

Contents

<i>Preface</i>	xv
<i>Acknowledgments</i>	xvi
PART ONE Data Communications	1
<i>Chapter 1 Introduction to Data Communications</i>	3
Current Roles of Communications	5
Advantages of Electronic Data Transfer	5
Business Applications	7
Information Service Applications	7
Local Area Information Exchange	11
Communication Network Systems	12
Growing Excitement	15
<i>Chapter 2 Taking the Mystery Out of Data Communications</i>	16
Data Communications Overview	16
Data Transfer Modes	18
Parallel I/O	19
Serial I/O	21
Serial Duplex Configurations	22
Serial Data Transfer Speeds	27
Details of Serial Data Transfer	28
Asynchronous Communication	28
Synchronous Communication	36
Asynchronous Communication Speed-Matching	43

<i>Chapter 3</i> Communication Codes and Controls	56
The ASCII Character Set	56
Communication Control Characters	61
Other Communication Codes	70
<i>Chapter 4</i> Communications Hardware	72
Modems	72
<i>How Modems Work</i>	73
<i>Modem Speeds and Protocols</i>	77
<i>Modem Features</i>	86
<i>Modem Registers</i>	98
<i>Modem Switches</i>	99
<i>Built-In Self-Tests</i>	99
<i>Modem Indicator Lights</i>	100
<i>Stand-Alone Versus Board-Mounted Modems</i>	101
<i>Modem Summary</i>	104
Communications Adapters	104
<i>Asynchronous Communications Adapter</i>	107
<i>Synchronous Communications Adapter</i>	110
<i>Multiprotocol Adapter</i>	111
The RS-232C Standard	111
<i>RS-232C Signal Characteristics</i>	112
<i>RS-232C Pin Assignments</i>	113
Cables and Genders	119
Computer-to-Computer Connections	120
Terminal Emulation	122
<i>Chapter 5</i> Terminal Communications Software	123
Software Layers	123
Software Design Concepts	125
<i>Polling Versus Interrupt-Driven</i>	125
<i>Command Mode Versus Conversation Mode</i>	127
<i>Menu-Driven Versus Command-Driven</i>	129
<i>Software Intelligence</i>	130
Smart-Terminal Software Capabilities	131
<i>Installation and Setup Features</i>	132
<i>Modem Control Features</i>	138

<i>Data Redirection and Flow Control Features</i>	140
<i>Data Manipulation Features</i>	147
<i>Special Features</i>	152
Evaluating Communications Software	155
<i>Chapter 6 Unattended Communications Software</i> 159	
<i>Remote Software in Perspective</i>	160
<i>Remote Software Capabilities</i>	161
<i>Host and Bulletin Board Features</i>	163
<i>Configuration Control</i>	164
<i>Help Files</i>	168
<i>Communications Parameters</i>	169
<i>File Transfer Features</i>	169
<i>System Options</i>	171
<i>Message Subsystem Capabilities</i>	174
<i>Log-on Bulletins</i>	175
<i>System Logs</i>	175
<i>Remote Takeover</i>	176
<i>System Operator Controls</i>	177
<i>System Reliability</i>	179
<i>Electronic Mail Software</i>	180
<i>System Customization</i>	182
<i>Send Mail Features</i>	184
<i>Receive Mail</i>	187
<i>File Maintenance Features</i>	189
<i>Miscellaneous Features</i>	189
<i>Gateways</i>	191
<i>Evaluating Unattended Communications Software</i>	191
<i>Operating Tips for Unattended Systems</i>	194
<i>Required Equipment</i>	194
<i>System Maintenance</i>	197
<i>Caller Activity</i>	198
<i>Upload Rules</i>	199
<i>Conclusions</i>	199
<i>Chapter 7 Protocols and Network Architectures</i> 200	
<i>Asynchronous Error Detection and Correction</i>	201

