

Motor Controls & Starters Low-Voltage

4.5 Days, 3.6 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 electromechanical 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.

Who Should Attend

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.

Learning Objectives:

Upon completion of this course and lab practice, the participant will demonstrate by attaining a minimum average of 80% (between lab and final exam), that he/she is able to:

- Describe 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.
- Describe 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*

I. Safety

- A. Working with Low-Voltage Equipment
- B. More Than One Source of Voltage
- C. Hazards Around Motor-Control Centers
- D. Disconnection of Motors While Troubleshooting

II. Description

- A. Components
- B. Interlocks
- C. Relays
- D. Contactors

Day 2

III. Common Control Circuits

- A. Two-Wire Control
- B. Three-Wire Control
- C. Reversing Circuits
- D. Jogging Circuits
- E. Labs (8 Hours)
 - 1. Design and Build
 - 2 Wire Control
 - 3 Wire Control
 - Reversing Circuit
 - Jogging Circuit

IV. Practical Exercise

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

V. AC Controls for Reduced Voltage Starters

- A. Primary Resistor
- B. Autotransformer
- C. Wye-Delta
- D. Solid-State

VI. Methods of Deceleration

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

Day 3

VII. Speed Control

- A. Wound-Rotor Motor Control
- B. Two-Speed Motor Control
- C. Consequent Pole Control
- D. Introduction to Variable-Frequency Drives

VIII. Motor Overloads

- A. Thermal
- B. Magnetic
- C. Solid-State
- D. Selection

Day 4

IX. Testing

- A. Insulation Resistance
- B. Contact Resistance
- C. Fuses
- D. Contactors

X. Troubleshooting

- A. Safety Precautions
- B. Techniques
- C. Using Test Equipment
- D. Common Problems in Starter Circuits

Day 5

XI. Review & Final Exam

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

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