

Precision Industrial Control: A Modern Perspective

Introduction

Precision Industrial Control: A Modern Perspective is the definitive guide to industrial control for American students and professionals. This comprehensive book covers the latest trends and technologies in the field, from the basics of programmable logic controllers (PLCs) to the most advanced topics in robotics and artificial intelligence.

With clear and concise explanations, real-world examples, and hands-on exercises, **Precision Industrial Control: A Modern Perspective** is the perfect resource for anyone who wants to learn more about industrial control.

Whether you're a student just starting out or an experienced engineer looking to brush up on your skills, **Precision Industrial Control: A Modern Perspective** has something for you. This book is up-to-date with the latest technologies, making it the perfect choice for anyone who wants to stay ahead of the curve in this rapidly changing field.

In addition to its comprehensive coverage of industrial control, **Precision Industrial Control: A Modern Perspective** also includes a wealth of practical information, such as tips on troubleshooting and maintaining industrial control systems. This book is a valuable resource for anyone who wants to succeed in the field of industrial control.

Key Features:

- Comprehensive coverage of all aspects of industrial control
- Clear and concise explanations
- Real-world examples and hands-on exercises

- Up-to-date coverage of the latest technologies
- Practical information on troubleshooting and maintaining industrial control systems

About the Author:

Pasquale De Marco is a professor of electrical engineering at the University of California, Berkeley. He has over 20 years of experience in industrial control, and he is the author of several books and articles on the subject.

Book Description

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Chapter 1: Industrial Automation Fundamentals

Programmable Logic Controllers (PLCs)

Programmable Logic Controllers (PLCs) are digital computers used to control industrial processes. They are designed to be rugged and reliable, and they can withstand harsh environmental conditions. PLCs are used in a wide variety of applications, including manufacturing, robotics, and transportation.

PLCs are programmed using ladder logic, a graphical programming language that is easy to learn and use. Ladder logic is based on the electrical diagrams used to design control systems. This makes it easy for engineers and technicians to program PLCs without having to learn a new programming language.

PLCs offer a number of advantages over traditional relay-based control systems. They are more reliable, more flexible, and more efficient. PLCs can also be

programmed to perform complex tasks that would be difficult or impossible to implement using traditional control systems.

PLCs are an essential part of modern industrial automation systems. They provide the flexibility and reliability needed to control complex processes in a safe and efficient manner.

Applications of PLCs

PLCs are used in a wide variety of applications, including:

- Manufacturing
- Robotics
- Transportation
- Food and beverage processing
- Pharmaceutical production
- Water and wastewater treatment
- Power generation
- HVAC systems

Benefits of PLCs

PLCs offer a number of benefits over traditional control systems, including:

- **Reliability:** PLCs are designed to be rugged and reliable, and they can withstand harsh environmental conditions.
- **Flexibility:** PLCs can be programmed to perform a wide variety of tasks, making them ideal for a variety of applications.
- **Efficiency:** PLCs are more efficient than traditional control systems, which can lead to significant cost savings.
- **Ease of use:** PLCs are easy to program and use, even for non-engineers.

Conclusion

PLCs are a powerful tool for industrial automation. They offer a number of advantages over traditional control systems, including reliability, flexibility,

efficiency, and ease of use. As a result, PLCs are used in a wide variety of applications, including manufacturing, robotics, transportation, and food and beverage processing.

Chapter 1: Industrial Automation Fundamentals

Distributed Control Systems (DCSs)

Distributed control systems (DCSs) are a type of industrial automation system that uses a distributed network of controllers to monitor and control a process. DCSs are typically used in large, complex processes, such as power plants, chemical plants, and manufacturing facilities.

DCSs offer a number of advantages over traditional centralized control systems. First, DCSs are more reliable. If one controller fails, the other controllers can continue to operate the process. Second, DCSs are more flexible. DCSs can be easily expanded or modified to meet changing process requirements. Third, DCSs are more efficient. DCSs can automatically optimize the process to improve efficiency and productivity.

