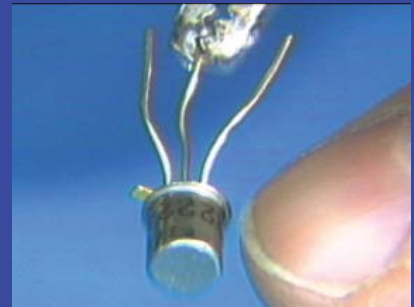
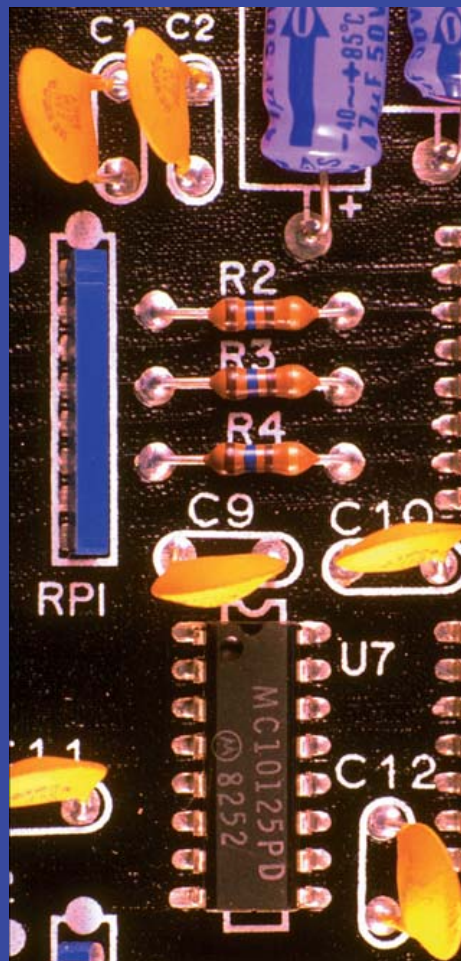
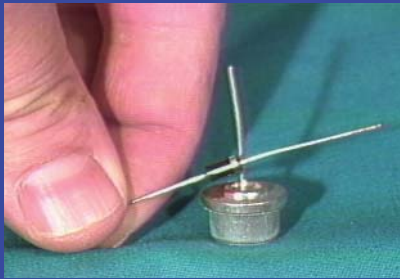


Electrical Circuits: Ohm's Law



Introduction

This program illustrates the arrangements and operations of basic electrical circuitry. Students will learn the differences between a series and parallel circuit, along with some of the rules relating to the operation of these particular circuits. The operation and configuration of a series-parallel circuit will also be discussed. The program also explains how Ohm's Law can be applied when calculating voltage, current, and resistance values. Students will discover the relationship between voltage, current, and resistance, and how they affect each other. Finally, the program will demonstrate how voltage, current, and resistance values can be obtained in more complex circuits. The information contained in *Ohm's Law* enables students to comprehend the basic concepts and principles of electrical circuitry.

This program is organized into major sections or topics. Each section covers one major segment of the subject. Graphic breaks are given between each section so that you can stop the video for class discussion, demonstrations, to answer questions, or to ask questions. This allows you to watch only a portion of the program each day, or to present it in its entirety.

This program is part of the ten-part series *Electricity and Electronics*, which includes the following titles:

- Electrical Principles
- Electrical Circuits: Ohm's Law
- Electrical Components Part I: Resistors, Batteries, and Switches
- Electrical Components Part II: Capacitors, Fuses, Flashers, and Coils
- Electrical Components Part III: Transformers, Relays, and Motors
- Electronic Components Part I: Semiconductors, Transistors, and Diodes
- Electronic Components Part II: Operation—Transistors and Diodes
- Electronic Components Part III: Thyristors, Piezo Crystals, Solar Cells, and Fiber Optics
- Electrical Troubleshooting
- Electronic Circuit Repair

To order additional titles please see **Additional Resources** at www.filmsmediagroup.com at the end of this guide.

Student Objectives

After viewing this program, the student will be able to:

- Explain the basic operation of a basic circuit
- Describe the difference between a series circuit and a parallel circuit
- Define the term series-parallel circuit
- Explain the function of a hot leg circuit
- Describe the basic purpose of a ground leg circuit
- List the basic rules relating to the operation of series and parallel circuits
- Explain the purpose of Ohm's Law

- Calculate voltage, current, and resistance in a series and parallel circuit
- Understand the relationship between voltage, current, and resistance values in a circuit
- Calculate voltage, current, and resistance in a series-parallel circuit

Discussion Topics

1. Name some of the electrical devices you encounter in your home.
2. Can you think of any advantages of wiring a circuit in series?
3. What are some of the applications of a series-parallel circuit?
4. Can you think of any applications for a frame-ground circuit, other than an automobile?
5. Which type of circuit would be easier to troubleshoot, a series circuit or a parallel circuit?
6. Would you wire the batteries in an electric car in a series or in parallel?
7. Can you think of any mechanism which uses a variable resistor?
8. Do you think the field of electricity and electronics could have advanced to its present state without the discovery of Ohm's Law?

