

Motor Controls & Starters Low-Voltage

4.5 Days, 3.2 CEUs

The low-voltage motor control center (MCC) plays a vital role in controlling motors and production processes. Now, more than ever, out of sequence motor operation, failure of timers, control relays, limit switches and other critical components carry a high cost. Over the years, MCCs have evolved from cabinets that housed basic electro-mechanical devices such as circuit breakers, contactors, and overload relays to centers of automation that may include variable frequency drives, starters, and programmable logic controllers. This course offers effective MCC maintenance and troubleshooting techniques that enable technicians to ensure correct operation of the control scheme, reduce repair times, and identify problems in control circuits from the manufacturer. Class participants learn to design basic ladder diagrams for motor control circuits then wire up the circuits on simulators.

This hands-on course is intended for new or experienced electricians and technicians that install, maintain, repair or troubleshoot MCCs rated 600 volts or less. The participant should have basic knowledge of AC/DC electricity.

Lab and Classroom Attire

AVO Training Institute is committed to the personal safety of each participant and require long pants and ANSI rated "safety-toe" work shoes for lab activities. Lecture courses may involve a tour of a work or shop area and for this reason open-toe shoes and shorts are not considered appropriate attire for the classroom.

Learning Objectives

To receive 3.2 CEUs, participants must attend 4.5 days of class (32 contact hours) and attain a minimum average grade of 80% (overall grade will consist of 50% lab practice and 50% final exam). Upon completion of this course and lab practice, the participant will demonstrate that he/she is able to:

- Explain the application of motor control pilot devices.
- Interpret MCC wiring diagrams and schematics.
- Describe control circuit types and show the application of two-wire control, three-wire control, reversing circuits, sequence control, jogging, and inching circuits.
- Outline the methods of deceleration, reduced-voltage controls, speed controls, and operating principles of variable frequency drives.
- Troubleshoot motor control circuits utilizing a multi-meter.
- Design and wire various motor control circuits.

SCOPE

Day 1* (7 contact hours)

- I. Safety (4 hrs)
 - A. Working with Low-Voltage Equipment
 - B. More Than One Source of Voltage
- AM Break

- C. Hazards Around Motor-Control Centers
- D. Disconnection of Motors While Troubleshooting
- Lunch
- II. Description (3 hrs)
 - A. Components
 - B. Interlocks

- PM Break
- C. Relays
- D. Contactors

*Class scheduling times may vary based on discussions and size of class

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SCOPE (cont'd)

Day 2 (7 contact hours)

III. Common Control Circuits (3 hrs)

- A. Two-Wire Control
- B. Three-Wire Control
- C. Reversing Circuits
- D. Jogging Circuits
- E. Labs

- 1. Design and Build
 - 2 Wire Control
 - 3 Wire Control

AM Break

- Reversing Circuit
- Jogging Circuit

IV. Practical Exercise (1 hr)

- A. Design Ladder Diagram
- B. Wire Circuits from Design
- C. Test Circuits
- D. Troubleshoot Circuits

Lunch

V. AC Controls for Reduced Voltage Starters (2 hrs)

- A. Primary Resistor
- B. Autotransformer

PM Break

- C. Wye-Delta
- D. Solid-State

VI. Methods of Deceleration (1 hr)

- A. Plugging
- B. Dynamic Braking
- C. Electric Braking
- D. Friction Brake

Day 3 (7 contact hours)

VII. Speed Control (4 hrs)

- A. Wound-Rotor Motor Control
- B. Two-Speed Motor Control

AM Break

- C. Consequent Pole Control
- D. Introduction to Variable-Frequency Drives

Lunch

VIII. Motor Overloads (3 hrs)

- A. Thermal
- B. Magnetic

PM Break

- C. Solid-State
- D. Selection

Day 4 (7 contact hours)

IX. Testing (4 hrs)

- A. Insulation Resistance
- B. Contact Resistance

AM Break

- C. Fuses
- D. Contactors

Lunch

X. Troubleshooting

- A. Safety Precautions
- B. Techniques

PM Break

- C. Using Test Equipment
- D. Common Problems in Starter Circuits

Day 5 - Half Day (4 contact hours)

XI. Conclusion (4 hours)

- A. Review

AM BREAK

- B. Final Exam