Preface

The field of industrial automation and control is growing at a rapid and unprecedented pace. This growth is due to advances in technology and an increasing demand for efficiency and productivity in various industries. Automation and control technologies are applied in a wide range of industries, including manufacturing, transportation, energy production, health care, and agriculture. The increasing demand for automation and control systems in various industries has created a growing need for skilled electrical maintenance technicians who can operate, maintain, and troubleshoot control systems.

Motor Control Systems is designed to train technicians preparing for careers in automation and control systems technology. This text covers the principles of control circuit logic and circuit operation, industrial control components, magnetic and programmable controllers, and the design, operation, and maintenance of electric motors. From theory to application, design to diagnosis, and installation to adjustment, you will learn the skills needed to be successful in a field that is constantly changing due to technological advancement. Written for the beginning technician, this comprehensive title provides a foundation for learning the skills needed to maintain and troubleshoot industrial control systems.

Motor Control Systems is organized in a logical sequence and covers introductory topics in depth before moving on to more advanced applications. The textbook begins with coverage of workplace safety, interpretation of electrical diagrams, and proper use of electrical test equipment. The textbook features in-depth coverage of contactors and motor starters, AC and DC motors, and motor starting and stopping methods. The textbook also features coverage of electronic control methods, components, and controllers, including power semiconductors, sensors, solid-state relays, soft starters, variable frequency drives, programmable logic controllers (PLCs), and human-machine interfaces (HMIs).

Motor Control Systems is extensively illustrated to clearly communicate chapter topics. Numerous in-text examples, procedures, and detailed explanations reinforce key concepts. Review questions and lab activities appear at the ends of chapters and enable you to reinforce learning, apply concepts, and use problem-solving skills. The lab activities provide practical applications and are designed to help you learn how to interpret, build, and troubleshoot motor control circuits. The *Motor Control Systems* Lab Workbook supplement features additional lab activities and review questions for each chapter.

Troubleshooting methodology is emphasized throughout the text to help you become a problem solver who can analyze and diagnose a system failure and determine the true cause of a problem. With straightforward explanations and procedures, this text will serve as a valuable reference for you in both the classroom and the workplace.

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About the Author

Shawn A. Ballee is a former associate professor of Industrial Systems Technology at Waubonsee Community College in Sugar Grove, Ill. During his 28 years of teaching, he taught classes in technology, automation, and mathematics. Mr. Ballee has extensive experience as an electrical and electronics technician and has performed consulting services for manufacturers. He holds a bachelor's degree in Industrial Technology from Northern Illinois University and a master's degree in Post-Secondary Mathematics from Concordia University. Mr. Ballee has been a member of the National Institute for Metalworking Skills (NIMS) Advisory Council and has served on the Manufacturing Skill Standards Council's National Experts Panel. He is also an OSHA-authorized general industry safety trainer, holds EPA 608 and 609 certifications, and is a member of Mensa International. Mr. Ballee is the coauthor of Goodheart-Willcox's *Industrial Maintenance and Mechatronics*.

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Reviewers

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Features of the Textbook

The instructional design of this textbook includes student-focused learning tools to help you succeed. This visual guide highlights these features.

Chapter Opening Materials

Each chapter opener contains a chapter outline, a list of learning outcomes, and a list of technical terms. The **Chapter Outline** summarizes the topics that will be covered in the chapter. **Learning Outcomes** clearly identify the knowledge and skills to be gained when the chapter is completed. These outcomes are labeled and correlated to related assessment elements to facilitate reporting and remediation. **Technical Terms** list the key words to be learned in the chapter. The **Introduction** provides an overview and preview of the chapter's content.


CHAPTER 10 AC Motors

CHAPTER OUTLINE

LEARNING OUTCOMES

TECHNICAL TERMS

Introduction

Additional Features

Additional features are used throughout the body of each chapter to further learning and knowledge. **Safety Notes** alert you to potentially dangerous materials and practices. **Cautions** alert you to practices that could potentially damage equipment or instruments. **Procedures** are highlighted throughout the textbook to provide clear instructions for hands-on service activities. **Tech Tips** provide advice and guidance that is especially applicable for on-the-job situations.


