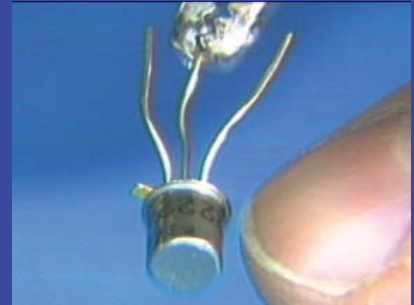
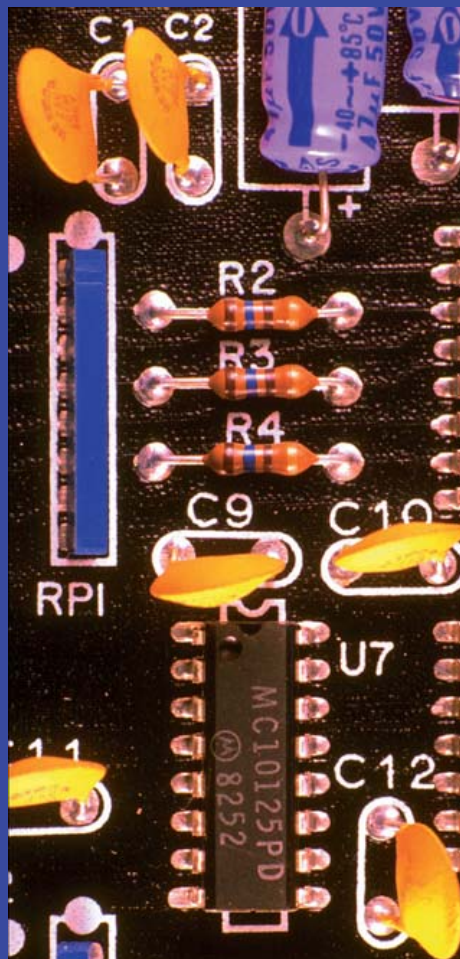
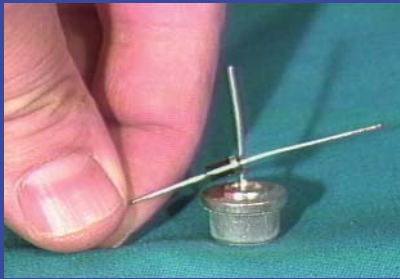


Electronic Circuit Repair



Introduction

The purpose of this video is to help you quickly learn the most common methods used to troubleshoot electronic circuits. Electronic troubleshooting skills are needed to diagnose and repair several types of devices. These devices include stereos, cameras, VCRs, and much more. As mentioned, the program will explain how to diagnose and repair different types of electronic components and circuits. Viewers will also learn how to use the specialized tools and instruments needed to test these particular types of circuits and components. If students plan to enter any type of electronics field, viewing this program will prove to be beneficial.

The 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/Switches
- Electrical Components Part II: Capacitors/Fuses/Flashers/Coils
- Electrical Components Part III: Transformers/Relays/Motors
- Electronic Components Part I: Semiconductors/Transistors/Diodes
- Electronic Components Part II: Operation—Transistors/Diodes
- Electronic Components Part III: Thyristors/Piezo Crystals/Solar Cells/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:

- Describe how to begin properly troubleshooting electronic circuits.
- Detect certain circuit malfunctions in a VCR.
- List several types of electronic circuit problems.
- Properly inspect the condition of an electronic circuit and its components.
- Explain the function of an electronic power supply.
- Describe how to test the operation of a diode.
- Explain how to test the operation of a transistor.
- Describe the applications of an oscilloscope.
- List the two types of integrated circuit chips and their functions.
- Remove and install an integrated circuit chip.

Discussion Topics

1. Describe the basic procedures used to troubleshoot a malfunction in a VCR.
2. Why is the use of service manuals so important when working on any type of electronic device?
3. Why is an intermittent electronic circuit malfunction difficult to detect?
4. What instruments should be used to inspect an electronic circuit for problems?
5. Explain how to properly clean an electronic circuit board.
6. Describe the basic procedures used to test a diode in an electronic power supply.
7. What normally causes an integrated circuit to malfunction?
8. Describe the basic procedures used to replace a component on an electronic circuit board.

