



*Data Communications
and
Networking
for
Manufacturing Industries*

Second Edition

*by
Dario J. Toncich
B.E.E. (Hons), M Eng, MIE Aust, CP Eng*

Published by...



ISBN 0 646 10522 1

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Layout and artwork by Chrystobel Engineering of Brighton Australia. Printed and Bound in Australia for Chrystobel Engineering.

First Printed in Australia, 1992. Second Edition printed in Australia, 1993 (Hard-Cover), 1994 (Soft-Cover). Additional copies of this text may be obtained by directing purchase enquiries directly to Chrystobel Engineering. Subject conveners and lecturers prescribing this text as a course reference may be eligible for complimentary copies.

Author

Dario Toncich was born in Melbourne Australia in 1960. He graduated (with honours) in Electrical Engineering from the University of Melbourne in 1983. Since that time he has held both industry and academic positions and has experience in the fields of data communications, computer architecture, FMS and simulation.

During his time in industry, Dario Toncich spent a number of years developing computer control, simulation and communications equipment for FMS at an Australian-based Advanced Manufacturing Technology (AMT) Company. In 1988, Dario Toncich was appointed as Manager of Research Activity for the CIM Centre at the Swinburne University in Hawthorn, Victoria, Australia. As the manager of the Centre he has led research into AMT fields including FMS control and simulation and industrial data communications. Dario Toncich is also a professional consulting engineer to industry in the fields of FMS and data communications and has a Master of Engineering (by Research) degree from the Swinburne University. The CIM Centre is internationally renowned for its applied, industry-oriented research programs in factory communications, non-contact inspection, robotics, FMS, machine control systems, and systems integration. The Centre is comprised of over 55 engineers and researchers and attracts Australia's highest ranked University engineering graduates for its research programs. The CIM Centre has numerous international collaborative links and is nationally recognised as a Centre of Excellence in advanced manufacturing.

Dario Toncich is also a subject convener and lecturer in a range of computer and CIM related subjects at postgraduate and undergraduate level at the Swinburne University. His research work has been published in international refereed journals and conference proceedings and he has also authored a number of guided learning programs in computer architecture and data communications.

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7 Wrixon Avenue Brighton Australia 3187.

Table of Contents

<i>Introduction</i>	<i>(iii)</i>
<i>How to Read and Use This Book</i>	<i>(v)</i>
1 <i>Computer System Fundamentals and Internal Data Transfer</i>	1
1.1 Microprocessor System Fundamentals	2
1.2 Number Systems, Conversion and Arithmetic	8
1.3 Representation of Alpha-numeric	14
1.4 Boolean Algebra	18
1.5 Microprocessor System Program Execution and Communication	23
1.6 Master-Slave Relationships and Interrupts	32
2 <i>Computers and Control Systems Within Manufacturing</i>	35
2.1 The Range and Scope of Computers within Manufacturing	36
2.2 Programmable Logic Controllers	40
2.3 Multiple Axis Motion Controllers (CNC and Robotics)	43
2.4 Linking Computer Aided Design to Manufacture	49
2.5 Manufacturing Systems	52
3. <i>Principles Of Data Communications</i>	59
3.1 Eight Fundamentals of Computer to Computer Communication	60
3.2 Resolution of Conflicts in Communication - Protocol	62
3.3 Modelling Conducting Communications Links	68
3.4 Electro-Magnetic Interference and Cross-Talk	74
3.5 Parallel Data Transmission and Communications Ports	78
3.6 The Centronics Parallel Port	82
3.7 Networked Parallel Data Transmission and IEEE-488	87
4. <i>Serial Data Communications -Fundamentals</i>	91
4.1 Serial Communications in Integrated Manufacturing	92
4.2 The Role of Parallel Communications in Manufacturing	95
4.3 Parallel to Serial Conversion	98
4.4 Synchronous Serial Data Communications	102
4.5 Asynchronous Serial Data Communications	107
4.6 Error Detection Techniques	111
4.7 Signal Modulation	121
4.8 DCE and DTE	136
4.9 UARTS and USRTS	138

