed circuits.

Projects are organized into the following themes:
Projects 1-4 Basic Electronic Lessons
Projects 5-15 Component Experiment Lessons
Projects 16-22 Basic DC Electronics Lessons
Projects 23-40 Electronic Projects Lessons
Projects 41-80 Build by Schematic Lessons

## TEACHER GUIDE

- Standards: Alignment to educational standards.
- Objective: Specific objective of the lesson.
- Materials: General materials list for the lesson.
- Background: General background information of the unit.
- Observations: What students should observe by building the circuit and performing the activity.
- Vocabulary: Key vocabulary used in activity. Definitions can be found using the PCS Edventures Term Library on the PCS Edventures web site.

## PROJECT PLANS

- Steps: General steps in the activity.
- Important Fact: A fact, or some historical information related to the project.
- Inventory List: Required electronic components for the project.
- Project Plan: Includes construction graphic, circuit schematic, step-by-step building instructions, procedure, and "quick check box."

## ASSESSMENT

- A short assessment sheet for the student to fill out after constructing the circuit.

## BUILD BY SCHEMATIC PROJECTS

- Advanced students can start with projects 41-80. These projects are the same circuits constructed in projects 1-40, however they include only the schematic for the student to use as a basis to build the circuit.

## PRECAUTION

- Remember that safety comes first!
- Never wire the components with the battery connected to the circuit. Always troubleshoot the circuit with the battery disconnected.