Short Answers

Briefly answer the following questions in your own words:

1. Explain the operation of a series circuit.
2. Describe the function of a hot leg circuit.
3. How does a parallel circuit operate?
4. What is a frame-ground circuit?
5. Explain the operation of a series-parallel circuit.
6. What rules should be remembered when calculating parallel circuit values?
7. Explain the purpose of a ground leg circuit.
8. List the rules to remember when calculating parallel circuit values.
9. Name the three basic formulas stated in Ohm's law.
10. What is the most basic rule in electricity?

Technical Terms

Write definitions for the following terms. Use a textbook or review the video if needed.

series circuit	parallel circuit	series-parallel circuit	hot leg circuit
ground leg circuit	series leg	parallel legs	Ohm's Law
resistance	voltage	current	resistor
variable resistor	ohmmeter		

Quiz

1. A _____ circuit only has one path for current flow.
a. parallel b. series
c. series-parallel d. parallel-series
2. A(n) _____ circuit has more than one path or leg for current flow.
a. series b. parallel
c. parallel-series d. electronic
3. The _____ leg refers to the section of the circuit that carries current to a load.
a. ground b. negative
c. hot d. parallel
4. The _____ leg is the circuit that returns current to the source of voltage.
a. ground b. positive
c. hot d. parallel
5. Which of these circuits uses the metal structure of a chassis as a conductor?
a. parallel b. series
c. frame-ground d. series-parallel
6. The most basic rule in electricity is that _____ follow(s) the path of least resistance.
a. ohms b. wattage
c. voltage d. current
7. Ohm's Law is a simple formula used to express the relationship between voltage, current, and _____.
a. amps b. resistance
c. electrons d. wattage
8. Which of these statement is true concerning a series circuit?
a. Current is the same everywhere in the circuit.
b. Total ohms is the sum of all resistance.
c. Voltage drop across the loads equals the voltage applied.
d. All of the above.
9. Which of these statements is true concerning a parallel circuit?
a. Total current is the sum of all branches.
b. Total circuit resistance is more than any one branch.
c. Resistance applied to each branch is the same.
d. All of the above.
10. According to Ohm's Law, current equals voltage _____ by resistance.
a. multiplied b. subtracted
c. divided d. none of the above

11. According to Ohm's Law, which of the following statements is true?
- a. Voltage equals current divided by resistance.
 - b. Voltage equals resistance subtracted by current.
 - c. Voltage equals current times resistance.
 - d. None of the above.
12. If there are two four-ohm resistances in a twelve volt series circuit, what is the approximate current flow in this circuit?
- a. 3.4 amps
 - b. 1.5 amps
 - c. 5.3 amps
 - d. 2.5 amps
13. If there are three four-ohm resistances in a two amp series circuit, what is the amount of voltage applied to this circuit?
- a. 12 volts
 - b. 6 volts
 - c. 24 volts
 - d. 3 volts
14. If a parallel circuit has three branches carrying four amps each, what would the total circuit current value be?
- a. 8 amps
 - b. 6 amps
 - c. 4 amps
 - d. 12 amps
15. What is the total resistance in a parallel circuit in which R-1 equals 4 ohms and R-2 equals 6 ohms?
- a. 2.4 ohms
 - b. 6.0 ohms
 - c. 3.5 ohms
 - d. 8.0 ohms

Answer Key

Use your own judgment to evaluate the Discussion Topics, Short Answers, and Technical Terms.

Quiz Answer Key:

1. b 2. b 3. c 4. a 5. c

6. d 7. b 8. d 9. a 10. c

11. c 12. b 13. c 14. d 15. a

Useful Web Sites

IEEE Virtual Museum—The History of Electricity, Electronics, and Computers

www.ieee-virtual-museum.org

Community Learning Network

Click on "Technology Education" for educational resources in Electronics and Electricity

http://www.cln.org/subject_index.html

Greatest Engineering Achievements of the 20th Century

Click on "Electrification," "Electronics," and more

<http://www.greatachievements.org>

Superconductor Information for Beginners

<http://superconductors.org>

Additional Resources at www.filmsmediagroup.com

Available from Films Media Group • www.filmsmediagroup.com • 1-800-257-5126

Electricity and Electronics

- VHS/DVD
- Preview clip online
- Viewable/printable teacher's guide online
- Item # 34798

