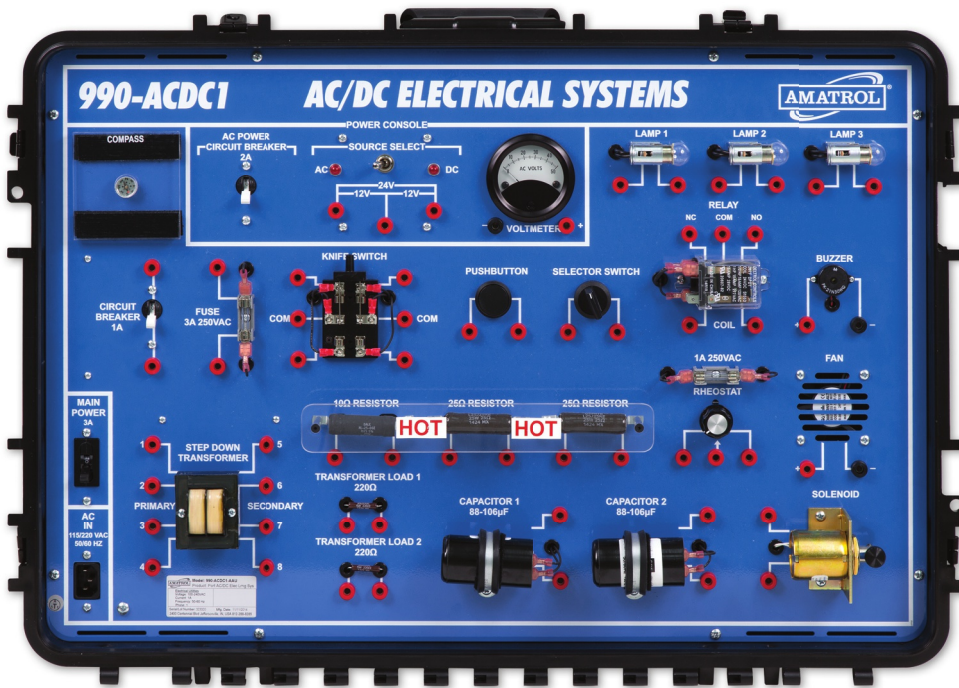


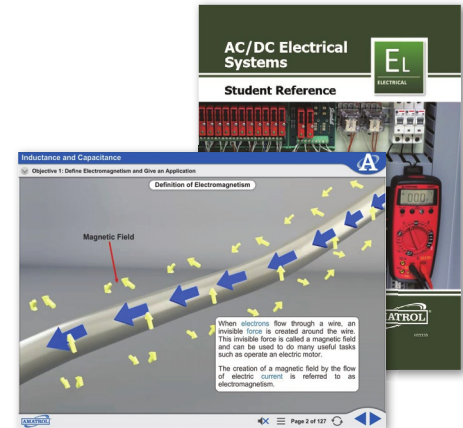
Portable AC/DC Electrical Learning System

990-ACDC1



Portable AC/DC Electrical Learning System

990-ACDC1 Student Reference Guide



Interactive Multimedia Curriculum



Portable Workstation

Learning Topics:

- Basic Electrical Circuits
- Fundamentals of Electricity
- Electrical Measurements
- Series and Parallel Circuits
- Circuit Analysis
- Circuit Protection Devices
- Inductance and Capacitance
- Electromagnetism
- Combination Circuits
- Lighting Circuits
- Transformers
- Transformer Sizing and Types

Amatrol's AC/DC Electrical Learning System (990-ACDC1) is a portable solution when training space is limited, but comprehensive knowledge and skill-building cannot be sacrificed! Thanks to its small footprint, this portable system can be placed on a conference room table, shop floor desk or practically anywhere. Its compact size and durable case provide for safe storage when available training space must be used to teach other topics.