# TEACHER GUIDE

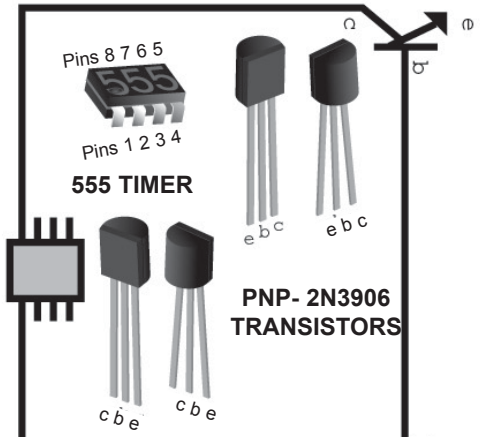
## TABLE OF CONTENTS

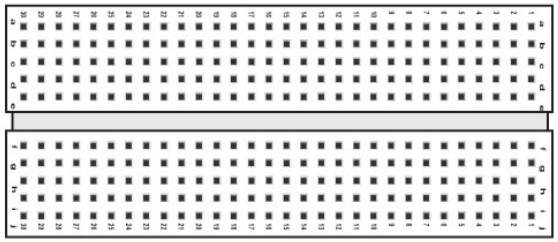
## PROJECT PLANS



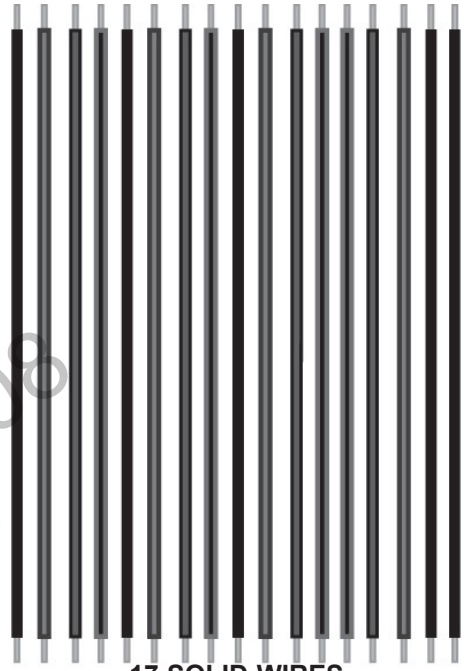
## BUILD BY SCHEMATIC

# PARTS INVENTORY LIST

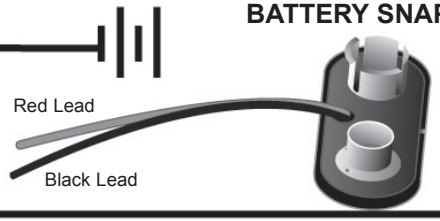


SOLDERLESS CIRCUIT BOARD

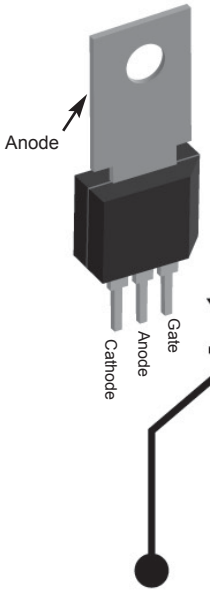


17 SOLID WIRES
(includes the wires soldered to the Speaker and Potentiometer.)

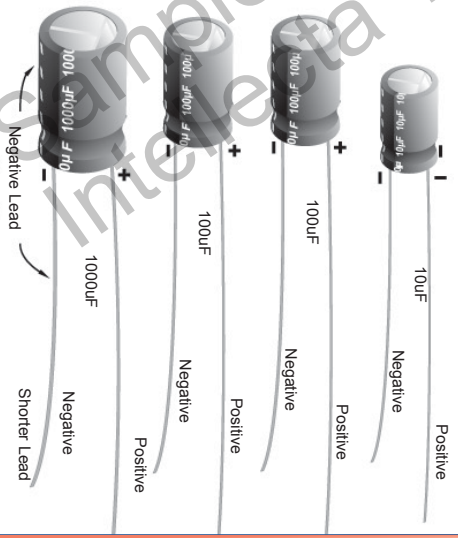



BATTERY SNAP

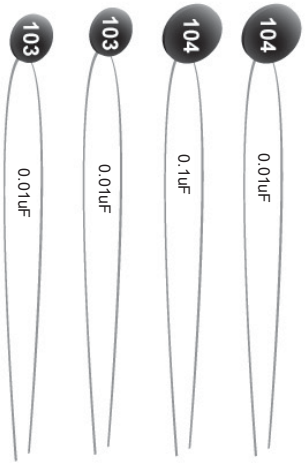
PHOTOCELL



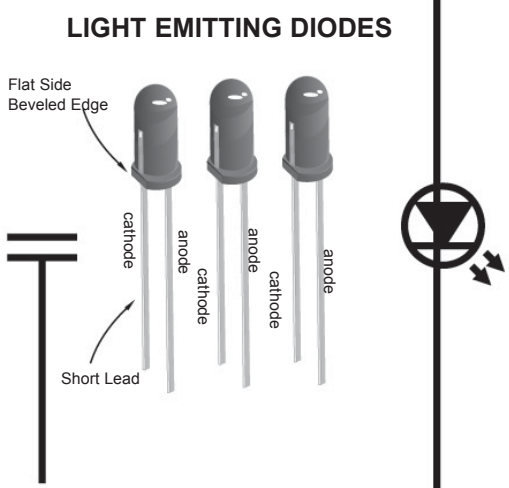

SCR




ELECTROLYTIC CAPACITORS

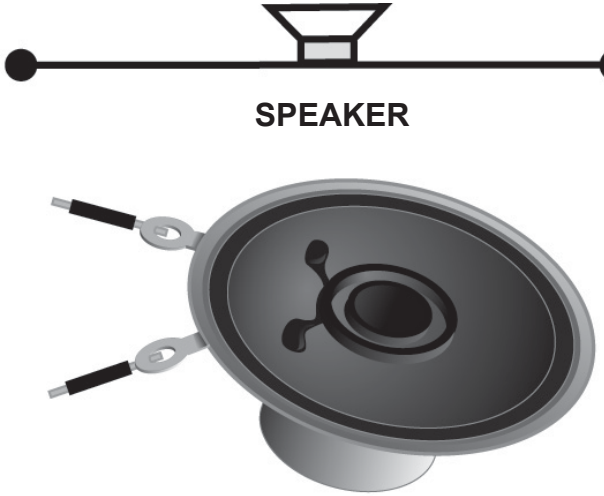



CERAMIC DISC CAPACITORS

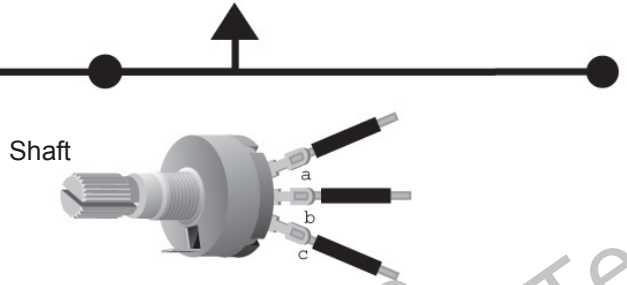



LIGHT EMITTING DIODES

# PARTS INVENTORY LIST



SPEAKER




POTENTIOMETER


DIODE

PUSHBUTTON SWITCH

## RESISTORS

10 ohm (Brown, Black, Black, Gold)
47 ohm (Yellow, Violet, Black Gold)
47 ohm (Yellow, Violet, Black Gold)
100 ohm (Brown, Black, Brown, Gold)
100 ohm (Brown, Black, Brown, Gold)
220 ohm (Red, Red, Brown, Gold)
220 ohm (Red, Red, Brown, Gold)
220 ohm (Red, Red, Brown, Gold)
330 ohm (Orange, Orange, Brown, Gold)
330 ohm (Orange, Orange, Brown, Gold)
330 ohm (Orange, Orange, Brown, Gold)
470 ohm (Yellow, Violet, Brown, Gold)
1K (Brown, Black, Red, Gold)
1K (Brown, Black, Red, Gold)
1K (Brown, Black, Red, Gold)
1K (Brown, Black, Red, Gold)
1K (Brown, Black, Red, Gold)
2.2K (Red, Red, Red, Gold)
3.3K (Orange, Orange, Red, Gold)
6.8K (Blue, Gray, Red, Gold)
6.8K (Blue, Gray, Red, Gold)
10K (Brown, Black, Orange, Gold)
10K (Brown, Black, Orange, Gold)
10K (Brown, Black, Orange, Gold)
16K (Brown, Blue, Orange, Gold)
33K (Orange, Orange, Orange, Gold)
33K (Orange, Orange, Orange, Gold)
120K (Brown, Red, Yellow, Gold)
470K (Yellow, Violet, Yellow, Gold)

29 Resistors

Academy of ELECTRONICS

# TEACHER GUIDE

## BASIC ELECTRONIC CIRCUITS #001

**ITEA STANDARD #16**

A. Students will develop an understanding of, and will be able to select and use energy and power technologies.
B. Students in grades 9-12 will study energy, power, and work concurrently in their science and technology classes.
C. Students should synthesize the concepts and principles learned in science with the knowledge gained in the study of technology to achieve a well-rounded understanding of energy and power.

