

Table of Contents

Preface	xix
1 Introduction	
1.1 Reasons for Reissues	1-1
1.1.1 Changes from Issue 2 to Issue 3	1-1
1.1.2 Changes from Issue 1 to Issue 2	1-1
1.2 Relation to the ANSI T1.4XX Series of Standards	1-2
1.3 Potentially Obsolete Features	1-2
1.4 Document Organization	1-3
1.5 Requirements Terminology	1-4
1.6 Requirement Labeling Conventions	1-5
1.6.1 Numbering of Requirement and Related Objects	1-5
1.6.2 Requirement, Conditional Requirement, and Objective Identification	1-5
2 Generic Requirements	
2.1 Network Power Systems	2-1
2.2 Steady-State Power Induction	2-1
3 Loop-Start Signaling	
3.1 Direct Current (dc) Supervisory Range	3-1
3.2 Loop-Start Signaling States Produced by an SPCS	3-2
3.2.1 Loop Current Feed (LCF) Criteria	3-3
3.2.2 Reverse Loop Current Feed (RLCF) Criteria	3-4
3.2.3 Open-Open Criteria	3-4
3.2.4 Ringing	3-4
3.3 Loop-Start Signaling States Applied to an SPCS	3-4
3.3.1 Loop Open	3-5
3.3.2 Loop Closure	3-5
3.4 Loop-Start Call States	3-5
3.4.1 Idle State	3-6
3.4.2 Answer State and Service-Request State	3-6
3.4.3 Addressing State	3-7
3.4.4 Call-Processing State	3-8
3.4.5 Communications State	3-8
3.4.6 Alerting State	3-9
3.4.7 Loop Current Feed Open (LCFO) Intervals	3-9
4 Ground-Start Signaling	
4.1 dc Supervisory Range	4-1
4.2 Ground-Start Signaling States Produced by an SPCS	4-2
4.2.1 Loop Current Feed (LCF) Criteria	4-3
4.2.2 Reverse Loop Current Feed (RLCF) Criteria	4-3
4.2.3 Ringing	4-4
4.2.4 Ground-Start Idle	4-4
4.3 Ground-Start Signaling States Applied to an SPCS	4-4

4.3.1	Loop Open	4-4
4.3.2	Loop Closure	4-5
4.3.3	Ring Ground	4-5
4.4	Ground-Start Call States	4-6
4.4.1	Idle State	4-7
4.4.2	Service-Request State	4-7
4.4.3	Addressing State	4-8
4.4.4	Call-Processing State	4-9
4.4.5	Communications State	4-9
4.4.6	Alerting State	4-10
4.4.7	Answer State	4-11
4.4.8	Loop Current Feed Open (LCFO) Intervals	4-12

5 Dial-Tone-First Coin Telephone

5.1	dc Supervisory Range	5-1
5.2	DTF Coin Telephone Signaling States Produced by an SPCS	5-2
5.2.1	Loop Current Feed (LCF) Criteria	5-2
5.2.2	Reverse Loop Current Feed (RLCF) Criteria	5-3
5.2.3	Negative Coin Presence Test	5-4
5.2.4	Positive Coin Presence Test	5-4
5.2.5	Negative Coin Control	5-5
5.2.6	Positive Coin Control	5-6
5.2.7	Ringing	5-6
5.3	DTF Coin Telephone States Applied to an SPCS	5-6
5.3.1	Loop Closure	5-7
5.3.2	Loop Open	5-7
5.3.3	Tip Ground	5-7
5.3.4	Transients During Tip-Ground Detection	5-8
5.4	DTF Coin Telephone Call States	5-8
5.4.1	Idle State	5-9
5.4.2	Answer State and Service-Request State	5-9
5.4.3	Addressing State	5-9
5.4.4	Call Processing and Communications States	5-10
5.5	Coin Detection, Coin Disposal, and Coin-Readout Control	5-10
5.5.1	Coin Readout Control	5-10
5.5.2	Initial-Deposit Test	5-11
5.5.3	Coin Present Test	5-11
5.5.4	Stuck-Coin Test	5-11
5.5.5	Coin Collect	5-12
5.5.6	Coin Refund	5-12
5.6	Signals from Operator Services Systems	5-13
5.6.1	MF Receiver Requirements	5-13
5.6.2	Wink Signal	5-13
5.6.3	Interpretation of MF Signals	5-14
5.6.4	Duration of Expanded In-Band DTF Coin Signals	5-14
5.6.5	Interval Between Expanded In-Band Signals from an Operator Services System	5-14