<i>Parity Error Detection</i>	203
<i>File Transfer Protocols</i>	206
<i>Continuous Error Detection and Correction</i>	225
Wide Area Network Architectures	229
<i>Network Layers</i>	230
<i>OSI Model</i>	231
<i>X.25 Packet-Switched Networks</i>	237
<i>System Network Architecture</i>	243
<i>SNA Software</i>	252
PART TWO Local Area Networks and Applications	265
<i>Chapter 8 Local Area Networks—The Communications Perspective</i>	267
<i>Local vs. Wide Area Networks</i>	268
<i>LANs</i>	268
<i>A Variation on Two Themes</i>	270
<i>The Physical Fundamentals—Cards, Cables and Data</i>	272
<i>Overview</i>	272
<i>Terminology</i>	273
<i>Getting the Data In and Out</i>	275
<i>Speed of Data on the Network (Data Rate)</i>	276
<i>How Data Move on the Network (Data Structure)</i>	277
<i>Local Area Network Classification</i>	279
<i>Media</i>	279
<i>Signaling</i>	281
<i>Topology</i>	285
<i>Protocol</i>	287
<i>Summary of LAN Communications Fundamentals</i>	291
<i>Chapter 9 Local Area Networks—The Software Perspective</i>	293
<i>An Overview of Network Operating Systems</i>	293
<i>MS-DOS 3.X (3.1, 3.2, 3.3)</i>	297
<i>NETBIOS</i>	299
<i>Network Operating Systems</i>	303
<i>Shared Device Support</i>	305
<i>File Sharing Support</i>	316

<i>LAN Utility Software Support</i>	320
Summary	323
<i>Chapter 10 Internetworking</i>	324
Terminology	325
Internetworking and the OSI Model	329
<i>Xerox Network Service (XNS)</i>	331
Name Services	333
Asynchronous Gateways	334
<i>Asynchronous Communications Server (ACS)</i>	334
<i>Virtual Networking System (VINES)</i>	335
<i>3+Route Communications Service</i>	337
SNA and RJE Gateways	338
X.25 and Other Gateways	340
Bridges	341
File Transfer Servers	342
Summary	344
<i>Chapter 11 Network Implementation</i>	345
<i>Virtual Networking System (VINES)</i>	346
<i>Major Features</i>	346
<i>Advanced NetWare with System Fault Tolerance (SFT)</i>	359
<i>Major Features</i>	360
<i>3+ Software System</i>	374
<i>Major Features</i>	374
<i>Tapestry</i>	386
<i>Tapestry Architecture</i>	387
<i>Major Features</i>	388
<i>System Comparisons</i>	396
<i>File Server Performance Enhancements</i>	397
<i>Support for PC Based File Servers</i>	397
<i>Network Mass Storage Options</i>	397
<i>Shared Printer Support</i>	397
<i>Other Shared Device Support</i>	398
<i>Network Naming Support</i>	398

<i>Internetworking Capabilities</i>	398
<i>File-Locking Standards Supported</i>	398
<i>Mainframe Access Capabilities</i>	399
<i>Network Performance Monitoring</i>	399
<i>Access Control and Security</i>	399
<i>File Server Software</i>	399
<i>Fault Tolerant Design</i>	400
<i>Electronic Mail</i>	400
<i>Backup and Archiving Capability</i>	400
<i>Network Utilities</i>	400
Summary	401
 <i>Chapter 12 Applications, Case Studies and the Real World</i>	403
 A Sampler of General Communications Applications	404
<i>Electronic Mail</i>	404
<i>Videotex and Teletext</i>	407
<i>Electronic (Desktop) Publishing</i>	417
<i>Teleshopping Services</i>	420
 Case Study 1—Automating XYZ Distributing Corporation	423
<i>The Company's Background</i>	423
<i>Defining the Need</i>	425
<i>An Approach to the Problem</i>	425
 Case Study 2—Upgrading an Existing System	427
<i>The Company's Background</i>	427
<i>An Approach to the Problem</i>	430
 Summary of Actual LAN Installations	436
<i>Hospital Medical Care</i>	437
<i>Management Information System—U.S. Army, Europe</i>	437
<i>Real Estate Syndicate</i>	437
<i>Electrical/Mechanical Construction Company</i>	439
<i>Commercial Credit Corporation</i>	440
<i>Law Firm</i>	440
<i>National Mortgage Association</i>	441
<i>Vertical Software Development—Hospitality Management</i>	442
<i>Department Store Chain—Real Estate Division</i>	442
<i>Defense Contractor—Electronics</i>	443
Summary	444

<i>Chapter 13</i> Answers to Frequently Asked Questions	446
Communications Hardware	446
Terminal Communications Software	449
Unattended Communications Software	452
<i>Appendix A</i> ASCII Character Set	456
<i>Appendix B</i> Line Feed Addition Program	461
<i>Appendix C</i> EBCDIC Character Set	462
<i>Appendix D</i> Baudot Character Set	465
<i>Appendix E</i> PC-SPEAK.BAS Communications Program	466
<i>Appendix F</i> PC-SPEAK.BAS Flow Chart	473
<i>Appendix G</i> WordStar Conversion Program	482
<i>Appendix H</i> IBM-Related Public Host and Bulletin Boards	483
<i>Index</i>	503