**CCEI STANDARDS #6 Electronic Components.**

A. Students will discern characteristics of commonly used electronic components.
B. Identifying symbols and component characteristics.
C. Determining resistor's values by identifying color codes.
D. Drawing schematic diagrams.
E. Using diagrams to interpret circuit characteristics.

**#7 Direct-Current (DC) Circuits**

The students will understand relationships between voltage, current, resistance and power as pertaining to direct-current circuits.
C. Comparing predicted outcomes to measured outcomes with lab activities.



## OBJECTIVE:

To review the basic vocabulary and theory of electronic circuits.

## MATERIALS:

- Paper
- Pencil
- Nine-volt battery
- Components on the inventory sheet

## BACKGROUND:

All matter is made up of atoms. An electron flow occurs when electrons move from the outer ring of one atom to the outer ring of another atom. An electrical current is the free movement of electrons. The way in which the atoms are combined within a material determines whether or not the materials will allow the flow of electrons. If a material allows the passage of electrons, it is a conductor. Elements classified as metals lose electrons easily, and the electrons in a metallic element are free to move along all the atoms in the metal. Metals, such as copper wire, are considered good electrical conductors. A simple circuit in electronics consists of a path for electrons to flow and a source of power, which will cause the electrons to flow.

## OBSERVATIONS:

Students will review basic vocabulary and theory of electronic circuits.

## VOCABULARY:

- **Atom:** The smallest particle of an element that can exist having the chemical properties of the element.
- **Electron:** A sub-atomic particle with a negative charge that orbits the nucleus of the atom.
- **Circuit:** A simple circuit in electronics is a path for electrons to flow. The word “circuit” comes from the word circle.

## STEP: 1

Review the structure of the atom, and be able to define an electron flow.

## STEP: 2

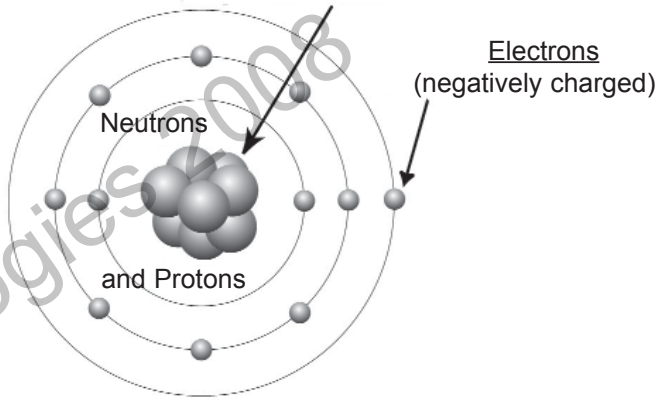
In this circuit electrons flow from the negative terminal of the battery, through the wire and then to the positive terminal of the battery. The amount of electrons that will flow depends on the resistance in the wire. Wire generally has a very low resistance and therefore there will be a high amount of electrons flowing.