6 Two-Party SPCS Interfaces

6.1 dc Supervisory Range 6-1

6.2 Two-Party Signaling States Produced by an SPCS 6-1

 6.2.1 Loop-Start Signaling Criteria 6-2

 6.2.2 Ringing 6-2

 6.2.3 Two-Party Automatic Number Identification (ANI) 6-2

6.3 Two-Party Signaling States Applied to an SPCS 6-3

 6.3.1 Loop-Start Signaling Criteria 6-3

 6.3.2 Tip-Party Ground 6-4

6.4 Two-Party Call States 6-4

 6.4.1 Idle State 6-4

 6.4.2 Service-Request State 6-4

 6.4.3 Addressing State 6-5

 6.4.4 Call-Processing State 6-5

 6.4.5 Communications State 6-5

 6.4.6 Answer State 6-5

 6.4.7 Alerting State 6-5

 6.4.8 Emergency Break-In 6-6

 6.4.9 Loop Current Feed Open Intervals 6-6

7 Loop Reverse-Battery Signaling – Outgoing Interface

7.1 dc Supervisory Range 7-1

7.2 Outgoing Loop Reverse-Battery Signaling States Produced by an SPCS 7-2

 7.2.1 Loop Open 7-2

 7.2.2 Loop Closure 7-2

7.3 Outgoing Loop Reverse-Battery Signaling States Applied to an SPCS 7-3

 7.3.1 Loop Current Feed 7-3

 7.3.2 Reverse Loop Current Feed 7-4

7.4 Loop Reverse-Battery Call States 7-4

 7.4.1 Idle State 7-4

 7.4.2 Seizure State 7-5

 7.4.3 Addressing State 7-6

 7.4.4 Call-Processing State 7-6

 7.4.5 Communication State 7-7

7.5 SPCS Generated Loop-Open Intervals 7-7

8 Loop Reverse-Battery Signaling – Incoming Interface

8.1 dc Supervisory Range 8-1

8.2 Incoming Loop Reverse-Battery Signaling States Produced by an SPCS 8-2

 8.2.1 Loop Current Feed (LCF) Criteria 8-2

 8.2.2 Reverse Loop Current Feed (RLCF) Criteria 8-3

 8.2.3 Transition Time 8-3

8.3 Loop Reverse-Battery Signaling States Applied to an Incoming SPCS Interface 8-3

 8.3.1 Loop Open 8-4

 8.3.2 Loop Closure 8-4

8.4 Loop Reverse-Battery Call States 8-4

 8.4.1 Idle State 8-4

 8.4.2 Seizure State 8-5

 8.4.3 Addressing State 8-5

8.4.4 Call-Processing State	8-6
8.4.5 Communication State	8-7
8.5 Connecting Equipment Generated Loop-Open Intervals	8-7

9 E&M Signaling

9.1 Type I SPCS E&M Signaling Interface	9-1
9.1.1 Transmission Pairs	9-2
9.1.2 Open-Circuit Voltages - M Lead	9-2
9.1.3 Open-Circuit Voltages - E Lead	9-2
9.1.4 Detection of On-Hook from the Connecting Equipment	9-2
9.1.5 Detection of Off-Hook from Connecting Equipment	9-3
9.1.6 Sending On-Hook to the Connecting Equipment	9-3
9.1.7 Sending Off-Hook to the Connecting Equipment	9-3
9.1.8 Switching Transients - M Lead	9-4
9.1.9 Switching Transients - E Lead	9-4
9.2 Type II SPCS E&M Signaling Interface	9-5
9.2.1 Transmission Pairs	9-5
9.2.2 Open-Circuit Voltages - M and SB Leads	9-5
9.2.3 Open-Circuit Voltages - E and SG Leads	9-6
9.2.4 Detection of On-Hook from the Connecting Equipment	9-6
9.2.5 Detection of Off-Hook from Connecting Equipment	9-6
9.2.6 Sending On-Hook to the Connecting Equipment	9-7
9.2.7 Sending Off-Hook to the Connecting Equipment	9-7
9.2.8 Switching Transients - M and SB Leads	9-8
9.2.9 Switching Transients - E and SG Leads	9-8
9.3 E&M Signaling Call States	9-8
9.3.1 Idle State	9-8
9.3.1.1 Outgoing Interface	9-8
9.3.1.2 Incoming Interface	9-9
9.3.1.3 Two-Way Interfaces	9-9
9.3.2 Seizure State	9-9
9.3.2.1 Outgoing Interface	9-9
9.3.2.2 Incoming Interface	9-10
9.3.2.3 Two-Way Interfaces	9-11
9.3.3 Addressing State	9-11
9.3.3.1 Outgoing Interface	9-11
9.3.3.2 Incoming Interface	9-12
9.3.3.3 Two-Way Interface	9-13
9.3.4 Call-Processing State	9-13
9.3.4.1 Outgoing Interface	9-13
9.3.4.2 Incoming Interface	9-13
9.3.4.3 Two-Way Interface	9-14
9.3.5 Communications State	9-14
9.3.5.1 Outgoing Interface	9-14
9.3.5.2 Incoming Interface	9-14
9.3.5.3 Two-Way Interface	9-15

