

HVAC

Electrical Controls For HVAC Systems

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This is a three day hard-hitting, hands-on, step-by-step program focusing on electrical components, how they operate, and how they are connected to control and protect air conditioning and heating equipment. This program is a logical follow-up to the AC&R mechanical seminar...a "must" for all maintenance personnel who need to understand the technology, troubleshooting, and repair of HVAC electrical control systems. Safety and various control devices are explained, how to adjust and troubleshoot these electrical components. The program illustrates how single phase, three phase, and low voltage control are integrated into a single system.

WHO SHOULD ATTEND

Building Maintenance Technicians, HVAC Mechanics, HVAC Apprentice, Maintenance Supervisors, Service Managers, Facility Engineers, Plant Engineers, Utility Engineers, Building Managers, and Planners and Schedulers.

INSTRUCTORS

Joe McAfee is a technical trainer and maintenance consultant with thirty years of progressive experience in plant maintenance and equipment management. Mr. McAfee has expertise in the areas of electro pneumatics, hydraulics, HVAC (including boilers), and fluid power. His career includes shop floor electrical experience, process and manufacturing engineering, department management, and maintenance management.

AGENDA

Ohms Law and Test Meters

- What is electricity
- How electrons move
- Electromotive force (EMF)
- How to use voltage testers
- Electron movement
- How to use ammeters
- Resistance
- How Ohm's Law works
- How to use an ohmmeter
- Complete circuit, open circuit, closed circuit
- Power and Watts
- How wattmeters are used
- Using test meters
- Hands-on exercises: bring you own multimeter (VOM)
- Checking resistance (pure)
- Checking resistance (variable)

Solenoids and Contactors

- Electromagnetism
- How solenoids are used
- How relays are used
- How contactors are used
- Symbols used on electrical drawings
- Reading schematics and ladders diagrams
- Residential AC systems and package systems
- Single and Three Phase Motors
- Overloads and capacitors
- Single phase motors and how they work
 - Shaded Pole
 - Split Phase
- Capacitor Start-induction Run
- Permanent Split Capacitor
- Capacitor Start-Capacitor Run
- How to troubleshoot motors
- Changing rotation and speed

- Checking resistance (reactive)
 - Checking voltages
 - Connecting circuits
- Connecting one light bulb
- Connecting three lights in series
- Connecting three lights in parallel
 - Using dimmer switches

Power Generation and Control

- Wire sizes and insulation
- AC vs DC and series-parallel connections
- Single phase vs three phase
- Neutral vs ground
- Disconnects and transformers
- Power tools and adapters
- Switches, plugs and receptacles

Safety, Fuses and Circuit Breakers

- How fuses operate
- Types of fuses
- Fuse ratings: amps, volts, AIC
- Circuit breakers and GFCI's
- Making good terminal connections

- Disconnecting the start winding
- Dual voltage and multi-speed motors
- Three phase motors and how they work
- Wye and Delta connections
- Dual voltage connections
- How to identify the nine motor leads

Line Starters and Troubleshooting

- How line starters operate
- How to select heaters
- Troubleshooting methods for line starters
- Three phase AC systems
- Reading multi-voltage schematics
- Troubleshooting control circuits
- Lockout relays and time delays
- Troubleshooting with schematics
- Fan cycle controls and variable speed
- Oil pressure safety controls
- High and low pressure safety controls
- Pumpdown cycles

Combining Heating and Air Conditioning

- Gas heat with Air Conditioning
- Types of thermostats
- Fan and limit controls
- Two-stage systems and thermostats
- Oil heat with Air Conditioning
- Electric heat with Air Conditioning
- Heat pump operation and schematics
- Time delay and holding relays for chillers
- Automatic sequencing and interlocks