**IMPORTANT FACT**

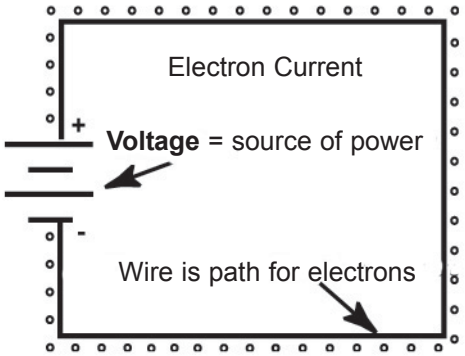
- If you create a circuit like this, it will run the battery down very quickly. This would be an example of a "short circuit."


## NEUTRONS:

Nucleus made of neutrons (no electrical charge) and protons (positive charged)




## CIRCUIT:




Name:

Date:

INVENTORY LIST

Academy of ELECTRONICS

# STUDENT ACTIVITY SHEET

## BASIC ELECTRONIC CIRCUITS #001

Name:

Date:

1. Describe an “electron flow.”

_____

_____

_____

_____

2. Circle the elements below that might be a good conductor.

| | | |
|---|---|---|
| • Copper Wire | • Steel Wool | • Paper Clip |
| • Wood Stick | • Gold Bar | • Rubber Tube |
| • Aluminum Foil | • Glass Window | • Plastic Bottle |
| • Silver Pin | • Paper Plate | • Fork |

3. Sketch a diagram of the parts of an atom in the box below.

4. Describe three facts that were introduced in this lesson.

Fact (1)

_____

_____

_____

_____

Fact (2)

_____

_____

_____

_____

Fact (3)

_____

_____

_____

_____

5. Draw the schematic of a circuit in the box.

# TEACHER GUIDE

## RESISTOR COLOR CODE # 002

**ITEA STANDARD #16**

A. Students will develop an understanding of, and will be able to select and use energy and power technologies.
B. Students in grades 9-12 will study energy, power, and work concurrently in their science and technology classes.
C. Students should synthesize the concepts and principles learned in science with the knowledge gained in the study of technology to achieve a well-rounded understanding of energy and power.

**CCEI STANDARDS #6 Electronic Components.**

A. Students will discern characteristics of commonly used electronic components.
B. Identifying symbols and component characteristics.
C. Determining resistor's values by identifying color codes.
D. Drawing schematic diagrams.
E. Using diagrams to interpret circuit characteristics.

**#7 Direct-Current (DC) Circuits**

The students will understand relationships between voltage, current, resistance and power as pertaining to direct-current circuits.
C. Comparing predicted outcomes to measured outcomes with lab activities.



## OBJECTIVE:

To examine and understand resistor electronic components, and be able to read the color code.

## MATERIALS:

- Paper
- Pencil
- Nine-volt battery
- Components on the inventory sheet

## BACKGROUND:

A resistor is an electrical device that resists the flow of electrical current. There are many different kinds of resistors and they come in a variety of shapes and sizes. Certain kinds of resistors use a pattern of colored stripes or bands to identify the value of the resistor. The colors are referred to as the “color code” Black = 0, Brown = 1 Red = 2, Orange = 3, Yellow = 4, Green = 5, Blue = 6, Violet = 7, Gray = 8, White = 9. The four color bands will let you determine a resistor’s value and its tolerance.

Band 1 = a number (first significant figure of resistance value)
Band 2 = a number (the second significant figure)
Band 3 = number of zeros (the decimal multiplier)
Band 4 = tolerance (accuracy of resistor) gold=5% silver=10%
no color=20%

## OBSERVATIONS:

Students will be able to recognize resistor components and be able to identify their value based on the color code.

## VOCABULARY:

- **Color Code:** colored bands associated with numbers that are used to indicate the values or ratings of electronic components.
- **Resistor:** An electrical device that resists the flow of electrical current.
- **Tolerance:** An electronic element’s limits or its capacity to tolerate use.

# PROJECT PLANS

## RESISTOR COLOR CODE # 002

Name:

Date:

### STEP: 1

Review resistor colored bands and color code. Be able to identify a resistor's value and tolerance.

Resistors have color bands around them. These colors tell you the value of the resistor. The colors are referred to as the "color code."

Black = 0, Brown = 1, Red = 2, Orange = 3, Yellow = 4,
Green = 5, Blue = 6, Violet = 7, Gray = 8, White = 9.

### STEP: 2

The four color bands will let you determine a resistor's value and its tolerance.

**COLOR BANDS**

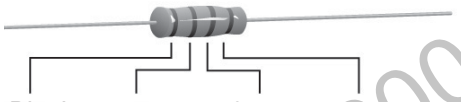
**1-2-3-4**

Band 1 = a number
Band 2 = a number
Band 3 = number of zeros
Band 4 = tolerance: gold=5% silver=10% no color=20%

**IMPORTANT FACT**

- In general, the smaller the size of the resistor, the lower the wattage rating.