The 990-ACDC1 workstation, combined with a highly-engaging interactive multimedia, teaches the fundamentals of AC and DC electrical systems used for power and control in industrial, commercial, agricultural and residential applications. Using a variety of input, output and other electrical components, the 990-ACDC1 offers industry-relevant skills, including how to operate, install, design and troubleshoot basic AC and DC electrical circuits.

This system provides the knowledge and skills needed with unmatched flexibility!



Technical Data

Complete technical specifications available upon request.

Portable Console

Durable ABS Plastic
Power Cord, 14/3, 15A
990-ACDC1 Mounted Panel

Magnetic Compass
Circuit Breaker, 1A & 2A
AC/DC Source Select
AC/DC Power Supply
Voltmeter
Lamp (3)
Fuse, 3A 250VAC
Knife Switch
Pushbutton
Selector Switch
Coil
Main Power Switch
AC Input
Buzzer
Step Down Transformer
10 Ohm Resistor
25 Ohm Resistor (2)
Rheostat, 1A 250VAC
Fan
220 Ohm Transformer Load (2)
Capacitor, 88-106F (2)
Solenoid

24" Stackable Banana Leads (14)

Neon Circuit tester

Digital Multimeter with Test Leads

Spare Fuse 10A

Fuses, 3A, Fast-Acting (12)

Fuse Puller, 250V

Student Curriculum – Interactive PC-Based

Multimedia (N11133)

Instructor's Guide (C11133)

Installation Guide (D11133)

Student Reference Guide (H11133)

Additional Requirements:

See <http://www.amatrol.com/support/computer-requirements>

Utilities Required:

120/220 VAC, 60/50 HZ, Power Outlet

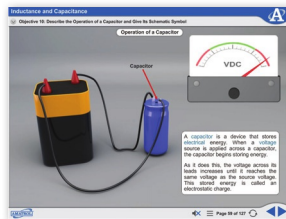
Learn about Electricity Nearly Anywhere

By simply using the 990-ACDC1 and a computer, anyone can attain a wide array of AC/DC electrical training at a desk, in a conference room, or practically anywhere – this compact system opens up untapped training areas in your facility that you have never been able to consider prior. The learning system provides knowledge and skill-building by covering topics such as Ohm's Law and Kichhoff's Voltage Law. This allows users to apply their knowledge using real-world components, such as digital multimeters, solenoids and switches. Learners build on this knowledge, adding skills such as testing wire continuity, connecting and operating electrical circuits, and designing a voltage divider network.



Highly Engaging Interactive Multimedia

The 990-ACDC1's extensive multimedia curriculum begins with the basic electrical circuits by defining the fundamentals of electricity, and then builds onto this knowledge by advancing to topics such as electromagnetism and transformers. As learners complete new topics, they'll use this theoretical knowledge to complete hands-on skills, like connecting and operating a basic lighting circuit, measuring resistance in series and parallel circuits, and troubleshooting a transformer. By combining theoretical knowledge and hands-on skills, the learner's comprehension and retention of electrical systems is greatly enhanced.

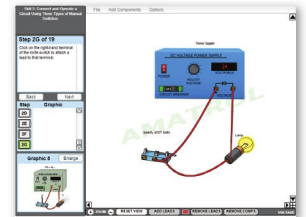


Screenshot of Interactive Multimedia Curriculum

Amatrol's peerless interactive multimedia curriculum utilizes text with voiceovers, pictures, videos, stunning 3D animations, and interactive quizzes and reviews that engage learners in theoretical knowledge and concepts. This thorough, detailed curriculum begins with the basics and advances to complex concepts. Through partnerships with key industry leaders and leading educators, Amatrol developed the right balance of knowledge to train learners to work in their chosen field.

Virtual Trainer for Online AC/DC Electrical Skill-Building

The AC/DC Electrical Training System also features a virtual multimedia trainer! Amatrol's virtual trainers replicate hands-on equipment in such great detail that learners will feel like they are using the actual equipment. Learners will perform essentially the same tasks using virtual trainers that they would perform using equipment hardware. Transition from theory to hands-on is a seamless process.

