



8992

ELECTRICAL CONTROLS (9)

40S / 40E / 40M

A Refrigeration and Air Conditioning Technology  
Course



# 8992 ELECTRICAL CONTROLS (12D)

## 40S / 40E / 40M

### Course Description

A student wanting to develop skills in the refrigeration and air conditioning industry must have knowledge of the basic principles of electrical control devices, switches, relays, transformers, and voltage supply systems. The student will be able to diagnose, service, and repair standard control systems and electrical components.

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**Goal 1:** Describe and apply appropriate **health and safety practices** as they relate to the **maintenance of a safe workspace**.

**GLO 1.1:** Create and maintain a **safe working environment** in machining technology.

- SLO 12A.1.1.1 Demonstrate awareness of the principles of workplace hazards surrounding electrical environments.
- SLO 12A.1.1.2 Demonstrate awareness of the principles of Workplace Hazardous Materials Information Systems (WHMIS) as they apply to the refrigeration and air conditioning service and repair industry. (A3.11)
- SLO 12A.1.1.3 Describe the purpose of Material Safety Data Sheets (MSDS).
- SLO 12A.1.1.4 Describe workplace health and safety procedures (e.g., S.A.F.E., right to refuse). (A3.11)
- SLO 12A.1.1.5 Follow safety information on supplier labels.
- SLO 12A.1.1.6 Identify the process for reporting injuries.
- SLO 12A.1.1.7 Identify ergonomically correct procedures to avoid injury (e.g., stress, strain). (A3.7)
- SLO 12A.1.1.8 Identify fire prevention and control strategies.
- SLO 12A.1.1.9 Identify emergency evacuation and response procedures.

**GLO 1.2:** Create and maintain a **safe working environment**.

- SLO 12A.1.2.1 Identify hazards and precautions working with and around energized electrical equipment.
- SLO 12A.1.2.2 Identify hazards and precautions working with and around energized equipment. (A12.2)

- SLO 12A.1.2.3 Identify and report hazards (e.g., electrical safety, ergonomics, material handling, and chemical) related to processes, materials, tools, and equipment used in the refrigeration and air conditioning shop.
- SLO 12A.1.2.4 Follow the directions of the teacher/supervisor in regards to safe work practices.
- SLO 12A.1.2.5 Follow safe practices and procedures for facilities, processes, materials, tools, and equipment used in the refrigeration and air conditioning shop (e.g., keep work area clean and organized, avoid horseplay).
- SLO 12A.1.2.6 Describe and use appropriate personal protective equipment (e.g., gloves, safety glasses or goggles, hearing protection, respirator mask, etc.). (A3.2)
- SLO 12A.1.2.7 Locate first aid and eyewash station.
- SLO 12A.1.2.8 Identify and report hazards (e.g., electrical, ergonomic, material handling, chemicals, and spills) related to materials, processes, tools, and equipment used in the refrigeration and air conditioning facility.
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**Goal 2: Demonstrate the safe and appropriate **selection, operation, and management** of shop **equipment and tools**.**

**GLO 2.1: Demonstrate the safe and appropriate **selection, operation, and management** of shop **equipment and tools**.**

- SLO 12A.2.1.1 Demonstrate the safe and appropriate selection, operation, and management of equipment and tools used in electrical controls.
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**Goal 3: Demonstrate the safe and appropriate selection and utilization of **materials**.**

**GLO 3.1 Demonstrate the safe and proper appropriate selection and utilization of **fasteners and supports**.**

No applicable SLO.

**GLO 3.2 Demonstrate the safe and proper manipulation of **pipng and tubing**.**

- SLO 12A.3.2.1 Describe and demonstrate the proper selection, set-up, modification, and manipulation of related conduits and piping for electrical and controls.

**GLO 3.3** Demonstrate the safe and appropriate manipulation of **sheet metal**.

No applicable SLO.

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**Goal 4: Install** heating, cooling, and refrigeration equipment.

**GLO 4.1** Demonstrate an awareness of the **installation requirements** for heating, cooling, and refrigeration equipment.

SLO 12A.4.1.1 Identify proper system control selection and types for various installation applications.

**GLO 4.2** Demonstrate the appropriate installation of heating, cooling, and refrigeration equipment.

SLO 12A.4.2.1 Demonstrate appropriate installation of electrical equipment related to HVAC/R systems.

**GLO 4.3:** Test and document refrigeration and air conditioning systems.

SLO 12A.4.3.1 Test electrical systems, record measurements, and compare to nameplate data.

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**Goal 5: Diagnose and repair** heating, cooling, and refrigeration equipment.

**GLO 5.1: Diagnose** problems in heating, cooling, and refrigeration equipment.

SLO 12A.5.1.1 Diagnose electrical problems in HVAC/R equipment.