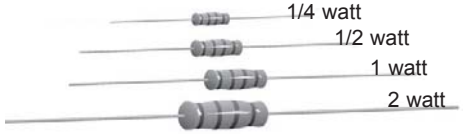
### COLOR CODE MULTIPLIER



| | | | |
|---|---|---|---|
| Black | 0 | 0 | x 1 |
| Brown | 1 | 1 | x 10 |
| Red | 2 | 2 | x 100 |
| Orange | 3 | 3 | x 1,000 |
| Yellow | 4 | 4 | x 10,000 |
| Green | 5 | 5 | x 100,000 |
| Blue | 6 | 6 | x 1,000,00 |
| Violet | 7 | 7 | x 10,000,000 |
| Gray | 8 | 8 | x 100,000,000 |
| White | 9 | 9 | x 1,000,000,000 |

Red, Red, Red, Gold
2 2 00 5%

(This resistor could actually measure up to 2200 ohms plus 5% or as little as 2200 ohms less 5%)




**RELATIVE SIZE VS. WATTAGE**

Generally, the smaller the size of the resistor, the lower the wattage rating.

### RESISTOR COLOR CODE

10 ohm (Brown, Black, Black, Gold)
47 ohm (Yellow, Violet, Black Gold)
47 ohm (Yellow, Violet, Black Gold)
100 ohm (Brown, Black, Brown, Gold)
100 ohm (Brown, Black, Brown, Gold)
220 ohm (Red, Red, Brown, Gold)
220 ohm (Red, Red, Brown, Gold)
220 ohm (Red, Red, Brown, Gold)
330 ohm (Orange, Orange, Brown, Gold)
330 ohm (Orange, Orange, Brown, Gold)
330 ohm (Orange, Orange, Brown, Gold)
470 ohm (Yellow, Violet, Brown, Gold)
1K (Brown, Black, Red, Gold)
1K (Brown, Black, Red, Gold)
1K (Brown, Black, Red, Gold)
1K (Brown, Black, Red, Gold)
1K (Brown, Black, Red, Gold)
2.2K (Red, Red, Red, Gold)
3.3K (Orange, Orange, Red, Gold)
6.8K (Blue, Gray, Red, Gold)
6.8K (Blue, Gray, Red, Gold)
10K (Brown, Black, Orange, Gold)
10K (Brown, Black, Orange, Gold)
10K (Brown, Black, Orange, Gold)
16K (Brown, Blue, Orange, Gold)
33K (Orange, Orange, Orange, Gold)
33K (Orange, Orange, Orange, Gold)
120K (Brown, Red, Yellow, Gold)
470K (Yellow, Violet, Yellow, Gold)

Tolerance
GOLD= 5%
SILVER=10%
No Color=20%

All Resistors used in this series are gold = 5%

# STUDENT ACTIVITY SHEET CONTINUED

## RESISTOR COLOR CODE QUIZ # 002

### TEST YOUR MEMORY...

### FILL IN THE BLANKS

**RESISTOR COLOR CODE:** The resistors have color _____ around them. These colors tell you the value of the resistor. The colors are called the "color code." _____ = 0, _____ = 1, _____ = 2, _____ = 3, _____ = 4, _____ = 5, _____ = 6, _____ = 7, _____ = 8, _____ = 9.

**COLOR BANDS:** There are four color _____ on each resistor in this lab. You do not have to memorize the Color Code. You just need to know how to read it.

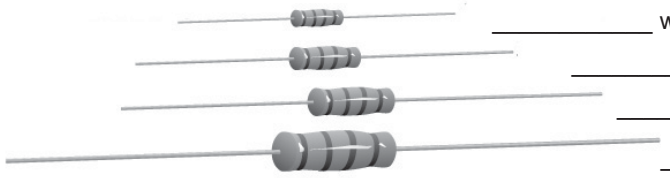
| | | | |
|---|---|---|---|
| BLACK | 0 | 0 | x 1 |
| _____ | 1 | 1 | x 10 |
| RED | 2 | 2 | x 100 |
| ORANGE | 3 | 3 | _____ |
| _____ | 4 | 4 | x 10,000 |
| _____ | 5 | 5 | x 100,000 |
| BLUE | 6 | 6 | _____ |
| _____ | 7 | 7 | x 10,000,00 |
| _____ | 8 | 8 | x 100,000,000 |
| GRAY | 9 | 9 | x 1,000,000,000 |

(This _____ could actually measure up to 2200 ohms plus 5% or as little as 2200 ohms less 5%)

### RELATIVE SIZE VS. WATTAGE RATING

(Generally the smaller the size of the _____, the lower the _____ rating.)

