



## ***Essential Electrical Skills for HVACR to Modern Refrigeration and Air Conditioning*** Crosswalk

This document is intended to help you pair the use of the 1st edition of ***Essential Electrical Skills for HVACR*** to the 21st edition of ***Modern Refrigeration and Air Conditioning***.

The following chart provides a basic content correlation between the two textbooks. The first column lists the chapter from the 1st (2022) edition of ***Essential Electrical Skills for HVACR*** and the second column lists the chapter in the 21st edition (2021) of ***Modern Refrigeration and Air Conditioning*** where the content is now located.

| <b>Essential Electrical Skills for HVACR Chapter</b> | <b>Modern Refrigeration and Air Conditioning Chapter(s)</b>                             |
|--|---|
| Chapter 1—Electrical Safety                          | Chapter 2—Safety<br>2.1–2.3   |
| Chapter 2—Electrical Fundamentals                    | Chapter 12—Basic Electricity<br>12.1, 12.3  |
| Chapter 3—The Simple Circuit                         | Chapter 12—Basic Electricity<br>12.4<br>Chapter 13—Electrical Power<br>13.3             |
| Chapter 4—Ohm’s Law                                  | Chapter 12—Basic Electricity<br>12.1.3<br>Chapter 13—Electrical Power<br>13.1           |
| Chapter 5—Types of Circuits                          | Chapter 12—Basic Electricity<br>12.4  |
| Chapter 6—Alternating and Direct Current             | Chapter 12—Basic Electricity<br>12.1, 12.5, 12.6  |
| Chapter 7—Electromagnetic Devices                    | Chapter 12—Basic Electricity<br>12.5, 12.7<br>Chapter 14—Basic Electronics<br>14.4–14.6 |

| Essential Electrical Skills for HVACR Chapter                    | Modern Refrigeration and Air Conditioning Chapter(s)  |
|--|---|
| Chapter 8—Capacitors   | Chapter 12—Basic Electricity<br>12.1.4<br>Chapter 13—Electrical Power<br>13.1.2<br>Chapter 15—Electric Motors<br>15.2.1<br>Chapter 18—Servicing Electric Motors and Controls<br>18.1.1          |
| Chapter 9—Power Distribution                                     | Chapter 13—Electrical Power<br>13.1–13.3<br>Chapter 15—Electric Motors<br>15.2  |
| Chapter 10—How Electric Meters Work                              | Chapter 17—Electrical Troubleshooting Fundamentals<br>17.1  |
| Chapter 11—Introduction to Practical Circuits                    | Chapter 17—Electrical Troubleshooting Fundamentals<br>17.2, 17.3  |
| Chapter 12—Switches, Electronic Components, and Sensors          | Chapter 14—Basic Electronics<br>14.2, 14.4<br>Chapter 16—Electrical Control Systems<br>16.2, 16.2   |
| Chapter 13—Electric Motors                                       | Chapter 15—Electric Motors<br>15.1–15.3<br>Chapter 16—Electrical Control Systems<br>16.2.5  |
| Chapter 14—Troubleshooting Printed Circuit Board Control Systems | Chapter 14—Basic Electronics<br>14.3<br>Chapter 18—Servicing Electric Motors and Controls<br>18.3<br>Chapter 38—Forced-Air Heating Fundamentals<br>38.5<br>Chapter 45—Energy Management<br>45.5 |

| <b>Essential Electrical Skills for HVACR Chapter</b> | <b>Modern Refrigeration and Air Conditioning Chapter(s)</b>                   |
|--|---|
| Chapter 15—Troubleshooting Overview                  | Chapter 17—<br>17.2, 17.3<br>Chapter 18—<br>18.1<br>Chapter 32—<br>32.1, 32.3 |

