Motor Controls

SERIES SPECIFICATIONS & COURSE OUTLINE

CONTENTS
This electrical maintenance series is designed to help participants understand the fundamentals of motor controls. It familiarizes participants with the subjects of basic controls, overload and time delay relays, schematic symbols, and wiring diagrams; starting methods for squirrel cage, wye-delta, synchronous, and wound rotor controls; and installation and troubleshooting techniques.

AUDIENCE
The Motor Controls series is designed for electrical maintenance workers who have little or no knowledge of the field. It does not assume any previous knowledge of motor controls. All the terms used are explained or defined throughout the courses, so participants are not required to have a technical vocabulary to understand the content.

LEARNER EXPECTATIONS
This series is intended to be used as an essential component in your electrical maintenance curriculum. Each course is designed to provide the background knowledge necessary to develop an understanding of motor controls. Each lesson has specific objectives which identify the anticipated level of understanding associated with the information presented. Our experience indicates that those who complete the training are likely to accomplish the stated objectives. Furthermore, if the lessons are built into a total curriculum which includes practice in the working environment, it will help provide participants with the knowledge necessary to master the subject.

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MTR001 Basic Motor Controls & Relays

**Purpose:** This course introduces basic motor controls and relays. Control systems are designed to regulate the speed, direction, starting, and stopping of electrically operated machinery. They can sense overload conditions and stop the machinery if a dangerous situation should develop.

**Objectives:** Describe the three basic types of control systems; discuss the operation of magnetic relays; draw schematic symbols for normally open and closed contacts; draw the standard symbol for a coil; and discuss the operation of solid state relays.

MTR002 Overload Relays

**Purpose:** This course introduces the different types of overload relays, how they work, and why they are used.

**Objectives:** Discuss the difference between overloads and fuses; list the major types of overload relays; differentiate between the major types of thermal overload relays; discuss the operation of magnetic type overload relays; describe the operation of a dashpot timer; and list the ways of changing the time setting of a dashpot timer.

MTR003 Time Delay Relays

**Purpose:** This course introduces time delay relays. An integral part of an industrial control system, they are used to provide time delays which permit the operations of a machine to occur in the proper sequence and order. Timers are often used to control the starting sequence of large motors which must be step-started or to control the starting of several motors which cannot be permitted to start simultaneously.

**Objectives:** Describe the operation of an ON delay timer; describe the operation of an OFF delay timer; and draw the standard NEMA schematic symbols for ON and OFF delay timers.

MTR004 Schematic Symbols

**Purpose:** This course discusses schematic symbols. It introduces participants to the differences between symbols used to represent electrical and control components. The manner in which symbols are drawn and interpreted is discussed.

MTR005 Schematics & Wiring Diagrams

**Purpose:** Schematics and wiring diagrams are the written language of control circuits. Before a technician can become proficient in troubleshooting control circuits, he or she must learn how to read and interpret schematic and wiring diagrams.

**Objectives:** Describe the differences between schematics and wiring diagrams; determine the logic of a control circuit by reading a schematic diagram; read a wiring diagram; and convert a schematic diagram into a wiring diagram.

MTR006 Starting Methods for Squirrel Cage Motors

**Purpose:** This course discusses different methods for the starting of squirrel cage induction motors. Different types of loads and power requirements can greatly affect the way large AC motors are started.

**Objectives:** Discuss across the line starting; explain resistor starting; describe reactor starting; and discuss auto-transformer starting.

MTR007 Wye-Delta, Synchronous & Wound Rotor Controls

**Purpose:** This course discusses the starting of wye-delta motors, synchronous motors, and wound rotor motors.

**Objectives:** Explain the operation of a wye-delta motor; properly connect a wye-delta motor; discuss the operation of a synchronous motor; and discuss the operation of a wound rotor motor.

MTR008 Installing & Troubleshooting Control Systems

**Purpose:** This course demonstrates the installation and maintenance of control systems. The manner in which a control system is installed can have great bearing on the ease or difficulty encountered when it becomes necessary to troubleshoot the system.

**Objectives:** Identify different methods of installing control systems; explain the steps required to install a control system using terminal strips and identifying wires with numbers; and troubleshoot a control system from a properly installed control cabinet.