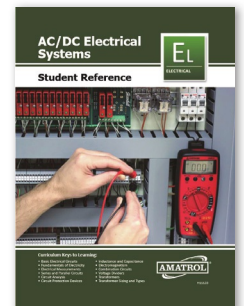


The 990-ACDC1: Mobile, Durable, Efficient

Set within a durable ABS plastic case, the 990-ACDC1 features wheels and a handle to create a completely mobile learning experience. This highly-efficient learning system also includes a lock for safety and a storage pouch on the inside cover for loose components, such as banana leads used to connect various circuits. Additionally, the system's front cover is easily removable, enabling the case to sit upright on a flat surface for more convenient use. It will be a breeze to both transport the learning system and store it.

Complimentary Student Reference Guide

A sample copy of the AC/DC Electrical Student Reference Guide is included with the learning system. Sourced from the curriculum, the Student Reference Guide takes the entire series' technical content contained in the learning objectives and combines them into one perfectly-bound book. If you would like to inquire about purchasing additional Student Reference Guides for your program, contact your local Amatrol Representative for more information.



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PORTABLE AC/DC ELECTRIC LEARNING SYSTEM

This learning system is designed to teach basic through advanced AC/DC electrical concepts and skills as they are used in industry today. Utilities required for this learning system are 120/220 VAC, 60 /50 Hz. It shall include a mobile carrying case, workstation mounting panel, student curriculum, installation guide, and teacher's guide. The minimum requirements include:

990-ACDC1 Final Assembly

- (1) Pushbutton Switch
- (1) Selector Switch
- (1) Circuit Breaker Switch
- (1) DPDT Knife Switch
- (1) 24 VDC DPDT
- (1) Buzzer
- (1) Transformer
- (3) Lamps, 28 V
- (1) Fan – 24 VDC
- (1) Solenoid
- (1) Compass
- (1) Circuit Tester
- (1) Fuse
- (2) 25 Ohm Resistors
- (1) 10 Ohm Resistors
- (1) Rheostat
- (2) Electrolytic Capacitors – 80-106 MF (2)
- (2) 220 Ohm-5 Watt Transformer Load Resistors

Power Cord, 14/3, 15A

(14) 24" Stackable Banana Leads

Neon Circuit Tester

Digital Multimeter

(1) Spare Fuse, 10A

(12) Fuses, 3A, Fast-Acting

Student Curriculum

The curriculum shall consist of one (1) set of six (6) multimedia modules. The student curriculum shall contain of at least 47 industry skills covering basic and advanced applications using electrical components. Topics shall include: Basic Electrical Circuits, Electrical Measurements, Circuit Analysis, Inductive and Capacitance, Combination Circuits, and Transformers.

The student curriculum supplied shall be designed in a skill-based format that focuses on teaching industry-relevant tasks. This curriculum shall be designed for use in both self-directed student learning and group instruction formats. The objectives shall be accomplished by organizing the learning material into a series of modules, which are further subdivided into two or more segments per module. All learning materials needed shall be contained in the modules including text material, laboratory equipment activities, and any multimedia directions. No external text sources shall be required. The specific cognitive skills taught by each text passage shall be identified next to the passage. Each lab activity shall be identified by the industrial task taught. All activities shall be highly detailed with step-by-step instructions to facilitate a self-directed learning environment. A combination of step-by-step enabling activities and creative,

problem-solving activities shall be provided. A self-review of five to ten questions shall be provided after each segment.

In addition to multimedia curriculum, this learning system includes access to Virtual Trainer skill-building. The student curriculum shall include six (6) interactive multimedia modules with at least forty-seven (47) electrical control industry skills. Major topics include: basic electrical circuits; electrical measurements; circuit analysis; inductance and capacitance; combination circuits; and transformers. This software shall be provided as a one seat license or in multiples as required.