5. Serial Data Communications - Hardware Application	143
5.1 The RS-232C Standard	144
5.2 The RS-232C Connectors	146
5.3 Basic RS-232 Connections	149
5.4 Complex RS-232 Connections	154
5.5 A Summary of Points Related to RS-232 Links	161
5.6 Devices to Assist in Establishing Serial Links	162
5.7 Selecting RS-232 Cables and Line-Drivers	164
5.8 Configuring UART Parameters	169
5.9 Bit Rates and Baud Rates	172
5.10 RS-422 and RS-449 Hardware Links	173
5.11 The 20mA Current Loop	177
5.12 Summary of Key Factors in Point to Point Serial Links	178
6. Serial Data Communications - Software Application	181
6.1 Developing Software for Serial Communications	182
6.2 The XON/XOFF Protocol	184
6.3 ACK/NAK Protocols	187
6.4 Communications Software Layering	204
6.5 Terminal Emulation and the Kermit System	206
7. Local Area Networks - Fundamentals	211
7.1 Local Area Network Concepts	212
7.2 Network Topologies	216
7.3 Contention Schemes	221
7.4 ISO / OSI Seven Layer Model	225
7.5 A Summary of Key Points Related to Networks	231
7.6 Data Packet Forms on Networks - BSC, HDLC and SDLC	233
7.7 PSTN / PSDN / CSDN / ISDN	238
7.8 The Role of Networking in Manufacturing	242
8. Local Area Networks - Applications And Standards	247
8.1 Interfacing Computers to Networks	248
8.2 Network Performance - Transfer Rates	252
8.3 Networks Standards Activities - IEEE 802 Committee	257
8.4 Bridges, Routers and Gateways	262
8.5 The Ethernet System	266
8.6 The General Motors / Boeing MAP and TOP Networks	269
8.7 SNA	279
8.8 File Server and Office Networks	281
8.9 What Will Our Computers Say Once they are Networked?	285

9. Real-Time Networks for Distributed Control	287
9.1 Introduction	288
9.2 Typical Control Applications for Real-Time Networks	292
9.3 Proprietary Real-Time LANs - CAN and LON	295
9.4 Conclusions	300
<i>Appendix A - Industrial Data Communications Dictionary</i>	
<i>Appendix B - References</i>	
<i>Appendix C - Index</i>	

Introduction

The physical integration of industrial controllers with Computer Aided Design (CAD) systems and manufacturing management systems has become one of the most important issues in the field of Computer Integrated Manufacture (CIM). Communications links between these intelligent, computer based systems are a vital part of all modern, manufacturing organisations endeavouring to integrate management systems and production systems into a more efficient, responsive and cohesive unit.

Communications within a manufacturing organisation can take on many forms. At a basic level it is often necessary to reliably transfer data or programs, developed on a Computer, to a Computer Numerical Control (CNC) machine tool, robot or Programmable Logic Controller (PLC). At a higher level it may be necessary to integrate CAD workstations, industrial controllers (CNCs & PLCs) and manufacturing management computer systems through a Local Area Network (LAN). However, in order to establish links and networks that can function with industrial equipment, there needs to be an understanding of the basic mechanisms and problems of data communications and the special needs of the manufacturing environment.

Contrary to the (often misguided) industry faith in turn-key solutions, the selection, installation and maintenance of a network requires a good deal of in-house expertise. A large proportion of high-technology manufacturing systems fail simply because companies place too much reliance on external consultants and vendors instead of developing this vital, in-house expertise. Inevitably, manufacturers need to realise that "all-embracing", "ever-lasting", "future-proofed", "turn-key" solutions simply do not exist in the world of reality. This is particularly true for industrial communications networks which live in an environment of widely differing, incompatible and constantly changing computer technologies and standards.

In many disciplines of engineering, there are difficulties in finding standards that cover a specific technology. This is certainly not the case in terms of industrial networking. In fact there are an enormous number of standards that cover the area. The bulk of these standards do not, in isolation, provide a mechanism for reliable data communication in the factory. A range of cohesive standards needs to be selected in order to realise a viable link or network. However, many standards are incompatible with one another or unsuitable for the industrial environment. Some communications standards are even irrelevant to the applications to which they are now applied.

In order to select communications equipment or develop communications protocols for the manufacturing environment, one needs to understand both the networking technology and the standards themselves.

This book is specifically designed to provide professionals in the field of manufacturing with the knowledge required to understand the fundamentals, applications and more importantly, the problems of industrial computer communications and networking. It will allow you to intelligently take on the challenge of integrating production equipment within a modern manufacturing organisation.

How to Read and Use This Book

"Data Communications and Networking for Manufacturing Industries" has been written to provide you with a very readable text that remains relatively free of complex mathematical analyses. Even if you are a beginner in the field of computer communications, you will still find that the book is very straightforward in addressing the complex issues of data communications. You will also find that the book will help you come to terms with the "jargon" used in relation to computer communications.

The book is structured as a complete handbook on industrial data communications, and hence some chapters deal with fundamental issues related to computers and communications. The more experienced readers may feel that a particular chapter is beneath their dignity. Therefore the chapters have been written as discrete (stand-alone) units which have been placed into a logical sequence. In keeping with the philosophy of other engineering texts, a summary appears at the beginning of every chapter and you may choose to leave out some chapters without affecting the reading of subsequent chapters. However, be forewarned - be judicious in omitting chapters. Many semi-experienced people have grave misconceptions about data communications and networking.

If you are like the many professionals who have had to learn about computers and communications through the "back-door", by listening to vendors and consultants who spout acronyms and jargon, then you should probably read this book chapter and verse, in sequential order. You may well find that on many occasions your back-door knowledge has led you to put the numbers two and two together and come up with the number five.