10 dc Dial-Pulse Signals

10.1 Detection of Dial-Pulse Signals from Analog Access Lines 10-1

 10.1.1 Dial-Pulse Signals Generated by Customer Installation Equipment 10-1

 10.1.2 Detection and Acceptance of Dial Pulses 10-2

 10.1.3 Interdigit Intervals 10-2

 10.1.4 Rejection of False Dial Pulses 10-3

 10.1.5 Interpretation of Dial-Pulse Signals 10-3

10.2 Detection of Dial-Pulse Signals from Inter-Switching-System Analog
Transmission Facilities 10-4

 10.2.1 Loop Dial Pulses 10-4

 10.2.1.1 Detection and Acceptance of Loop Dial Pulses 10-4

 10.2.1.2 Interdigit Intervals 10-5

 10.2.1.3 Rejection of False Loop Dial Pulses 10-6

 10.2.1.4 Interpretation of Dial-Pulse Signals 10-6

 10.2.2 Battery-and-Ground Dial-Pulse Signals 10-6

 10.2.2.1 Detection and Acceptance of Battery-and-Ground Dial Pulse
Signals 10-7

 10.2.2.2 Interdigit Intervals 10-8

 10.2.2.3 Rejection of False Battery-and-Ground Dial Pulses 10-8

 10.2.2.4 Interpretation of Dial-Pulse Signals 10-8

 10.2.3 Detection of E&M Dial Pulses 10-8

 10.2.3.1 Detection and Acceptance of E&M Dial Pulses 10-9

 10.2.3.2 Interdigit Intervals 10-9

 10.2.3.3 Interpretation of Dial-Pulse Signals 10-9

10.3 Generation of Dial-Pulse Signals for Application to Inter-Switching-System
Analog Transmission Facilities 10-9

 10.3.1 Dial-Pulse Generation Criteria Applicable to All Signaling Methods 10-10

 10.3.2 Loop Dial Pulse Criteria 10-10

 10.3.2.1 Loop Dial Pulse Characteristics 10-10

 10.3.2.2 Loop Dial Pulse Make Intervals 10-11

 10.3.2.3 Assignment of Dial-Pulse Digits 10-11

 10.3.2.4 Spurious Loop Opens or Loop Closures 10-12

 10.3.3 Battery-and-Ground Dial Pulse Criteria 10-12

 10.3.3.1 Battery-and-Ground Dial-Pulse Characteristics 10-12

 10.3.3.2 Battery-and-Ground Dial Pulse Make Intervals 10-12

 10.3.3.3 Assignment of Dial-Pulse Digits 10-13

 10.3.3.4 Spurious Loop Opens or Loop Closures 10-13

 10.3.4 E&M Dial Pulse Criteria 10-13

 10.3.4.1 E&M Dial Pulse Characteristics 10-13

 10.3.4.2 Assignment of Dial-Pulse Digits 10-14

 10.3.4.3 Spurious On-Hook or Off-Hook Signals 10-14

11 Inter-Switching-System Call Control Signals and Procedures

11.1 Seizure Signal 11-1

11.2 Addressing Control Signals 11-1

 11.2.1 Wink-Start Operation 11-2

 11.2.1.1 SPCS Outgoing Interface Requirements 11-2

 11.2.1.2 SPCS Incoming Interface Requirement 11-3

 11.2.2 Immediate-Dial Operation 11-4

11.2.2.1 SPCS Outgoing Interface Requirements	11-4
