

Contents

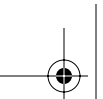
<i>Introducaion</i>		<i>xxi</i>
<i>Assessment Test</i>		<i>xxx</i>
Chapter 1	The Physics of RFID	1
	Electromagnetic Radiation	2
	Near Field	3
	Far Field	4
	Propagation and Interference of Waves	6
	The Complete Laws of Electrodynamics	8
	Interpreting the Complete Laws	10
	Permeability and Depth of Penetration	12
	Summary	13
	Exam Essentials	14
	Key Terms	15
	Review Questions	16
	Answers to Review Questions	20
Chapter 2	Interrogation Zone Basics	23
	Interrogator Construction	25
	Interrogator Functions	26
	Read/Write Capability	26
	I/O Capability	26
	User Interface	27
	Dumb Reader vs. Smart Reader	28
	Communication	29
	Tag Population Management	30
	Firmware Upgrades	31
	Interrogator Types	32
	Fixed Interrogators	32
	Mobile Interrogators	33
	Interrogation Zone Performance	34
	Dwell Time	34
	Antenna Performance	34
	Dense Reader Environment	40
	Anticollision	42
	Summary	43
	Exam Essentials	45
	Key Terms	47
	Review Questions	48
	Answers to Review Questions	52

Chapter 3	Site Analysis	55
	Business Process Flow and Mapping	56
	Blueprints, CADs, and Seeing the Big Picture	58
	Getting Ready to Measure	58
	Getting the Right Test Equipment	60
	Setting Up for RF Testing	60
	Measuring for AEN during Normal Operations (and Beyond)	62
	Micromanaging Your Waves	64
	Ever Think You Could Lose a Path?	65
	Summary	70
	Exam Essentials	70
	Key Terms	72
	Review Questions	73
	Answers to Review Questions	75
Chapter 4	Tags	77
	Tag Types	78
	Active Tags	79
	Passive Tags	80
	Semi-passive Tags	82
	Communication	83
	Inductive Coupling	83
	Passive Backscatter	84
	Frequencies	85
	Low-Frequency Tags	85
	High-Frequency Tags	86
	Ultra-High-Frequency Tags	86
	Microwave Tags	88
	Frequencies Used around the World	88
	Tag Classes (EPC)	90
	Tag Construction	92
	The Chip, or IC	93
	Tag Antenna Production	94
	Chip Attachment	94
	Modulation: Why It Matters	95
	Q Factor	96
	Tags for Specific Applications	96
	Tag Packaging	96
	Material-Specific Tags	99
	Tag Placement	100
	Package Contents	104
	Tag Placement Testing	105

	Summary	107
	Exam Essentials	108
	Key Terms	110
	Review Questions	111
	Answers to Review Questions	115
Chapter 5	Designing the RFID Network	117
	Determining the Proper Frequency for Your RFID System	118
	Choosing the Right Reader for Your RFID Network	121
	Basics of an RFID Reader	121
	Choosing the Proper Components in a UHF System	123
	Scientific Testing	124
	Use-Case Testing	129
	Choosing the Correct Cable Type	131
	Choosing the Correct Antenna and Design	135
	Understanding Middleware Considerations	136
	Summary	138
	Exam Essentials	138
	Key Terms	140
	Answers to Review Questions	141
	Review Questions	145
Chapter 6	Peripherals	147
	RFID Printers/Encoders	148
	Printer Installation	149
	Printing Methods	151
	Media (Label) Selection	152
	Printer Configuration and Calibration	153
	RFID Tag Encoding	154
	Label Applicators	155
	Wipe-on Label Applicators	156
	Pneumatic Piston Label Applicators	156
	Triggering Devices	156
	Feedback Devices	157
	Light Stacks	157
	Sound Devices	158
	Diverters	158
	Verification and Exception Handling	159
	Real-Time Location Systems (RTLS)	159
	Summary	161
	Exam Essentials	162
	Key Terms	163
	Review Questions	164
	Answers to Review Questions	168

Chapter 7	Deployment and Installation	171
	Providing a Methodology for Managing an Installation	172
	Role and Benefit of the Technical Design Review Team	173
	Role and Benefit of the Quality Assurance Team	173
	Execute with Military Precision: the POAM	174
	Implementing QC Processes for RFID Systems	176
	Getting the Team Ready On-site	179
	Logistics and Access Management	179
	Communications	180
	Subcontractor Management	182
	Installing an RFID System	183
	Marrying Design Documents with Installation	183
	Performing Reader Optimization Analysis and Configuration	185
	Working off the Site Assessment	186
	Summary	192
	Exam Essentials	193
	Key Terms	194
	Review Questions	195
	Answers to Review Questions	199
Chapter 8	Troubleshooting and Optimizing an RFID Network	201
	Understanding RFID Performance Drivers	203
	Reader Functionality	203
	Antenna Options	204
	Tag Impact	204
	Middleware	205
	Determining Possible Causes of Problems	205
	Environmental Interferences	207
	Antenna Tuning	210
	Tag Quality	211
	Reader Settings	213
	Physical Layout	214
	Optimizing Large-Scale Deployments	214
	Describing a Troubleshooting Protocol	215
	Understanding the Steps to Isolate a Problem	216
	Using a Variable Isolation Approach to Fix the Problem	216
	Containing Radiation	217
	Summary	219
	Exam Essentials	220
	Key Terms	221
	Review Questions	222
	Answers to Review Questions	226

Chapter 9	Standards and Regulations	229
	International Standardization Organizations	231
	International Organization for Standardization (ISO)	231
	International Electrotechnical Commission (IEC)	234
	International Telecommunication Union (ITU)	234
	Universal Postal Union (UPU)	235
	Standardization and Regulatory Organizations by Region	236
	Europe	236
	North America	239
	Asia	241
	Pan-industry Organizations	241
	GS1	241
	EPCglobal	242
	AIM Global	244
	Safety Regulations	244
	Personnel Safety	245
	Human Exposure to Radiation	246
	Device Exposure to Radiation	247
	Summary	247
	Exam Essentials	248
	Key Terms	250
	Review Questions	251
	Answers to Review Questions	255
Appendix A	Vendors and Links	257
	RFID Vendors	258
	Alien Technology	258
	Datamax	259
	FOX IV Technologies	259
	IBM	259
	Impinj	260
	Intermec	260
	MARKEM	261
	ODIN Technologies	261
	OMRON	262
	Paxar	262
	Printronix	263
	SATO	263
	Savi Technology	263
	Sirit	264
	Symbol Technologies	264
	TAGSYS	265
	Texas Instruments (TI)	265



xx Contents

ThingMagic	266
UPM Raflatac	266
Zebra	266
RFID Links	267
RFID Journal Online	267
EPCglobal	267
RFid Gazette	268
UsingRFID	268
Auto-ID Labs	268
RFID Switchboard	268
RFID Update	269

Glossary 271

Index 277

