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Substation Automation Systems: Design and Implementation - User Manual

Comprehensive Guide for Professionals

INTRODUCTION

This manual provides a comprehensive overview and guide to the principles and practical application of Substation Automation Systems (SAS). It is designed to bridge the gap between rapidly evolving technologies and established practices in the conception and implementation of substation secondary systems. The content aligns with current industry best practice standards.

Authored by Evelio Padilla, this resource is invaluable for professionals involved in various stages of SAS projects.

KEY FEATURES AND SCOPE

The book covers essential aspects of Substation Automation Systems, focusing on practical application and understanding of modern standards.

- **Project-Oriented Approach:** Addresses all practical aspects of SAS design and project development, providing a structured methodology.

- **Focus on Control Aspects:** Emphasizes the dynamic control elements of substation design, integrating novel communication technologies and Intelligent Electronic Devices (IEDs).

- **Comprehensive System Coverage:** Explores the entire chain of SAS components and related equipment, extending beyond just IEDs and communication networks.

- **Auxiliary Power Systems:** Includes discussions on control and monitoring facilities specifically for auxiliary power systems within substations.

- **IEC 61850 Standard Clarification:** Significantly contributes to the understanding of the IEC 61850 standard, often perceived as complex, by explaining its role in communication networks and systems for power utility automation.

- **Support for Networked Systems:** Details how IEC 61850 supports new systems networked for control, monitoring, automation, metering, and protection functions.

Target Audience and Application

This book is a valuable resource for professionals engaged in various stages of SAS projects, including:

- **Specification Process:** Guiding the initial definition of system requirements.

- **Contracting Process:** Assisting in the procurement and contractual agreements.

- **Design and Engineering Process:** Providing insights for the technical design and implementation phases.

- **Integration Process:** Supporting the seamless integration of various SAS components.

- **Testing Process:** Offering guidance for validating system functionality and performance.

- **Operation and Maintenance Process:** Informing best practices for ongoing system management and upkeep.

Setup and Initial Use (Reading the Manual)

To effectively utilize this manual, consider the following:

1. **Familiarization:** Begin by reviewing the overall structure and chapter titles to gain a general understanding of the topics covered.

2. **Contextual Reading:** For specific project phases or technical challenges, refer directly to the relevant sections. The book is designed for both sequential reading and quick reference.

3. **Cross-Referencing:** Pay attention to internal references within the text that may direct you to related concepts or detailed explanations in other chapters.

4. **Glossary/Index:** Utilize any provided glossary or index for quick definitions of technical terms and location of specific information.

Substation Automation Systems

Design and Implementation

Evelio Padilla

WILEY

Figure 1: Front cover of the "Substation Automation Systems: Design and Implementation" book. The cover features a power line tower on the left, network cables on the top right, and abstract digital circuit imagery at the bottom, with the title prominently

OPERATING PRINCIPLES (APPLYING KNOWLEDGE)

The knowledge presented in this manual can be applied to real-world scenarios by understanding the underlying principles:

- **Design Implementation:** Apply the project-oriented approach to structure your SAS design and development processes.

- **Technology Integration:** Use the insights on novel communication technologies and IEDs to modernize substation control systems.

- **Standard Compliance:** Leverage the detailed explanation of IEC 61850 to ensure your systems meet international standards for power utility automation.

- **System Optimization:** Utilize the comprehensive coverage of SAS components to optimize system performance and reliability.

Substation Automation Systems
Design and Implementation

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Substation Automation Systems: Design and Implementation aims to close the gap created by fast changing technologies impacting on a series of legacy principles related to how substation secondary systems are conceived and implemented. It is intended to help those who have to define and implement Substation Automation Systems (SASs), whilst also conforming to the current industry best practice standards.

Key features:

- Project-oriented approach to all practical aspects of SAS design and project development.

- Uniquely focuses on the rapidly changing control aspect of substation design, using novel communication technologies and IEDs (Intelligent Electronic Devices).

- Covers the complete chain of SAS components and related equipment instead of purely concentrating on IEDs and communication networks.

- Discusses control and monitoring facilities for auxiliary power systems.

