

Lesson 1 - Getting Started

Objectives:

- Use checklists and log sheets to record information about the equipment you service, and about the service procedures you perform.
- Identify common warning symbols used by manufactures today, and explain basic electrical safety precautions.
- Isolate a problem by performing simple electrical troubleshooting tasks in a logical order.
- Locate a faulty component by using the “hopscotch” method of troubleshooting.

Lesson 2 - Reading Schematics

Objectives:

- Read and interpret electrical schematic diagrams correctly as an aid in troubleshooting.
- Recognize and explain some of the differences between the schematics of one manufacturer and another, including wiring and terminal designations, symbol usage, component placement, and so on.
- Describe the sequence of operation for the equipment of several different manufacturers by tracing their respective wiring diagrams.
- Explain how high-voltage and low-voltage power supply information is provided on the schematics of residential and light commercial equipment.

Lesson 3 - Split Systems (Part 1)

Objectives:

- Describe appropriate electrical troubleshooting procedures for residential split systems.
- Develop a logical approach to isolating the cause of a service problem.
- Read and follow a troubleshooting flow chart.

Lesson 4 - Split Systems (Part 2)

Objectives:

- Explain some of the problems encountered with high-voltage gas heating/air conditioning systems.
- Describe appropriate electrical troubleshooting procedures for these types of residential split systems.
- Read and interpret the self-diagnostic fault codes used in some high-efficiency furnaces.
- Locate the probable causes of a service problem (e.g., the electronic thermostat, the printed circuit board, wiring difficulties, etc.).

Lesson 5 - Gas Furnaces (Part 1)

Objectives:

- Explain some of the problems encountered with several types of ignition systems and safety controls that are used with gas furnaces.
- Describe appropriate electrical troubleshooting procedures for these types of heating systems.
- Read and interpret the schematic diagrams and troubleshooting flow charts provided by the manufacturers of such equipment.
- Locate the probable cause of a service problem (e.g., the thermostat, the printed circuit board, the wiring, etc.).

Lesson 6 - Gas Furnaces (Part 2)

Objectives:

- Explain some of the problems encountered with hot surface ignition (HSI) systems.
- Describe appropriate electrical troubleshooting procedures for heating systems that use microprocessors, printed circuit boards, and self-diagnostic LEDs.
- Read and interpret the schematic diagrams and troubleshooting flow charts provided by the manufacturers of such equipment.

Lesson 7 - Oil Furnaces

Objectives:

- Explain some of the problems encountered with various types of ignition systems and safety controls that are used with oil-fired furnaces.
- Describe appropriate electrical troubleshooting procedures for these types of heating systems.
- Locate the probable cause of a service problem.
- Evaluate the performance of a cad cell.
- Use a test lamp to find a short circuit.

Lesson 8 - Electric Furnaces

Objectives:

- Explain some common problems encountered with multistage electric furnaces.
- Describe appropriate electrical troubleshooting procedures for these types of heating systems.
- Calculate the actual air flow (in cfm) of an electric furnace.
- Calculate the temperature rise across a set of electric heaters.
- Calculate the current draw of an electric heater.
- Describe the procedure for identifying an open heater.
- Explain what is meant by “black heat.”
- Locate the probable cause of a service problem.

Lesson 9 - Air-to-Air Heat Pumps

Objectives:

- Explain some common problems encountered with air-to-air heat pump systems.
- Describe appropriate electrical troubleshooting procedures for these types of heat pumps.
- Locate the probable causes of typical service problems, including those involving defrost controls and supplemental electric heating sections.
- Explain the basic operation of a reversing valve, and describe how to diagnose a bad valve.
- Determine whether the compressor is operating in both the heating mode and the cooling mode.
- Check the operation of outdoor thermostats.

Lesson 10 - Water-Source Heat Pumps

Objectives:

- Explain some common problems encountered with water-source heat pump systems.
- Describe appropriate electrical troubleshooting procedures for these types of heat pumps.
- Locate the probable causes of typical service problems, including those involving water flow controls, changeover controls, and lockout controls.
- Explain the basic operation of a reversing valve, and describe how to diagnose a bad valve.

- Determine whether the compressor is operating in both the heating mode and the cooling mode.

Lesson 11 - Electronic Air Cleaners

Objectives:

- Describe the basic operation of an electronic air cleaner (EAC) and its high-voltage power supply.
- Explain the purpose of “doubler” rectifier circuits.
- Discuss some common problems encountered with electronic air cleaners, and describe appropriate electrical troubleshooting procedures for this type of equipment.
- Locate the probable causes of typical service problems, including those involving safety controls, ozone odors, “white dust,” noisy operation, and television interference.

Lesson 12 - Humidifiers

Objectives:

- Describe the basic operation of an evaporative humidifier, and of a steam humidifier.
- Discuss some common problems encountered with humidifiers, and describe appropriate electrical troubleshooting procedures for this type of equipment.
- Locate the probable causes of typical service problems, including those involving humidistats, solenoid valves, float switches, and safety controls.
- Diagnose “too much humidity” and “not enough humidity” complaints.

Lesson 13 - Electrical Troubleshooting Reference Guide

This Lesson is intended to serve as a general reference guide for the electrical troubleshooter. It contains a broad range of technical information, including various tables, charts, symbols, and mathematical equations, as well as service tips and reminders designed to help technicians increase their productivity on the job.