Short Answers

Briefly answer the following questions in your own words:

1. Where can you obtain the proper service manuals for the particular electronic unit being repaired?
2. List four types of electronic circuit faults.
3. How should you begin diagnosing an electronic circuit for problems?
4. What type of testing instrument should be used to compare operating temperatures of electronic components in a circuit?
5. What normally causes an electronic power supply malfunction?
6. Why do transistors fail more often than other components in a circuit?
7. Why is it important for an electronic replacement part to be the same type and specs as the original?
8. Describe some of the testing applications of an oscilloscope.
9. List the two types of integrated circuit chips.
10. Explain the term “diagnostic software.”

Technical Terms

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

electronic circuit	VCR	DC voltage	AC voltage
fuse	circuit board	circuit board conductor	
capacitor	resistor	transistor	ohmmeter
condensers	coils	integrated circuit	digital thermometer
oscilloscope	forward bias	reverse bias	multimeter
collector	emitter	base	waveform
color bars	IC pins	short	open
static electricity	ground strap	logic devices	logic probe
vacuum gun	soldering iron	computer trouble code numbers	

Quiz

- Once you understand the electronic circuit and equipment being serviced, you can use _____ and a logical sequence of tests to detect the source of trouble.
 - circuit testers
 - diagnostic scanners
 - deductive reasoning
 - none of the above
- When diagnosing problems in a VCR, you should first determine what _____ of the _____ might be causing the symptoms.
 - section; output
 - part; rectifier
 - section; chip
 - section; circuit
- What must a student of electronics first understand before attempting to troubleshoot a circuit?
 - The function of the circuit
 - The power capabilities of each transistor
 - The power output of each chip
 - The types of rectifiers used
- A(n) _____ electronic fault is one that changes with operating conditions.
 - logic
 - intermittent
 - permanent
 - parameter
- A(n) _____ fault is caused when a(n) _____ produces an incorrect output.
 - intermittent; circuit board
 - permanent; IC chip
 - intermittent; power transistor
 - logic; logic gate
- A(n) _____ electronic fault is one that causes the _____ or _____ to operate out of specs.
 - permanent; rectifier; transistor
 - intermittent; circuit; chip
 - parameter; component; circuit
 - conductive; diode; transistor
- When inspecting an electronic circuit for problems, you should use a _____ to apply light pressure to the circuit board and components to locate bad connections.
 - short screwdriver
 - plastic screwdriver
 - digital probe
 - none of the above
- A _____ will often show high or low resistance in both directions.
 - faulty transistor
 - faulty IC
 - bad diode
 - all of the above
- A(n) _____ converts 120 _____ volts into low voltage _____ for the electronic components in the circuit.
 - power supply; AC; DC
 - power transistor; DC; AC
 - NPN transistor; AC; DC
 - none of the above
- A(n) _____ will often swell up when shorted or burned.
 - variable resistor
 - circuit board
 - NPN transistor
 - capacitor case

11. A small line across a circuit board _____ might indicate a crack and _____ in the circuit.
- a. component; high voltage
 - b. chip; high current
 - c. conductor; high resistance
 - d. conductor; high current
12. _____ are good for testing diodes because they use their battery to send current through the diode to turn it on.
- a. Test lights
 - b. Analog meters
 - c. Circuit testers
 - d. Digital probes
13. To check a transistor still in the circuit, measure _____ across the transistor.
- a. input resistance
 - b. output resistance
 - c. voltage drops
 - d. current input
14. A(n) _____ measures voltage levels over time.
- a. ohmmeter
 - b. oscilloscope
 - c. voltmeter
 - d. all of the above
15. Today's trend is to perform _____ repairs when ICs or other components in the circuit fail.
- a. circuit level
 - b. component level
 - c. circuit conductor
 - d. board level

Answer Key

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

Quiz Answer Key:

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

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

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

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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