

Preface

Preface to the Second Edition

In the few months of its existence, this “AutoBoK” is already making an impact by better defining the automation profession, both to automation practitioners and to academicians working to improve automation curricula, and by helping automation professionals prepare for the Certified Automation Professional (CAP) exam.

Now, circumstances have allowed us to make revisions and improvements to the book much sooner than we expected. A team working to provide technical expertise to a new self-study program for CAP, “ISA CAP Learning System” — Lee Lane, Nick Sands, and Joe Bingham — has identified several areas of improvement and has worked to make those changes happen. Their efforts have resulted in a much better book.

The topics on Analog Communications, Motion Control, and Electrical Installations have been strengthened to better cover the material in those topics; the topics on Digital Communications, Industrial Networks and Maintenance have had minor changes; and topics have been added on Continuous Emissions Monitoring Systems and on Custom Software to give more weight to those topics.

In addition, an appendix has been added on Control Equipment Structure. This appendix goes into some historical detail since an understanding of that history is useful to an understanding of how automation systems are structured today.

Prior to the 1970s when programmable control hardware for discrete applications began to see widespread use, discrete control was much more difficult and was thus limited in functionality. However, available analog controllers were very capable for continuous control; so most of the more complex control application work and most of the automation professionals worked on process applications.

Today, virtually all new control is performed in programmable devices which do a very good job for both discrete and continuous applications. However, the tremendous opportunities in manufacturing (discrete and motion) applications have caused this area to overtake the continuous applications and a major fraction of automation professionals today work outside the process industries.

Though a variety of control devices today can do a variety of discrete, motion, and process applications, many of the devices are best suited to specific areas. The design of these devices is influenced by the historical expectations of that manufacturing area as well as by the true requirements of the automation task.

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This book is intended to be read and studied both by automation professionals and by those who want to learn about automation—not just used for looking up facts and figures. However, it contains so much technical information you may also find it useful as a reference.

Because each topic was written by a highly respected expert, or experts, in that subject area, there is much more detailed information than you would expect in a typical overview. Even so, each topic is short enough to be read like a summary.

This book emerged from the work to develop ISA's Certified Automation Professional (CAP) program. However, its value is much broader than just as a helpful text for CAP.

The topics in this book represent THE scope of automation application, which makes it one of the most important books published by ISA. This is a unique book that will go a long way toward defining the scope of automation and helping to establish automation "engineering" as a profession.

The term "automation" includes all topics that have traditionally been identified using names such as *instrumentation, instruments and control, process control, process automation, control systems, automation and control, manufacturing control, manufacturing automation, and system integration*. Automation professionals are the practitioners responsible for the direction, design, and deployment of systems and equipment for manufacturing and control systems.

A number of organizations in recent years have developed a document that defines their knowledge base, frequently referred to as the *Body of Knowledge*. Some of those documents are bibliographies of the relevant literature, some are a critique of the literature, and some are an overview of the topics. This book is obviously the latter type. Because this book contains only a small fraction of all the information in automation knowledge, it might be titled "Overview," "Summary," or "Introduction." However, following the lead of the Project Management Institute with their *A Guide to Project Management Body of Knowledge*, which is now an ANSI standard, many organizations use the *Guide to . . . nomenclature*. We also have chosen to follow that usage.

This book is intended to serve as a technical summary of automation knowledge for those who need a comprehensive perspective on automation in their job, including:

- Automation professionals who need to understand the basics of an unfamiliar topic. They might, for example, need to determine if it is useful in the application on which they are currently working. Or, they may have been assigned to use that technology, and they need to begin to learn about it.
- Anyone who knows something about a topic, but needs to gain a better understanding of the range of information in the topic
- Academicians who need guidance in developing and improving curriculum or courses, and who wish to expand their own knowledge and that of their students
- Managers who need a better perspective of all aspects of automation, enabling them to better set direction and make staffing decisions
- Those who work in fields related to automation, and who need a comprehensive understanding of what automation is all about. For example, just as automation professionals need to learn much more about information technology (IT), people in IT working on systems related to manufacturing need to learn more about plant floor control and information systems.
- Students, novices, and others evaluating career decisions
- Those studying for ISA's Certified Automation Professional (CAP) exam

To be useful in all these ways, each of the 35 topics in the book needed to be understandable to those who know very little about that topic while, at the same time, useful to those knowledgeable and experienced in that subject. And, each topic needed to include real technical information—not just a

newsy overview. Achieving all that was a real challenge in the short space that could be devoted to each topic.

Some users will find the material fully meets their educational or reference needs on a particular topic; others, who find they need more depth or more background, will find it useful to study some of the listed references. Those studying for the CAP exam, for example, may find that this material meets their needs in topics where they have some familiarity, but in topics where they know very little, they may also need to consult other sources to adequately understand the material.

Also, while this book attempts to cover all the topics in the scope of the CAP exam, many CAP exam questions will not be covered in this book, because CAP questions can be drawn from any book or referred paper in automation. Still, a good knowledge of the material in this book will be a big step towards preparing for the CAP exam.

The organization of the 35 topics in this book is somewhat arbitrary and evolved from more than a year of work trying to capture as many topics as possible in a logical category. The continuous numbering of the topics from 1 to 35 is to indicate the topics themselves are really the most important headings. The seven topic categories are for convenience only.

Deciding what not to include was as big a challenge as deciding what should be covered. Older technologies less used today have been skipped, as well as technologies that are very specialized. Techniques used less frequently—even ones very important in some applications—are often not covered simply because of space limitations. Applications used only by a particular industry are also not included. For example, automation professionals working in chemical and refining applications may feel that distillation column control is so basic that it should have been included. However, those outside those industries—a majority of today's automation professionals—may hardly know, or care, what a distillation column is.

You may feel your area of automation is slighted, or find that some topics you consider important in the scope of automation are not addressed. We welcome hearing from you about topics that you think should be included in future editions. If there are errors or topics that need further clarification, please let us know. Send your comments to info@isa.org.

The idea for this book first came from Ken Baker, who, as a member of the CAP Steering Team, realized the value of putting the entire scope of automation together into one book. Chip Lee, Director of Publications on the ISA staff, was also a strong proponent from the beginning and continued to pursue the idea even though some, including me, initially thought a useful coverage of such a broad scope in one reasonably sized book was not practical.

Lois Ferson on the ISA publications staff undertook the big task of identifying authors for each topic and convincing them to deliver a comprehensive technical document in fewer words than they probably imagined possible. Jim Strothman did the editing for format and style and to overcome our tendency as engineers to use too many unnecessary words. But it is the authors of the 35 topics who are most responsible for this book. Though many of them initially resisted the tough assignment of covering significant technical detail in such a small space, particularly with a tight time schedule, each did an outstanding job addressing their topic. Many of the authors have written books specifically on their topic, and a number of the authors are *the* recognized expert on their topic. About a third of the authors are ISA Fellows.

Vernon Trevathan
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