Fill in the blanks below:



_____ watt

_____ watt

_____ watt

_____ watt

# TEACHER GUIDE

## SOLDERLESS CIRCUIT BOARDS #003

**ITEA STANDARD #16**

**A.** Students will develop an understanding of, and will be able to select and use energy and power technologies.
**B.** Students in grades 9-12 will study energy, power, and work concurrently in their science and technology classes.
**C.** Students should synthesize the concepts and principles learned in science with the knowledge gained in the study of technology to achieve a well-rounded understanding of energy and power.

**CCEI STANDARDS #6 Electronic Components.**

**A.** Students will discern characteristics of commonly used electronic components.
**B.** Identifying symbols and component characteristics.
**C.** Determining resistor's values by identifying color codes.
**D.** Drawing schematic diagrams.
**E.** Using diagrams to interpret circuit characteristics.

**#7 Direct-Current (DC) Circuits**

The students will understand relationships between voltage, current, resistance and power as pertaining to direct-current circuits.
**C.** Comparing predicted outcomes to measured outcomes with lab activities.

## OBJECTIVE:

To examine and be able to use solderless circuit boards.

## MATERIALS:

- Paper
- Pencil
- Nine-volt battery
- Components on the inventory sheet

## BACKGROUND:

A solderless circuit board or breadboard is a reusable solderless device used to build a temporary prototype of an electronic circuit and for experimenting with circuit designs.

A modern solderless circuit board consists of a perforated block of plastic with spring clips under rows of holes. Interconnecting wires and electronic component leads can be inserted into free holes to construct a circuit. Solderless circuit boards are used to prototype many electronic systems.

The solderless circuit board originated from the early days of radio. Hobbyists would nail copper wire to a wooden board (sometimes a board for cutting bread hence the term “bread board”), and solder electronic components to them. Often a paper schematic diagram was first glued to the board as a guide to placing components and wires.

The solderless circuit board included with the PCS Academy of Electronics has 300 holes, divided into sixty groups of five holes. It has a center channel with separates the board into two sets of thirty groups of five holes. Each group of five holes is connected by a clip inside the board. Any wires that are plugged into any one of the five holes will be electrically connected together.

## OBSERVATIONS:

Students will be able to recognize a solderless circuit board and be able to describe its use and identify how components can be connected to make a circuit.

## VOCABULARY:

- **Connect:** To become linked or joined.
- **Prototype:** A functional model.
- **Solderless Circuit Board:** A reusable solderless device used to build prototype electronic circuits.

Name:

Date:

## STEP 1:

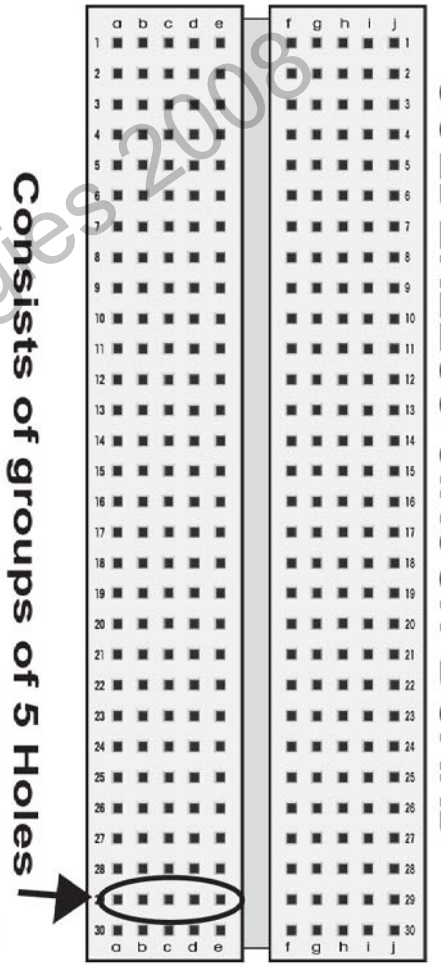
Examine the solderless circuit board. A modern solderless circuit board consists of a perforated block of plastic with spring clips under rows of holes. The solderless circuit board included with the PCS Academy of Electronics has 300 holes, divided into sixty groups of five holes. It has a center channel that separates the board into two sets of thirty groups of five holes. Each group of five holes is connected by a clip inside the circuit board. Any wires that are plugged into any one of the five holes will be electrically connected together.

## STEP 2:

You will be able to describe and define a solderless circuit board and identify connected rows. You will be able to explain how to plug electronic components into the board.

**IMPORTANT FACT**

- Many solderless circuit boards have a bus strip down one or both sides. Bus strips are used primarily for a power supply or a part of the circuit that requires a large number of connections.