**GLO 5.2: Repair** heating, cooling, and refrigeration equipment.

SLO 12A.5.2.1 Perform electrical repairs to heating and cooling equipment.

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**Goal 6: Service** heating, cooling, and refrigeration equipment.

**GLO 6.1:** Demonstrate awareness of the **servicing needs** of heating, cooling, and refrigeration equipment.

SLO 12A.6.1.1 Identify service and maintenance required for electrical components.

**GLO 6.2:** Demonstrate the appropriate **servicing** of heating, cooling, and refrigeration equipment.

SLO 12A.6.2.1 Perform service on electrical components.

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**Goal 7:** Describe and demonstrate the transferable **cross-curricular** knowledge and skills as they pertain to the refrigeration and air conditioning service and repair industry.

**GLO 7.1:** Demonstrate skills from **information and communication technology**.

No applicable SLO.

**GLO 7.2: Read, interpret, and communicate** information relevant to the refrigeration and air conditioning service and repair industry.

SLO 12A.7.2.1 Apply electrical diagrams to troubleshooting electrical faults in HVAC/R equipment.

**GLO 7.3:** Apply the knowledge and skills related to the refrigeration and air conditioning service and repair industry from **mathematics**.

SLO 12A.7.3.1 Apply necessary mathematical formulas to make electrical calculations surrounding OHMS law, etc.

**GLO 7.4:** Apply knowledge and skills from the sciences to the refrigeration and air conditioning service and repair industry.

SLO 12A.7.4.1 Apply necessary mathematical formulas to make pressure/temperature calculations.

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**Goal 8:** Demonstrate awareness of **sustainability** as it pertains to the refrigeration and air conditioning service and repair industry.

**GLO 8.1:** Describe the impact of human **sustainability** on the health and well-being of refrigeration and air conditioning mechanics and their clients.

SLO 12A.8.1.1 Discuss the long-term health and human sustainability concerns for refrigeration and air conditioning technicians.

SLO 12A.8.1.2 Discuss the contribution of electrical controls to human health and well-being.

**GLO 8.2:** Describe the refrigeration and air conditioning industry's **sustainability practices and impact on the environment**.

SLO 12A.8.2.1 Discuss the need to recover refrigerants to prevent their release into the environment.

SLO 12A.8.2.2 Discuss the new energy-efficient electrical projects that reduce the impact on our environment.

**GLO 8.3:** Describe **sustainable business practices** within the refrigeration and air conditioning service and repair industry.

SLO 12A.8.3.1 Discuss the influence of refrigeration and air conditioning businesses on the local economy.

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**Goal 9:** Demonstrate awareness of the **ethical and legal standards** as they pertain to the refrigeration and air conditioning service and repair industry.

**GLO 9.1:** Practice the **ethical and legal standards** as they pertain to the refrigeration and air conditioning service and repair industry.

SLO 12A.9.1.1 Demonstrate an understanding of codes and regulations related to electrical controls.

SLO 12A.9.1.2 Demonstrate ethical behaviour by producing high-quality work.

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**Goal 10:** Demonstrate **employability skills** related to the refrigeration and air conditioning service and repair industry.

**GLO 10.1:** Demonstrate fundamental **employability skills**.

SLO 12A.10.1.1 Demonstrate critical-thinking and problem-solving skills.

SLO 12A.10.1.2 Demonstrate regular attendance and punctuality.

SLO 12A.10.1.3 Demonstrate accountability by taking responsibility for their actions.

SLO 12A.10.1.4 Demonstrate adaptability, initiative, and effort.

SLO 12A.10.1.5 Demonstrate the ability to accept and follow direction and feedback.

SLO 12A.10.1.6 Demonstrate the ability to stay on task and to use time in class and in the shop effectively.

SLO 12A.10.1.7 Demonstrate the ability to communicate respectfully with co-workers and customers.

**GLO 10.2:** Demonstrate an understanding of the **business operation** of a refrigeration and air conditioning service and repair shop.

SLO 12A.10.2.1 Identify business activities that affect profit and loss.

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Goal 11: Understand **career opportunities** in the refrigeration and air conditioning service and repair industry and associated professions.

**GLO 11.1:** Describe **education and career opportunities** and **professional organizations** in the refrigeration and air conditioning service and repair industry and associated professions.

SLO 12A.11.1.1 Discuss the electrical trade and opportunities in cross-training with the HVAC/R industry.

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Goal 12: Understand the **evolution, technological progression, and emerging trends** in the refrigeration and air conditioning service and repair industry.

**GLO 12.1:** Describe the **evolution, technological progression, and emerging trends** in the refrigeration and air conditioning service and repair industry.

SLO 12A.12.1.1 Discuss the progression of electrical and electronic controls in the HVAC/R industry (e.g., the necessity for energy conservation, etc.).