The program you have just viewed is part of the ten-part series *Electricity and Electronics*. The series provides a comprehensive guide to the study of electronics, ranging from the fundamental laws and principles of electricity at the atomic level to troubleshooting and repair of electronic components. Lively computer animation and hands-on demonstrations make these videos an ideal resource for the classroom. A Shopware Production. (18-24 minutes each)

The series includes: *Electrical Principles*; *Electrical Circuits: Ohm's Law*; *Electrical Components Part I: Resistors, Batteries, and Switches*; *Electrical Components Part II: Capacitors, Fuses, Flashers, and Coils*; *Electrical Components Part III: Transformers, Relays,*

and Motors; Electronic Components Part I: Semiconductors, Transistors, and Diodes; Electronic Components Part II: Operation—Transistors and Diodes; Electronic Components Part III: Thyristors, Piezo Crystals, Solar Cells, and Fiber Optics; Electrical Troubleshooting; Electronic Circuit Repair

Electric Power on the Move

- VHS/DVD-R
- Viewable/printable teacher's guide online
- Produced in association with the Accreditation Board for Engineering and Technology and the Junior Engineering Technical Society
- Item # 34288

This *Science Screen* Report looks at the production, transportation, and consumption of electricity. Using the Hoover Dam as an example of efficient hydroelectric power generation, the video illustrates how transformers raise or lower voltage and how electricity is channeled to illuminate buildings, power devices, and propel vehicles. The difference between alternating and direct current is discussed, as well as advantages of neon over filament bulbs. Animated segments help students with vital electrical concepts, including ohms, volts, and amperes. © 2004. (18 minutes)

Residential Electrical Wiring

- VHS/DVD
- Preview clip online
- Viewable/printable teacher's guide online
- Correlates to the National Center for Construction Education and Research standards.
- Item # 32070

This eight-part series is filled with information on installing, upgrading, and updating residential electrical service, walking students through all the major processes they'll need to know. A Shopware Production. © 2004. (16-21 minutes each)

The series includes: *The Service Entrance; Panelboards; Wiring Methods; Grounding; GFCIs and AFCIs; Receptacles and Switches; Wiring Light Fixtures; Wiring for Appliances*

Electricity

- VHS/DVD-R
- Viewable/printable teacher's guide online
- Item # 3548

This six-part series covers many of the fundamental concepts in the study of electricity. It explores the mystery of electricity's causes and effects, and enable students to visualize—and thereby understand—abstract and sometimes difficult concepts in physics. (10 minutes each)

The series includes: *Conductors and Insulators; Charging and Discharging; Charging by Induction; Current Electricity; Potential Difference; Resistance*

Electricity and Magnetism

- CD-ROM (Windows/Macintosh)
- Activity sheets
- Preview clip online
- Correlates to the National Science Education Standards developed by the National Academies of Science and Project 2061 Benchmarks for Science Literacy from the American Association for the Advancement of Science.
- Item # 10267

This program examines the principles of electricity and magnetism and gives students insight into this fascinating topic, covering such subjects as: static electricity; attraction/repulsion; current electricity and electrical circuits; measuring electricity—current, voltage, meters; electrical calculations; magnetism—materials, fields, rules, Earth's field; field around a current-carrying wire; the link between electricity and magnetism—induction. A Cambridge Educational Production.

The Generation of Electricity

- VHS/DVD-R
- Recommended by *Science Books & Films*
- Item # 2621

The basic principle of electromagnetic generation of electric current is demonstrated in the laboratory; the principles behind the rather complicated construction of AC and DC generators is elucidated by means of a single coil; the use of slip rings and commutators is demonstrated; and a demonstration shows the relationship between the amounts of mechanical energy input in a generator and the electrical energy output. Sequences at a 2,000-megawatt coal-fired generator demonstrate that the same basic principles are operative, but the processes in a large industrial electricity generator are far more complex. Part of the series *Physics in Action*. (19 minutes)

Understanding Electricity

- VHS/DVD-R
- Preview clip online
- Item # 11937

From the lighting of homes to the beating of a heart, electricity is an integral and fundamental force in human life. In this program, a variety of experts discuss the study and wide-ranging uses of this pervasive phenomenon, from the physics of motors and neon lights to the output of the Hoover Dam. Engaging computer graphics are used to explain voltage, amps, and watts. Dr. Martin Uman of the University of Florida Lightning Research Lab conducts modern versions of the experiment Ben Franklin made famous. Dr. Hugh Calkins, Director of Electrophysiology at Johns Hopkins Hospital, discusses innovations in defibrillators that can now be installed in the patient. A Discovery Channel Production. © 1997. (53 minutes)



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