SOLDERLESS CIRCUIT BOARD

Academy of ELECTRONICS

# STUDENT ACTIVITY SHEET

## SOLDERLESS CIRCUIT BOARDS #003

Name:

Date:

1. Describe why you would use a solderless circuit board:

_____

_____

_____

_____

2. Explain how the solderless circuit board works.

_____

_____

_____

_____

3. Sketch a solderless circuit board in the box below:

4. A _____ is a functional model.

5. To _____ is to become linked or joined.

6. A circuit board consists of how many holes?

Answer _____

7. Describe a fact that was introduced in this lesson:

_____

_____

_____

_____

# TEACHER GUIDE

## READING CAPACITOR VALUES #004

**ITEA STANDARD #16**

A. Students will develop an understanding of, and will be able to select and use energy and power technologies.
B. Students in grades 9-12 will study energy, power, and work concurrently in their science and technology classes.
C. Students should synthesize the concepts and principles learned in science with the knowledge gained in the study of technology to achieve a well-rounded understanding of energy and power.

**CCEI STANDARDS #6 Electronic Components.**

A. Students will discern characteristics of commonly used electronic components.
B. Identifying symbols and component characteristics.
C. Determining resistor's values by identifying color codes.
D. Drawing schematic diagrams.
E. Using diagrams to interpret circuit characteristics.

**#7 Direct-Current (DC) Circuits**

The students will understand relationships between voltage, current, resistance and power as pertaining to direct-current circuits.
C. Comparing predicted outcomes to measured outcomes with lab activities.



### OBJECTIVE:

To recognize and understand capacitor electronic components, and be able to read capacitor values.

### MATERIALS:

- Paper
- Pencil
- Nine-volt battery
- Components on the inventory sheet

### BACKGROUND:

A capacitor is an electrical device that can store an electric charge. Capacitors usually consist of two plates, each of which stores an opposite charge. The two conductive plates are separated by an insulator. As opposite charges accumulate on the plates of a capacitor due to the separation of charge, a voltage develops across the capacitor owing to the electric field of these charges.

There are two types of capacitors included in the PCS Academy of Electronics: Ceramic Disc and Electrolytic.

### OBSERVATIONS:

Students will be able to identify and describe a capacitor, and be able to recognize disc and electrolytic capacitors. Students should be able to identify the positive and negative leads on a electrolytic capacitor and be able to identify a capacitor's rating.

### VOCABULARY:

- **Capacitor:** An electrical device that can store an electric charge.
- **Ceramic Disc Capacitor:** A small disc shaped capacitor composed of ceramic and metal material.
- **Electrolytic Capacitor:** A small cylindrical shaped capacitor.

# PROJECT PLANS

## READING CAPACITOR VALUES #004

**STEP: 1**

Examine the ceramic disc capacitors in the Lab. They are marked with a 103 or 104.

The capacitance of a capacitor is measured in farads. One farad is equal to one amp being charged by a voltage rate of change of one volt per second. The ceramic disc capacitors marked with a 103 are rated at 10,000 picofarads. This shorthand method takes the first two numbers and then the multiplier or number of zeros. (For example, 103 equals one, zero, plus three zeros).

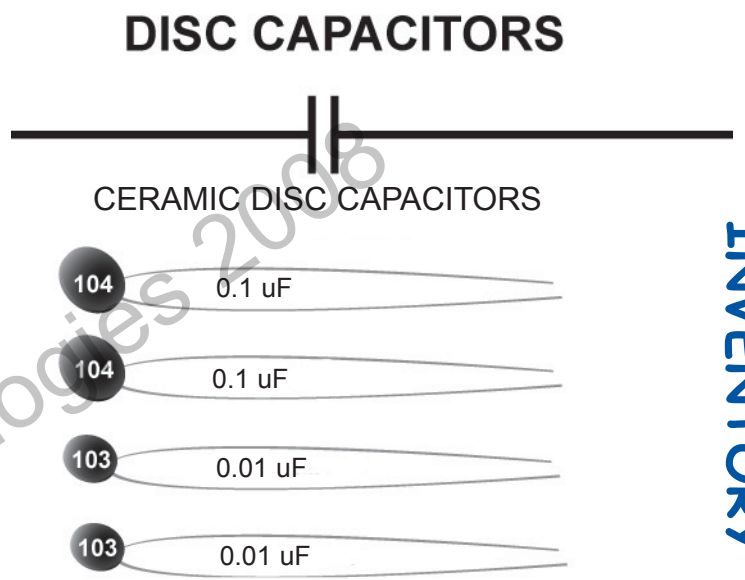
Practice reading the value of ceramic disc capacitors.

