

Content Standard 1: Safety and Tools

Performance Standard 1.1: Demonstrate general lab safety rules and procedures

- 1.1.1 Describe the physiological reactions electrical shock causes; list various degrees of current the human body can tolerate
- 1.1.2 Describe the roles of OSHA in the workplace
- 1.1.3 Identify and use proper lifting procedures and proper use of support equipment
- 1.1.4 Utilize proper ventilation procedures for working within the lab/shop area
- 1.1.5 Identify marked safety areas
- 1.1.6 Describe the type and usage of the fire extinguishers
- 1.1.7 Identify the location of the posted evacuation routes
- 1.1.8 Explain eye and ear protection needed by technicians, and appropriate clothing for lab/shop activities
- 1.1.9 Explain the concepts of First Aid and its particular importance to workers in electronic and electronics fields; explain precautions for untrained people
- 1.1.10 Describe fusing and circuit breaker rules and reasons for different types of fuses
- 1.1.11 Explain how electrostatic discharge (ESD) damages sensitive electronic components
- 1.1.12 Demonstrate proper procedures for preventing damage from ESD (ground straps, mats, etc.)

Performance Standard 1.2: Identify and safely utilize tools and equipment

- 1.2.1 Identify the appropriate usage of tools and equipment
- 1.2.2 Demonstrate the proper techniques when using tools and equipment
- 1.2.3 List tools hazards that are associated with technician activities in the workplace and in the field
- 1.2.4 Demonstrate proper cleaning, storage, and maintenance of tools and equipment
- 1.2.5 Identify meter protection, safety and usage
- 1.2.6 Explain care of equipment and test leads
- 1.2.7 List the purposes and types of signal generators
- 1.2.8 Describe meter loading and precautions
- 1.2.9 Describe oscilloscope usage; explain the purpose of each front panel control

Content Standard 2: Electronic Theory

Performance Standard 2.1: Explain the principles of electronic theory

- 2.1.1 Describe the atomic structure, the components of the atom, their charges and importance to electronics technology
- 2.1.2 Explain the characteristics of voltage, current, and resistance (unit of measure, letter/symbol)
- 2.1.3 Explain basic uses for electricity
- 2.1.4 Describe the basic methods of using electricity to operate a motor and how to mechanical motion causes a generator to produce electrical current
- 2.1.5 List different types of resistive materials and how resistors are used in electronics

- 2.1.6 Describe the purposes of capacitors. List common types and construction designs
- 2.1.7 Explain how inductance relates to magnetism and describe coil construction, cores and usages
- 2.1.8 Compare impedance with reactance and resistance, and describe current/voltage relationships.
- 2.1.9 List voltage sources, AC and DC, batteries and natural generation (solar, wind, hydro, etc.)
- 2.1.10 List Ohms law formulas for current, voltage, resistance and power. Solve math problems utilizing each
- 2.1.11 Calculate power consumption and its effects on circuit design

Performance Standard 2.2: Utilize schematics and block diagrams

- 2.2.1 Draw and interpret common electrical/electronic symbols
- 2.2.2 Explain how block diagrams are used for troubleshooting and maintenance of electronics products
- 2.2.3 Explain the differences between wiring prints, schematics and block diagrams
- 2.2.4 Describe the purpose and use of test points.
- 2.2.5 Explain how schematics are used to locate component and wiring failures in electronics products
- 2.2.6 Explain the methods of using flow diagrams/charts
- 2.2.7 Explain how block diagrams are used for troubleshooting and maintenance of electronics products

Performance Standards 2.3: Identify basic wiring principles

- 2.3.1 List wire types and construction
- 2.3.2 List American wire gauges used for various purposes
- 2.3.3 Explain the effects of proper and improper termination
- 2.3.4 Explain the purposes of grounding and common conventions used in electrical systems and electronics

Content Standard 3: Electronic Components

Performance Standard 3.1: Identify electronic components

- 3.1.1 Illustrate schematic symbols for various types of electrical and electronic components
- 3.1.2 Recognize the effects of environmental conditions on electronic components
- 3.1.3 Identify capacitor types; list common usages; methods of varying capacitance and explain the terms charge and coulomb
- 3.1.4 Identify inductor types and reasons for various core materials; how diameter and wire size affects inductance
- 3.1.5 Identify common types of transformers and list uses for each; explain step up/down voltage methods; explain why laminations are used
- 3.1.6 List common optical devices (LEDs, LCDs, etc.) and describe how a photovoltaic cell is activated. Draw symbols for photo resistors, photodiodes and phototransistors; list materials from which these devices are made

Performance Standard 3.2: Analyze quantities utilized in electronics

- 3.2.1 Identify and utilize the basic units of electronic measurements

- 3.2.2 Express and convert numbers in scientific, engineering and metric notation
- 3.2.3 Convert from scientific notation to engineering notation
- 3.2.4 Identify resistor values from color code or other marks and list composition and reasons for different usages

Content Standard 4: DC and AC Circuit Configuration

Performance Standard 4.1: Analyze series circuit configuration

- 4.1.1 Identify series circuit configuration
- 4.1.2 Calculate voltage drops in a series circuit
- 4.1.3 Utilize Kirchhoff's Voltage Law
- 4.1.4 Recognize polarity in a series circuit
- 4.1.5 Calculate voltage, current, resistance, and power in a series circuit
- 4.1.6 Construct, measure, and analyze simple series circuits

Performance Standard 4.2: Analyze parallel circuit configuration

- 4.2.1 Identify parallel circuit configuration
- 4.2.2 Calculate voltage drops in a parallel circuit
- 4.2.3 Utilize Kirchhoff's Current Law
- 4.2.4 Recognize polarity in a parallel circuit
- 4.2.5 Calculate voltage, current, resistance, and power in a parallel circuit
- 4.2.6 Construct, measure, and analyze simple parallel circuits