11.2.2.2 SPCS Incoming Interface Requirements	11-4
11.2.3 Delay-Dial Operation	11-4
11.2.3.1 SPCS Outgoing Interface Requirements	11-4
11.2.3.2 SPCS Incoming Interface Requirement	11-5
11.3 Answer Signal	11-6
11.4 Flash Signal	11-6
11.5 Glare Resolution	11-6
11.5.1 Controlling Interface	11-7
11.5.2 Release Interface	11-7

12 Hits, Flash Signals, and Disconnect Signals

12.1 Hit Timing	12-2
12.2 Flash Signal Timing	12-2
12.3 Disconnect Signal Timing	12-3
12.4 Dial Pulses During the Communications State	12-3

13 Disconnect Procedures

13.1 Internal SPCS Connections Between Interfaces	13-1
13.2 Release Procedures	13-2
13.2.1 Immediate Release	13-2
13.2.2 Ground-Start Guard-Release	13-2
13.2.3 OGT Guard Release	13-3
13.2.4 Timed-Disconnect Release Procedure	13-4
13.3 Disconnect During the Service-Request or Seizure Call State	13-4
13.4 Disconnect During the Addressing Call State	13-5
13.5 Disconnect During the Call-Processing Call State	13-5
13.6 Disconnect During the Communication Call State	13-6
13.6.1 Timed-Release Interval	13-6
13.6.1.1 Timed-Release Interval for Loop-Start and Ground-Start Interfaces	13-6
13.6.1.2 Timed-Release Interval for ICT Interfaces	13-6
13.6.2 Call-Originating Interface Disconnects First	13-7
13.6.2.1 Loop-Start Interfaces	13-7
13.6.2.2 Ground-Start Interfaces	13-7
13.6.2.3 Outgoing Trunk (OGT) Interfaces	13-8
13.6.3 Call-Terminating Interface Disconnects First	13-8
13.6.3.1 Loop-Start Interfaces	13-9
13.6.3.2 Ground-Start Interfaces	13-9
13.6.3.3 Incoming Trunk (ICT) Interfaces	13-10
13.6.4 Connections Between ICT and OGT Interfaces	13-11
13.6.4.1 Call-Originating Interface Disconnects First	13-11
13.6.4.2 Call-Terminating Interface Disconnects First	13-11
13.7 No Disconnect Signal Received Before the Expiration of the Timed-Release Interval	13-12
13.7.1 Loop-Start Interfaces	13-13
13.7.2 Ground-Start Interfaces	13-13
13.7.3 Incoming Trunk (ICT) Interfaces	13-13
13.7.4 Outgoing Trunk (OGT) Interfaces	13-14
13.7.5 Call-Terminating Interface Disconnects First	13-14

13.7.5.1 Loop-Start Interfaces 13–15
 13.7.5.2 Ground-Start Interfaces 13–15

14 Alerting Signals

14.1 Alerting Signals Using Ringing 14–1
 14.1.1 Ringing Source Criteria 14–1
 14.1.2 Initial Application of Ringing 14–2
 14.1.3 Ringing Applied to Individual-Service Access Lines 14–3
 14.1.4 Ring Trip 14–6
 14.1.5 Reverting Ringing Code 14–6
 14.2 Alerting Signals Using Call-Waiting Tones 14–7