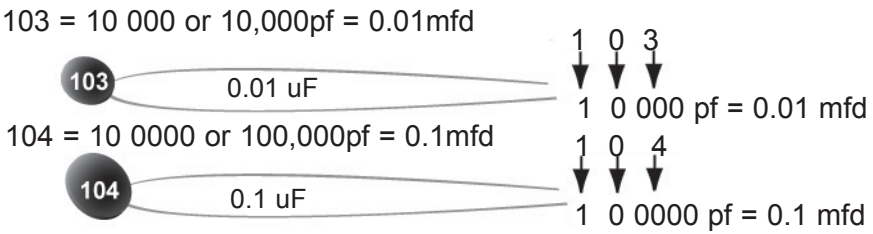
**STEP: 2**

The electrolytic capacitors usually have the shape of a cylinder, and have their leads marked with a (-) for negative and a (+) for positive. The negative side may have a solid band along it sometimes with negative signs and arrows inside the band. The wire coming out of the negative side is usually shorter than the one coming out of the positive side.

**IMPORTANT FACT**

- Picofarads can be converted to microfarads by moving the decimal point six places to the left. A 10,000 pfd would equal a 0.01 mfd.




Name:

INVENTORY LIST

Date:

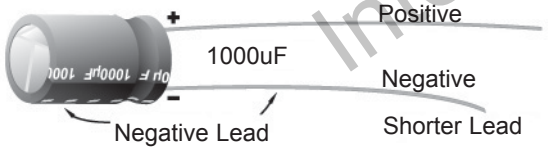
## ELECTROLYTIC CAPACITORS

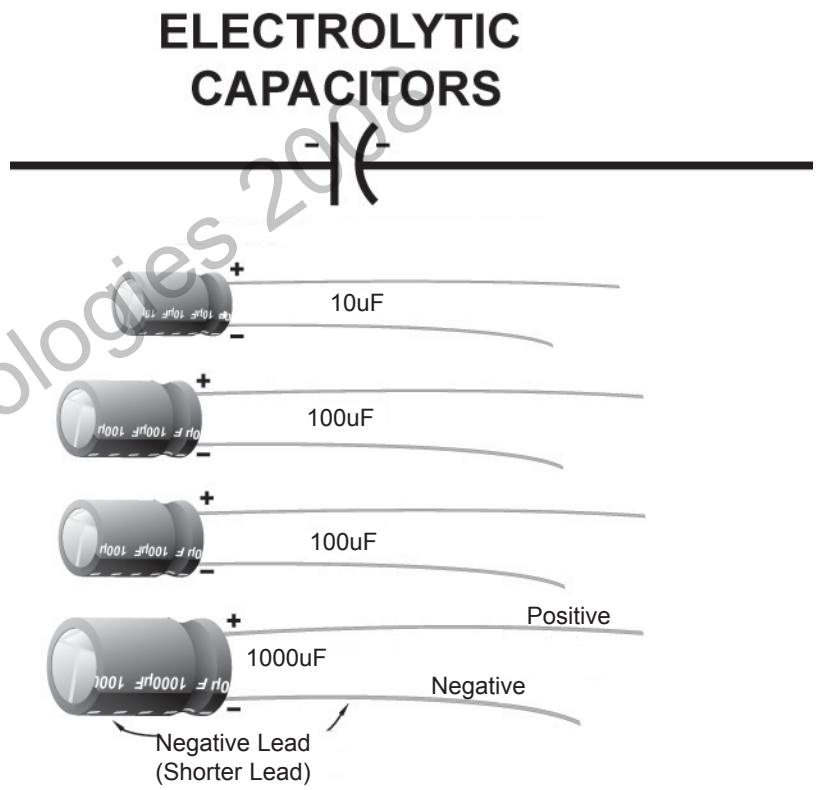
The electrolytic capacitors, usually have polarity, and are marked using a (-) for negative and a (+) for positive. The negative side may have a solid band along it sometimes with negative signs (- - - -) and arrows ( ➡ ➡ ) inside the band. The wire coming out of the capacitor from the negative side is usually shorter than the one coming out of the positive side.

Find the electrolytic capacitors in your Lab and determine which one is the 10mfd, 100mfd, and 1000mfd.

Look for the band with the arrows and negative signs (-).

Look for the shorter wire coming out of the capacitor to determine which lead is negative and which lead is positive.






Name:

Date:

Academy of ELECTRONICS

# STUDENT ACTIVITY SHEET

## READING CAPACITOR VALUES #004

Name:

Date:

1. Describe what a capacitor does.

2. Explain the difference of electrolytic capacitors and Disc capacitors.

3. Convert the following values from picofarads to microfarads:

(a) 10,000

(a) = _____

(b) 47,000

(b) = _____

(c) 50,000

(c) = _____

4. What is the purpose of this experiment?

5. Describe a way to identify a negative lead on an electrolytic capacitor.

6. Sketch a ceramic disc capacitor in the box.

7. Sketch an electrolytic capacitor in the box.