Instructor's Guide

The instructor's guide shall contain student data sheets, data sheet solutions, self-review answers, quizzes, quiz answers, student skill record sheets, and assessment directions. The student data sheets shall be designed with data collection blanks to permit students to record data without consuming the learning activity packets. A quiz shall be provided for each module. A question shall be provided in each quiz for each cognitive objective taught and correlated as such. All tasks listed in the module shall be listed on personalized student record sheets. Detailed instructions and any supplemental material shall be provided for the teacher to perform live assessment of each student.

Certification Alignment

The 990-ACDC1 aligns with the SACA C-201 Electrical Systems 1 credential.

Amatrol Model No. 990-ACDC1 or equal

990-ACDC1
PORTABLE AC/DC ELECTRICAL LEARNING SYSTEM

MODULE 1 BASIC ELECTRICAL CIRCUITS

SEGMENT 1	FUNDAMENTALS OF ELECTRICITY
OBJECTIVE 1	Define electricity and give an application
OBJECTIVE 2	Describe the two types of electrical current and give an application of each
OBJECTIVE 3	Describe the function and operation of a circuit tester
SKILL 1	Use an AC tester to check a wall outlet for electricity
SEGMENT 2	ELECTRICAL CIRCUIT COMPONENTS
OBJECTIVE 4	Describe the function of the four basic components of an electrical circuit
OBJECTIVE 5	Describe the operation of two types of power supplies and give their schematic symbols
OBJECTIVE 6	Describe the function of an electrical schematic
SKILL 2	Connect and operate a power supply
SEGMENT 3	MANUAL INPUT DEVICES
OBJECTIVE 7	Describe the operation of a manual switch
OBJECTIVE 8	Describe the operation of N.O. and N.C. contacts and give their schematic symbols
OBJECTIVE 9	Describe the function of three types of manual switch operators and give an application of each
OBJECTIVE 10	Describe the operation of three types of manual switch operators and give their schematic symbols
SKILL 3	Connect and operate a circuit using three types of manual switches
SEGMENT 4	OUTPUT DEVICES
OBJECTIVE 11	Describe the Function of five types of electrical output devices and give an application of each
OBJECTIVE 12	Describe the operation of five types of electrical output devices and give their schematic symbols
SKILL 4	Connect and operate an electrical circuit with a resistor
SKILL 5	Connect and operate an electrical circuit with a buzzer
SKILL 6	Connect and operate an electrical circuit with a solenoid
SKILL 7	Connect and operate an electrical circuit with a motor

MODULE 2 ELECTRICAL MEASUREMENTS

SEGMENT 1	VOLTAGE MEASUREMENT
OBJECTIVE 1	Define voltage and give its units of measurement
OBJECTIVE 2	Describe the function of two types of voltmeters and give their schematic symbol
OBJECTIVE 3	Describe how to use a voltmeter to measure voltage
SKILL 1	Use an analog voltmeter to measure the voltage at a point referenced to ground
OBJECTIVE 4	Describe the function of two multimeters: analog and digital
ACTIVITY 1	Identification of digital multimeter components
SKILL 2	Use a DMM to measure the voltage of a point referenced to ground