15 Dual-Tone MultiFrequency (DTMF) Signaling

15.1 Detection of DTMF Signals from Analog Access Lines 15–1
 15.1.1 SPCS Transmission Requirements During DTMF Signal Reception 15–1
 15.1.2 DTMF Digit and Signal Frequencies 15–2
 15.1.3 DTMF Signal Frequency Tolerance 15–2
 15.1.4 Code Validity Check 15–2
 15.1.5 Accept and Reject Power Levels 15–3
 15.1.6 DTMF Signal Twist 15–3
 15.1.7 DTMF Signal Duration 15–3
 15.1.8 Rise and Fall Times 15–3
 15.1.9 Interdigit Intervals 15–4
 15.1.10 Cycle Time 15–4
 15.1.11 Non-Linear Distortion Tolerance 15–4
 15.1.12 DTMF Signal Echos 15–4
 15.1.13 Dial Tone 15–4
 15.1.14 Gaussian Noise Immunity 15–5
 15.1.15 Impulse Noise Immunity 15–5
 15.1.16 Induction from Power Lines 15–6
 15.1.17 Digit Simulation Immunity 15–6
 15.2 Detection of DTMF Signals from Inter-Switching-System Transmission Facilities 15–7
 15.3 DTMF Access Line Test Receiver 15–7
 15.3.1 Connection of DTMF Access Line Test Receiver 15–7
 15.3.2 DTMF Digits and Signal Frequencies 15–7
 15.3.3 DTMF Signal Frequency Tolerance 15–8
 15.3.4 Code Validity Check 15–8
 15.3.5 Accept and Reject Amplitude Levels 15–8
 15.3.6 DTMF Signal Twist 15–8
 15.3.7 DTMF Signal Duration 15–8
 15.3.8 Rise and Fall Times 15–9
 15.3.9 Interdigit Intervals 15–9
 15.3.10 Cycle Time 15–9
 15.3.11 Non-Linear Distortion Tolerance 15–9
 15.3.12 DTMF Signal Echos 15–10
 15.3.13 Dial Tone 15–10
 15.3.14 Gaussian Noise Immunity 15–10
 15.3.15 Impulse Noise 15–11
 15.3.16 Induction from Power Lines 15–11

15.3.17	DTMF Signal Simulation by Speech	15–12
15.4	Generation of DTMF Signals by an SPCS	15–12
15.4.1	SPCS Transmission Requirements During DTMF Signal Generation	15–13
15.4.2	DTMF Digits and Signal Frequencies	15–13
15.4.3	DTMF Signal Frequency Tolerance	15–13
15.4.4	DTMF Signal Power	15–13
15.4.5	DTMF Signal Duration	15–13
15.4.6	Rise and Fall Times	15–13
15.4.7	Interdigit Intervals	15–14
15.4.8	Cycle Time	15–14
15.4.9	Non-Linear Distortion	15–14
15.4.10	Transients	15–14

16 Multifrequency (MF) Signaling

16.1	Detection of MF Signals	16–1
16.1.1	SPCS Transmission Requirements During MF Signal Reception	16–2
16.1.2	MF Codes and Signal Frequencies	16–2
16.1.3	MF Signal Frequency Limits	16–3
16.1.4	Code Validity Check	16–3
16.1.5	Accept and Reject Power Levels	16–3
16.1.6	MF Signal Twist	16–3
16.1.7	MF Signal Duration	16–3
16.1.8	Rise and Fall Times	16–4
16.1.9	Interdigit Intervals	16–4
16.1.10	Non-Linear Distortion Tolerance	16–4
16.1.11	Gaussian Noise Immunity	16–5
16.1.12	Impulse Noise Immunity	16–5
16.2	Generation of MF Signals by an SPCS	16–6
16.2.1	SPCS Transmission Requirements During MF Signal Generation	16–6
16.2.2	MF Codes and Signal Frequencies	16–6
16.2.3	MF Signal Frequency Tolerance	16–7
16.2.4	MF Signal Power	16–7
16.2.5	MF Signal Twist	16–7
16.2.6	MF Signal Duration	16–7
16.2.7	Rise and Fall Times	16–8
16.2.8	Interdigit Intervals	16–8
16.2.9	Non-Linear Distortion	16–8
16.2.10	Transients	16–8

17 Call Progress Signals

17.1	Precise Tone Plan	17–1
17.2	Call Progress Tones	17–3
17.2.1	Dial Tone	17–3
17.2.2	Recall Dial Tone	17–3
17.2.3	Message-Waiting Indicator Tone	17–4
17.2.4	Confirmation Tone	17–4
17.2.5	Audible Ringing	17–5
17.2.6	Line Busy Tone	17–5
17.2.7	Reorder Tone	17–6