DCSs are typically composed of the following components:

- **Controllers:** Controllers are the brains of the DCS. They monitor and control the process by sending commands to the actuators.
- **Actuators:** Actuators are the muscles of the DCS. They physically change the process by moving valves, motors, and other devices.
- **Sensors:** Sensors are the eyes and ears of the DCS. They collect data about the process and send it to the controllers.
- **Network:** The network connects the controllers, actuators, and sensors. It allows the components of the DCS to communicate with each other.

DCSs are a powerful tool for industrial automation. They can improve reliability, flexibility, efficiency, and safety.

DCSs are used in a wide variety of applications, including:

- Power plants
- Chemical plants
- Manufacturing facilities
- Food and beverage processing plants
- Pharmaceutical plants
- Water treatment plants
- Wastewater treatment plants

DCSs are a critical part of modern industrial automation. They help to ensure that processes are safe, efficient, and productive.

Chapter 1: Industrial Automation Fundamentals

Supervisory Control and Data Acquisition (SCADA)

Supervisory Control and Data Acquisition (SCADA) systems are used to monitor and control industrial processes. They are typically used in large-scale applications such as power plants, water treatment facilities, and manufacturing plants.

SCADA systems collect data from sensors and other devices throughout the process. This data is then transmitted to a central computer, where it is monitored and analyzed. The computer can then send commands to actuators and other devices to control the process.

SCADA systems play a vital role in the safe and efficient operation of industrial processes. They help to improve

productivity, reduce costs, and ensure compliance with environmental regulations.

Here are some of the benefits of using SCADA systems:

- Improved productivity: SCADA systems can help to improve productivity by automating tasks and reducing the need for human intervention.
- Reduced costs: SCADA systems can help to reduce costs by reducing energy consumption and waste.
- Improved safety: SCADA systems can help to improve safety by monitoring and controlling processes remotely.
- Enhanced environmental compliance: SCADA systems can help to ensure compliance with environmental regulations by monitoring and controlling emissions.

SCADA systems are a valuable tool for industrial process control. They can help to improve productivity,

reduce costs, improve safety, and enhance environmental compliance.

SCADA systems are typically composed of the following components:

- Sensors and other devices that collect data from the process
- A communication network that transmits data to the central computer
- A central computer that monitors and analyzes data
- Actuators and other devices that control the process

SCADA systems can be used to control a wide variety of processes, including:

- Power generation and distribution
- Water treatment and distribution
- Manufacturing

- Transportation
- Oil and gas production and distribution

**This extract presents the opening
three sections of the first chapter.**

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50 sections by purchasing the book,
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Table of Contents

Chapter 1: Industrial Automation Fundamentals - Programmable Logic Controllers (PLCs) - Distributed Control Systems (DCSs) - Supervisory Control and Data Acquisition (SCADA) - Industrial Networks - Industrial Sensors

Chapter 2: Electric Motors and Drives - AC Induction Motors - DC Motors - Stepper Motors - Servo Motors - Variable Frequency Drives (VFDs)

Chapter 3: Power Electronics - Diodes and Thyristors - Power Transistors - Gate Turn-Off Thyristors (GTOs) - Insulated Gate Bipolar Transistors (IGBTs) - Power Converters

Chapter 4: Control Systems - Feedback Control Systems - Proportional-Integral-Derivative (PID) Controllers - State Space Control - Model Predictive Control - Robust Control

Chapter 5: Robotics - Robot Kinematics and Dynamics
- Robot Control - Robot Sensors - Robot Applications -
Robot Ethics

Chapter 6: Sensors and Instrumentation -
Temperature Sensors - Pressure Sensors - Flow Sensors
- Level Sensors - Chemical Sensors

Chapter 7: Programmable Logic Controllers (PLCs) -
PLC Hardware - PLC Programming - PLC Applications -
PLC Troubleshooting - PLC Security

Chapter 8: Distributed Control Systems (DCSs) - DCS
Hardware - DCS Software - DCS Applications - DCS
Troubleshooting - DCS Security

Chapter 9: Industrial Networks - Ethernet - Industrial
Ethernet - Fieldbus - WirelessHART - Bluetooth

Chapter 10: Industrial Safety - Electrical Safety -
Mechanical Safety - Chemical Safety - Fire Safety -
Environmental Safety

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