SEGMENT 2

OBJECTIVE 5

OBJECTIVE 6

ACTIVITY 2

SKILL 3

INTRODUCTION TO SERIES AND PARALLEL CIRCUITS

Define series and parallel circuits

Describe the voltage characteristics in series and parallel circuits

Voltage characteristics of series and parallel circuits

Use a DMM to measure voltage drops in series and parallel circuits

SEGMENT 3

OBJECTIVE 7

OBJECTIVE 8

OBJECTIVE 9

SKILL 4

SKILL 5

OBJECTIVE 10

ACTIVITY 3

CURRENT MEASUREMENT

Define current and give its units of measurement

Describe the function of two types of ammeters and give their schematic symbol

Describe how to use an ammeter to measure current

Use a DMM to measure the electrical current

Use a DMM to measure current in series and parallel circuits

Describe the current characteristics in series and parallel circuits

Characteristics in series and parallel circuits

SEGMENT 4

OBJECTIVE 11

OBJECTIVE 12

OBJECTIVE 13

SKILL 6

OBJECTIVE 14

SKILL 7

OBJECTIVE 15

SKILL 8

RESISTANCE MEASUREMENT

Define resistance and give its units of measurement

Describe the function of two types of ohmmeters and give their schematic symbol

Describe how to use an ohmmeter to measure resistance

Use a DMM to measure the resistance of a component

Describe the resistance characteristics in series and parallel circuits

Measure the resistance in series and parallel circuits

Describe two methods of measuring continuity

Test the continuity of wires using a DMM

MODULE 3 CIRCUIT ANALYSIS**SEGMENT 1**

OBJECTIVE 1

SKILL 1

OBJECTIVE 2

SKILL 2

OBJECTIVE 3

ACTIVITY 1

OBJECTIVE 4

OBJECTIVE 5

SKILL 3

POWER IN SERIES CIRCUITS

State the formula for calculating series resistance and give an application

Calculate series resistance given each load's resistance

State Ohm's Law, explain its importance and give an application

Use Ohm's Law to calculate voltage, current, and resistance in a series circuit

State Kirchhoff's Voltage Law for a series circuit and give an application

Verification of Kirchhoff's Voltage Law

Define power and give its units of measurement

State a formula for calculating the total power used in an electrical circuit

Calculate the total power used by a series circuit

SEGMENT 2

OBJECTIVE 6

SKILL 4

OBJECTIVE 7

SKILL 5

SKILL 6

POWER IN PARALLEL CIRCUITS

State Kirchhoff's Current Law and give an application

Calculate the main line current in a parallel circuit

State a formula for calculating total parallel resistance

Calculate the total parallel resistance

Calculate the total power used in a parallel circuit

SEGMENT 3

OBJECTIVE 8

CIRCUIT PROTECTION DEVICES

Describe the function of two types of circuit protection and give an application of each

OBJECTIVE 9	Describe the operation of a fuse and give its schematic symbol
SKILL 7	Operate a circuit using a fuse
SKILL 8	Test and replace a fuse
OBJECTIVE 10	Describe the operation of two types of circuit breakers and give their schematic symbols
SKILL 9	Operate a circuit using a circuit breaker
SKILL 10	Test and reset a circuit breaker

MODULE 4 INDUCTANCE AND CAPACITANCE

SEGMENT 1 ELECTROMAGNETISM

OBJECTIVE 1	Define electromagnetism and give an application
ACTIVITY 1	Test an electromagnetic field
OBJECTIVE 2	Describe the functions of four electromagnetic devices
ACTIVITY 2	Electromagnetic device operation
SKILL 1	Connect and operate a relay in a circuit

SEGMENT 2 INDUCTANCE

OBJECTIVE 3	Define inductance and give its units of measurement
OBJECTIVE 4	Describe the operation of an inductor and give its schematic symbol
OBJECTIVE 5	Describe the effect of an inductor in a DC circuit and give an application
ACTIVITY 3	Effect of inductance in a DC circuit
OBJECTIVE 6	Describe the effect of an inductor in an AC circuit and give an application
ACTIVITY 4	Effect of inductive reactance in an AC circuit
OBJECTIVE 7	State the formulas for calculating total series inductance and inductive reactance
OBJECTIVE 8	State the formulas for calculating total parallel inductance and inductive reactance
SKILL 2	Calculate the total load on an AC circuit with inductors

SEGMENT 3 CAPACITANCE

OBJECTIVE 9	Define capacitance and give its units of measurement
OBJECTIVE 10	Describe the operation of a capacitor and give its schematic symbol
OBJECTIVE 11	Describe the functions of three types of capacitors
SKILL 3	Discharge a capacitor
SKILL 4	Test a capacitor with a DMM

