



## **Advanced Electrical Troubleshooting**

This development course is available in both virtual and in-person, instructor-led formats, it is a two-day Advanced Electrical Troubleshooting course designed for electrical maintenance workers looking to gain additional in-depth hands-on understanding of complex controls and control circuits. It is recommended that this course be taken only after completion of the Electrical Troubleshooting & Preventive Maintenance course.

### **Description:**

Hands-on lab activities are the focus of this course. Throughout the day, participants will troubleshoot on a large variety of systems components, ranging from forward/reversing motor control circuits to proximity switches and float switches. Anyone who wants a chance to spend quality hands-on time and build expertise with components seen every day throughout their facilities will gain great value from this course.

### **Course Outline:**

#### **Day One – Topics**

##### Advanced Skills for Electrical Troubleshooting

1. Requirements per the National Electrical Code (NEC) for control circuits, and electric motors
2. Overview of Motor rules per article 430 in the National Electrical Code
3. Learn to navigate and troubleshoot from multiple page electrical drawings
4. Using both NEMA and IEC Electrical Drawings for Troubleshooting
5. Hands-on component troubleshooting using an electrical meter
6. Learn advanced features of multimeters.
7. Learning to ask the right questions and the correct way to approach troubleshooting



## Testing Field Components: Hands-on Exercises

1. Inductive proximity sensors
2. Capacitive proximity sensors
3. Magnetic proximity sensors
4. Photoelectric sensor retroreflective/ visible red-light emission
5. Float switches
6. Control Relays
7. Motor Starter Contactors
8. Overload Devices
9. Forward/Reversing motor starter
10. Solid State Timers
11. Limit Switches
12. Auxiliary Contact Blocks
13. Indicator Lamps
14. Push Buttons
15. Selector Switches – 2-position and 3-position
16. Circuit Breakers

## Day Two – Topics

### Build and Troubleshoot Advanced Motor Control Circuits – Hands-on Exercises

1. Multiple Stop Start Stations
2. Forward Reversing Circuits
3. Level Control Circuits
4. Test and understand all components
5. Learn how to quickly troubleshoot
6. Make field changes based on changes in the schematics
7. Add remote control capabilities

### Motor Troubleshooting and Preventative Maintenance

1. Troubleshooting Single Phase and Three Phase Motors
2. Troubleshooting DC Motors
3. Important Motor Nameplate Parameters



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4. Preventive Maintenance for Motors
5. Proper Tools for Motor Troubleshooting

#### Troubleshooting Variable Frequency Drives (VFDs)

1. VFD Terminology
2. VFD Basic Operation
3. Major Components
4. Common Problems & Corrective Actions
5. Troubleshooting

#### Power Quality Problems

1. Sources of Power Quality Problems
2. Test Equipment for Troubleshooting Power Quality Problems
3. Harmonics
4. Phase Unbalance