Performance Standard 4.3: Analyze series-parallel circuit configuration

- 4.3.1 Identify series-parallel circuit configuration
- 4.3.2 Calculate voltage drops in a series-parallel circuit
- 4.3.3 Utilize Kirchhoff's Voltage and Current Laws where appropriate
- 4.3.4 Recognize polarity in a series-parallel circuit
- 4.3.5 Calculate voltage, current, resistance, and power in a series-parallel circuit
- 4.3.6 Utilize Thevenin's and Norton's theorems

Performance Standard 4.4: Analyze alternating circuits (AC)

- 4.4.1 Construct and test AC circuits
- 4.4.2 Identify AC wave form characteristics: effective voltage (RMS), average voltage, negative alternation, positive alternation, wavelength, amplitude, period, and frequency
- 4.4.3 Calculate peak, peak-to-peak, RMS, and average voltage values for an AC waveform
- 4.4.4 Explain cycle, hertz, phase, and frequency
- 4.4.5 Describe the requirement for inductance in AC electrical circuits (self and mutual inductance)
- 4.4.6 Compare and contrast reactance, resistance, and impedance
- 4.4.7 Explain phase relationships for series, and series- parallel RL, RC, and RCL circuits
- 4.4.8 Analyze high and low pass filter circuits

Content Standard 5: Digital Electronic Principles

Performance Standard 5.1: Analyze digital concepts design and circuitry

- 5.1.1 Identify and convert numbers between numbering systems (decimal, binary, hexadecimal, BCD)
- 5.1.2 Compare and contrast between 1 (high) and 0 (low or ground)

- 5.1.3 Perform numerical calculations in numbering systems (binary, hexadecimal, octal)
- 5.1.4 Identify and describe basic logic operations (AND, OR, buffer, inverter, NAND)
- 5.1.5 Explain Boolean Algebra and its use in digital circuitry
- 5.1.6 Utilize Karnaugh Maps
- 5.1.7 Interpret data sheet information
- 5.1.8 Evaluate logic circuit truth tables
- 5.1.9 Analyze clock and timing circuit operations
- 5.1.10 Analyze combinational logic circuits for a given application (relay logic)
- 5.1.11 Assess the operation of analog-to-digital and digital-to-analog convertors
- 5.1.12 Describe ASCII code
- 5.1.13 List the uses and precautions for logic test probes
- 5.1.14 Explain how logic pulsers are used

Performance Standard 5.2: Utilize microcontroller devices

- 5.2.1 Describe basic principles of microcontrollers
- 5.2.2 Describe the process of executing instructions in a microcontroller
- 5.2.3 Draw a flowchart for a typical program or process
- 5.2.4 Describe the procedure for instruction coding and program debugging
- 5.2.5 Describe the fundamental principles for microcontroller interfacing
- 5.2.6 Demonstrate basic wiring procedures for microcontrollers
- 5.2.7 Write, deploy, and test an original microcontroller program

Content Standard 6: Soldering and Desoldering Techniques

Performance Standard 6.1: Apply soldering techniques

- 6.1.1 Describe solder safety as it pertains to burns and potential fires, damage to facilities or customer products
- 6.1.2 Explain the causes of solder fumes and the effects of lead poisoning
- 6.1.3 List causes and precautions to prevent or reduce solder splatter
- 6.1.4 Explain the reasons for flux usage and describe types
- 6.1.5 List types of solder and reasons for choosing each
- 6.1.6 Explain heat sinks, why and how they are used
- 6.1.7 Identify cold solder joints and explain causes
- 6.1.8 Describe the difference between good and bad mechanical and electrical solder connections
- 6.1.9 Demonstrate proper care of solder-desolder equipment and aids
- 6.1.10 Demonstrate proper soldering techniques for through-hole and surface mount components

Performance Standard: 6.2: Apply desoldering techniques

- 6.2.1 Explain desoldering principles
- 6.2.2 Describe various types of desoldering equipment and how it is used
- 6.2.3 Demonstrate the use of braid-wick and pump solder removers

Content Standard 7: Troubleshooting and Maintenance Techniques

Performance Standard 7.1: Apply troubleshooting techniques

- 7.1.1 Explain troubleshooting techniques
- 7.1.2 Create and utilize a non-routine task form (job hazard analysis)
- 7.1.3 Utilize all safety procedures necessary while troubleshooting (lock-out tag-out, etc.)

- 7.1.4 Select and utilize appropriate tools for electronics troubleshooting
- 7.1.5 Research various sources of repair/maintenance/troubleshooting documentation (print media, electronic media, tech support, local expert, and manufacturer)
- 7.1.6 Interpret electronic schematic diagrams
- 7.1.7 Measure electrical characteristics of voltage, current, and resistance in basic electronic circuits using multimeters, oscilloscopes, logic probes, etc.

Performance Standard 7.2: Demonstrate repair documentation techniques

- 7.2.1 Explain the difference between maintenance and repair
- 7.2.2 Identify the common causes of system and equipment failures
- 7.2.3 Use electrostatic discharge (ESD) control devices and techniques when handling ESD-sensitive equipment and components
- 7.2.4 Isolate common faults in wiring and equipment
- 7.2.5 Identify common preventive maintenance measures (lubrication, housekeeping, alignment, and filters)
- 7.2.6 Explain the purposes and requirements for proper recordkeeping
- 7.2.7 Interpret preventative maintenance and inspection schedules