## ***Essential Electrical Skills for HVACR*** **1st Edition Contents**

- 1—Electrical Safety
  - Lab 1.1—Digital Multimeter Owner’s Manual
  - Lab 1.2—Lockout/tagout Performed by Individual
  - Lab 1.3—Lockout/tagout Performed by Group
- 2—Electrical Fundamentals
  - Lab 2.1—Navigating the Digital Multimeter
  - Lab 2.2—Distinguishing between Basic Wiring Tools
  - Lab 2.3—Working with Wires
- 3—The Simple Circuit
  - Lab 3.1—Drawing a Simple Circuit
  - Lab 3.2—Assembling a Lab Board for a Simple Circuit
  - Lab 3.3—Operating a Simple Circuit
- 4—Ohm’s Law
  - Lab 4.1—Verifying Ohm’s Law through Simple Circuits
- 5—Types of Circuits
  - Lab 5.1—Series, Parallel, and Complex Circuit Evaluation
- 6—Alternating and Direct Current
  - Lab 6.1—Evaluate the Effects of AC on a Load
- 7—Electromagnetic Devices
  - Lab 7.1—Inductive Reactance and Transformer Evaluation
  - Lab 7.2—Relays
  - Lab 7.3—Contactors
- 8—Capacitors
  - Lab 8.1—Evaluating Capacitors
  - Lab 8.2—Capacitive Reactance
  - Lab 8.3—Capacitors in a Rectifier Circuit
- 9—Power Distribution
  - Lab 9.1—Checking Residential Power
  - Lab 9.2—Apparent and True Power
  - Lab 9.3—Checking Three-Phase Voltage
- 10—How Electric Meters Work
  - Lab 10.1—Multimeter Evaluation
  - Lab 10.2—Measurement and Accuracy
  - Lab 10.3—Multimeter Features
- 11—Introduction to Practical Circuits
  - Lab 11.1—Analyzing Circuit by Tracing Voltage
  - Lab 11.2—Analyzing Circuit by Line, Control, and Load Sections
  - Lab 11.3—Simplifying a Pictorial Diagram
- 12—Switches, Electronic Components, and Sensors
  - Lab 12.1—Two-Way Lighting
  - Lab 12.2—Latching Circuit
  - Lab 12.3—Lockout Relay Operation
- 13—Electric Motors
  - Lab 13.1—Split-Phase Motor Analysis
  - Lab 13.2—Hermetic Compressor Motor
  - Lab 13.3—Three-Phase Motor Analysis
- 14—Troubleshooting Printed Circuit Board Control Systems
  - Lab 14.1—Wiring an Integrated Furnace Controller PCB
  - Lab 14.2—Analyzing the Heat Cycle
  - Lab 14.3—Simplifying a Pictorial Diagram
- 15—Troubleshooting Overview
  - Lab 15.1—Heating System Evaluation
  - Lab 15.2—Evaluating Heating System Diagnostics
  - Lab 15.3—AC Unit Evaluation

## ***Modern Refrigeration and Air Conditioning***

### **Section 1—Professional Development**

- 1—Careers and Certification
- 2—Safety
- 3—Service Calls

### **Section 2—Refrigeration System Fundamentals**

- 4—Energy and Matter
- 5—Gases
- 6—Basic Refrigeration Systems

### **Section 3—Service Basics**

- 7—Tools and Supplies
- 8—Working with Tubing and Piping

### **Section 4—Refrigerants**

- 9—Introduction to Refrigerants
- 10—Equipment and Instruments for Refrigerant Handling and Service
- 11—Working with Refrigerants

### **Section 5—Basic Electricity, Magnetism, and Electronics**

- 12—Basic Electricity
- 13—Electrical Power
- 14—Basic Electronics

### **Section 6—Motors and Electric Control Systems**

- 15—Electric Motors
- 16—Electrical Control Systems
- 17—Electrical Troubleshooting Fundamentals
- 18—Servicing Electric Motors and Controls

### **Section 7—Refrigeration System Components**

- 19—Compressors
- 20—Compressor Safety Components
- 21—Metering Devices
- 22—Heat Exchangers
- 23—Refrigerant Flow Components

### **Section 8—Domestic Refrigerators and Freezers**

- 24—Overview of Domestic Refrigerators and Freezers
- 25—Installation and Troubleshooting of Domestic Refrigerators and Freezers
- 26—Service and Repair of Domestic Refrigerators and Freezers

## **21st Edition Contents**

### **Section 9—Indoor Air Fundamentals**

- 27—Air Movement and Measurement
- 28—Air Quality
- 29—Air Distribution
- 30—Ventilation System Service

### **Section 10—Air-Conditioning Systems**

- 31—Self-Contained Air-Conditioning Systems
- 32—Residential Split Air-Conditioning Systems
- 33—Commercial Air-Conditioning Systems
- 34—Absorption and Evaporative Cooling Systems
- 35—Humidity Control
- 36—Thermostats
- 37—Heating and Cooling Loads

### **Section 11—Heating Systems**

- 38—Forced-Air Heating Fundamentals
- 39—Hydronic Heating Fundamentals
- 40—Heat Pumps
- 41—Gas-Fired Heating Systems
- 42—Oil-Fired Heating Systems
- 43—Electric Heating Systems

### **Section 12—Energy Management and Conservation**

- 44—Solar Power and Thermal Storage
- 45—Energy Management
- 46—Energy Conservation

### **Section 13—Commercial Refrigeration Systems**

- 47—Overview of Commercial Refrigeration Systems
- 48—Special Refrigeration Systems and Applications
- 49—Commercial Refrigeration System Configurations

### **Section 14—Designing Commercial Refrigeration Systems**

- 50—Understanding Heat Loads and System Thermodynamics
- 51—Commercial Refrigeration Component Selection

### **Section 15—Installing and Servicing Commercial Refrigeration Systems**

- 52—Installing Commercial Systems
- 53—Troubleshooting Commercial Systems—System Diagnosis
- 54—Troubleshooting Commercial Systems—Component Diagnosis
- 55—Servicing Commercial Systems