SEGMENT 4 CHARACTERISTICS OF CAPACITANCE

OBJECTIVE 12	Describe the effect of a capacitor in a DC circuit and give an application
SKILL 5	Measure the voltage across a charged capacitor
ACTIVITY 5	Effect of a capacitor in a DC circuit
OBJECTIVE 13	Describe the effect of a capacitor in an AC circuit and give an application
ACTIVITY 6	Effect of a capacitor in an AC circuit
OBJECTIVE 14	State the formulas for calculating total series capacitance and capacitive reactance
OBJECTIVE 15	State the formulas for calculating total parallel capacitance and capacitive reactance
SKILL 6	Calculate the total load on an AC circuit with capacitors

SEGMENT 5 INDUCTOR AND CAPACITOR APPLICATIONS

OBJECTIVE 16	Describe the function of a fluorescent light fixture
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OBJECTIVE 17	Describe the function of an RC timing circuit in a time-delay relay
SKILL 7	Calculate the time to charge and discharge a capacitor
OBJECTIVE 18	Describe the function of capacitor and inductors in an electric power supply

MODULE 5 COMBINATION CIRCUITS

SEGMENT 1

CHARACTERISTICS

OBJECTIVE 1	Define a series-parallel circuit
OBJECTIVE 2	Describe a method for identifying the series and parallel sections of a circuit
SKILL 1	Trace the current path in a combination circuit
OBJECTIVE 3	List the seven steps for solving a combination circuit
SKILL 2	Solve a combination circuit

SEGMENT 2

LIGHTING CIRCUITS

OBJECTIVE 4	Describe how switches are used in combination circuits and give an application
SKILL 3	Connect and operate a basic lighting circuit
SKILL 4	Connect and operate a ceiling fan circuit
OBJECTIVE 5	Describe the function of a variable resistor and give an application
ACTIVITY 1	Rheostat operation
SKILL 5	Connect and operate a rheostat as a light dimmer

SEGMENT 3

VOLTAGE DIVIDERS

OBJECTIVE 6	Describe the function of a voltage divider and give an application
OBJECTIVE 7	Describe the operation of three types of voltage dividers
SKILL 6	Design a voltage divider network
SKILL 7	Connect and operate a voltage divider network

SEGMENT 4

TROUBLESHOOTING

OBJECTIVE 8	Explain the effect of a short circuit
OBJECTIVE 9	Describe the four steps for troubleshooting a short circuit
SKILL 8	Locate a short circuit
OBJECTIVE 10	Describe the three basic steps for troubleshooting an open circuit
SKILL 9	Locate an open circuit

MODULE 6 TRANSFORMERS

SEGMENT 1

INTRODUCTION TO TRANSFORMERS

OBJECTIVE 1	Describe the function of a transformer and give an application
OBJECTIVE 2	Describe the operation of a transformer and give its schematic symbol
SKILL 1	Connect and operate a transformer
OBJECTIVE 3	Describe how to calculate the output voltage of a transformer
SKILL 2	Calculate the secondary coil voltage of a transformer
OBJECTIVE 4	Describe how to troubleshoot a transformer
SKILL 3	Troubleshoot a transformer by measuring continuity

SEGMENT 2

SIZING A TRANSFORMER

OBJECTIVE 5	Describe how to size a transformer
SKILL 4	Size a transformer
OBJECTIVE 6	Describe a transformer's input and output power relationship and explain its importance

ACTIVITY 1	Transformer power loss
OBJECTIVE 7	Describe how to calculate the current load of a transformer
SKILL 5	Calculate the current load on a transformer
SEGMENT 3	TRANSFORMER TYPES
OBJECTIVE 8	Describe the function of two basic categories of transformers
OBJECTIVE 9	Describe the function of a control transformer
SKILL 6	Design a control transformer circuit to provide a given output voltage
OBJECTIVE 10	Describe the function of a tap on the secondary of a transformer and give an application
ACTIVITY 2	The distribution transformer