SAFETY NOTE

TECH TIP
Selecting a DMM

Resistance Test Mode

SAFETY NOTE


PROCEDURE
Preparing for Motor Startup

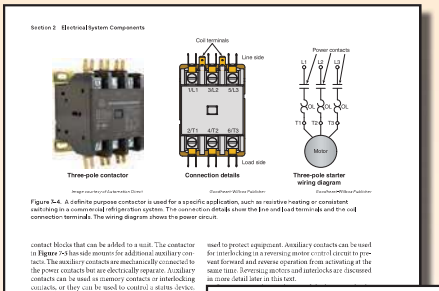
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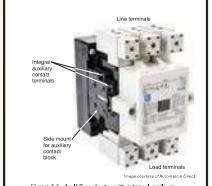
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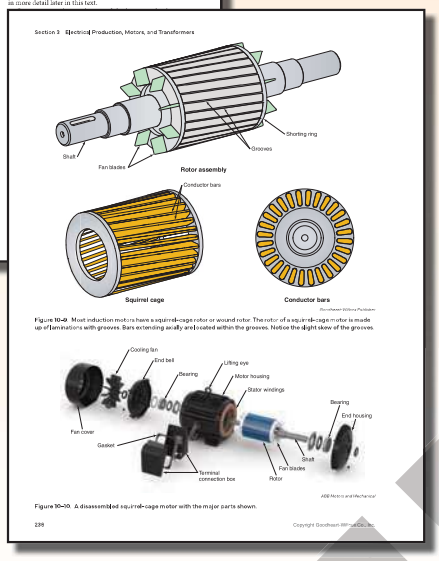
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Illustrations

Illustrations have been designed to clearly and simply communicate specific topics. Illustrations show control circuit layouts, wiring diagrams, component diagrams, and internal construction details and wiring configurations for motors. Photographic images show various products and equipment from manufacturers.



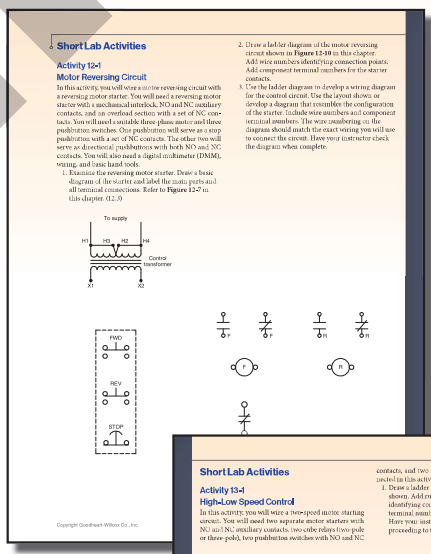


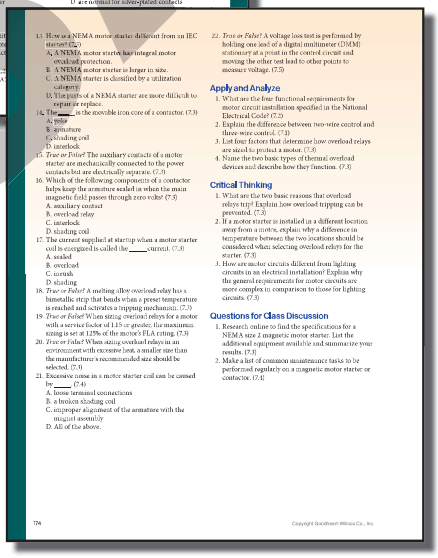


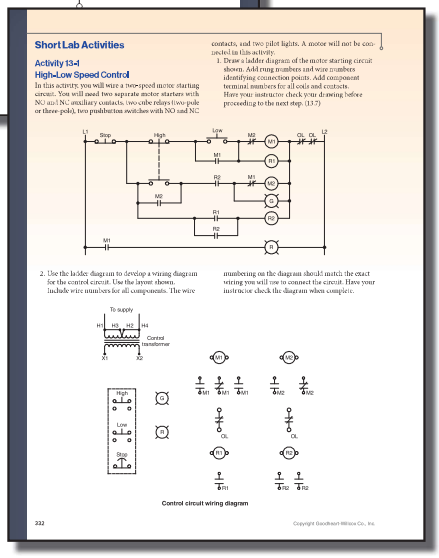
End-of-Chapter Content

End-of-chapter material provides an opportunity for review and application of concepts. A **Summary** provides an additional review tool and reinforces key learning outcomes. This helps you focus on important concepts presented in the text. **Know and Understand** questions enable you to demonstrate knowledge and comprehension of chapter material. **Apply and Analyze** questions allow you to apply knowledge of the related content. **Critical Thinking** questions require you to evaluate concepts and apply higher-order analytical skills. **Questions for Class Discussion** extend your learning by allowing for further exploration and research. **Short Lab Activities** provide opportunities to build circuits, troubleshoot, and apply problem-solving skills.









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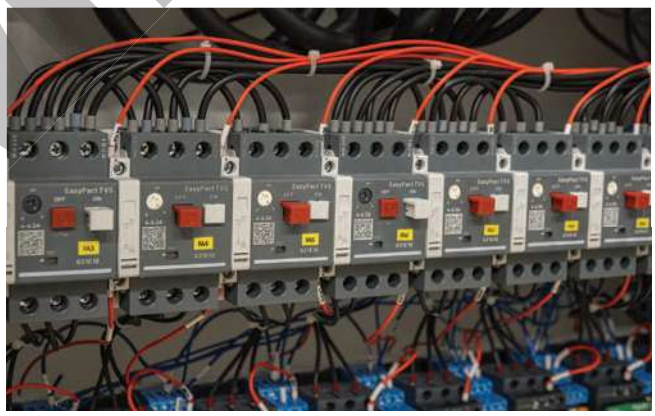
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