- Contributes significantly to the understanding of the Standard IEC 61850, which is viewed as a "black box" for a significant number of professionals around the world.

- Explains Standard IEC 61850 – Communication networks and systems for power utility automation – to support all new systems networked to perform control, monitoring, automation, metering and protection functions.

Written for practical application, this book is a valuable resource for professionals operating within different SAS project stages including the specification process, contracting process, design and engineering process, integration process, testing process and the operation and maintenance process.

Figure 2: Back cover of the "Substation Automation Systems: Design and Implementation" book. This image displays a summary of the book's key features and scope, along with information about the author, Evelio Padilla, and the publisher, Wiley.

Maintenance (Keeping Knowledge Current)

Maintaining proficiency in Substation Automation Systems requires continuous learning and engagement with evolving technologies and standards:

- **Regular Review:** Periodically revisit key sections of this manual to reinforce understanding and stay updated on fundamental concepts.
- **Industry Updates:** Supplement the knowledge gained from this book with current industry publications, conferences, and workshops on SAS and related technologies.
- **Practical Application:** Actively apply the principles discussed in the manual to real-world projects to solidify understanding and identify areas for further study.

Troubleshooting (Addressing Challenges)

While this manual provides comprehensive guidance, practical implementation may present challenges. Consider the following approaches:

- **Conceptual Clarity:** If encountering difficulties, re-read the relevant sections to ensure a clear understanding of the theoretical underpinnings before attempting practical solutions.
- **Standard Interpretation:** For issues related to IEC 61850, refer back to the detailed explanations provided to clarify standard interpretations and application.
- **Systematic Approach:** When troubleshooting a system, apply the project-oriented methodology outlined in the book to systematically diagnose and resolve issues.
- **Consultation:** For complex problems, consider consulting with experienced professionals or industry forums, referencing the concepts learned from this manual.

Specifications

Key specifications of the "Substation Automation Systems: Design and Implementation" book:

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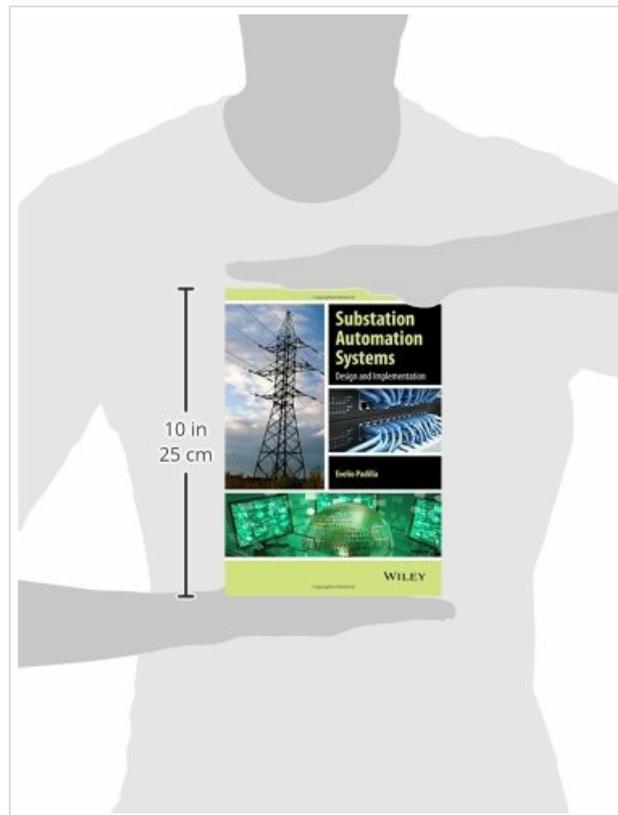| Attribute	Detail
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Figure 3: Side view of the "Substation Automation Systems: Design and Implementation" book, illustrating its physical dimensions (approximately 10 inches in height).

SUPPORT AND FURTHER RESOURCES

For additional support or inquiries related to the content of this publication, please refer to the publisher's official channels:

- **Publisher:** Wiley
- **Official Website:** www.wiley.com (for general inquiries, errata, or new editions)
- **Author Information:** Information about Evelio Padilla and his other works may be found on the publisher's site or academic platforms.

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