17.2.8 Receiver-Off-Hook (ROH) Tone 17-6
 17.2.9 Special Information Tones (SITs) 17-7

18 Coin-Deposit Signals

18.1 Signal Parameters 18-1
 18.1.1 Frequency Limits 18-2
 18.1.2 Signal Power and Twist 18-2
 18.1.3 Interpretation of Coin-Deposit Signals 18-3
 18.1.4 Inter-Signal Intervals 18-4
 18.2 Talkdown 18-4
 18.2.1 Coin-Deposit Detectors Located in End Offices 18-5
 18.2.2 Coin-Deposit Detectors Located in Tandem Offices 18-6
 18.3 Talkoff 18-7
 18.3.1 Intentional Talkoff 18-7
 18.3.2 Accidental Talkoff 18-8
 18.4 Fraud 18-8
 18.5 Suggested Test Guidelines for Coin-Deposit Detectors 18-10
 18.5.1 Test Guidelines for Signal Parameters 18-10
 18.5.2 Test Guidelines for Talkdown 18-11
 18.5.3 Test Guidelines for Talkoff 18-11

19 Multiwink Coin Control Signals

19.1 Detection of Multiwink Coin Control Signals 19-1
 19.2 Interpretation of Multiwink Coin Control Signals 19-1
 19.2.1 Interval Between Multiwink Signals 19-2

20 Operator Services Systems Requirements

20.1 Expanded In-Band Signaling 20-1
 20.1.1 MF Transmitter Requirements 20-1
 20.1.2 Wink Signal 20-1
 20.1.3 Assignment of MF Signals 20-2
 20.1.4 Duration of Expanded In-Band DTF Coin Signals 20-2
 20.1.5 Interval Between Expanded In-Band Signals 20-2
 20.2 Multiwink Coin Control Signals 20-3
 20.2.1 Wink and Interwink Intervals 20-3
 20.2.2 Assignment of Multiwink Coin Control Signals 20-3
 20.2.3 Interval Between Multiwink Signals 20-4

Appendix A: Exchanging Trunk-Side Digitally Encoded Analog Signals Between NGN Systems

A.1 NGN Architecture A-1
 A.2 Using NGN Components to Send and Receive Digitally Encoded Analog Signals A-3
 A.3 Sending Digitally Encoded Analog Signals over RTP A-4
 A.3.1 Inter-Switching-System Call Control Signals and Procedures (Section 11) A-7
 A.3.2 Dual-Tone MultiFrequency (DTMF) Signaling (Section 15) A-8
 A.3.3 MultiFrequency (MF) Signaling (Section 16) A-9
 A.3.4 Call Progress Signals (Section 17) A-9

A.3.5 Special Information Tones (SITs) (Section 17.2.9)	A-9
A.3.6 Coin-Deposit Signals (Section 18)	A-13
A.3.7 Multiwink Coin Control Signaling (Section 19)	A-14
A.3.8 Operator Services System Requirements - Expanded Inband Signaling (EIS) (Section 20)	A-15

Appendix B: References

B.1 Telcordia Documents	B-1
B.2 Non-Telcordia Documents	B-2
B.3 Telcordia Reference Notes	B-3

Appendix C: Acronyms

Requirement-Object Index

List of Figures

Figure 3-1	Network Voltage-Current Characteristics at the Network Interface During the Addressing, Call-Processing, and Communications States Under Normal SPCS Operation	3-11
Figure 3-2	Network Voltage-Current Characteristics at the Network Interface During the Addressing, Call-Processing, and Communications States During ac Power Outages or SPCS Equipment Malfunction	3-12
Figure 3-3	Network Voltage-Current Characteristics at the Network Interface During the Service-Request and Answer States Under Normal SPCS Operation	3-13
Figure 3-4	Network Voltage-Current Characteristics at the Network Interface During the Service-Request and Answer States During ac Power Outages or SPCS Equipment Malfunction	3-14
Figure 3-5	Illustration of Two Types of Current Feed Circuits	3-15
Figure 3-6	SPCS Voltage-Current Characteristics in the Idle State at the Moment of a Service Request, in the Service-Request State, and in the Answer State	3-16
Figure 3-7	SPCS Voltage-Current Characteristics in the Addressing, Call Processing, and Communications States	3-17
Figure 3-8	SPCS Loop-Current versus External Resistance Characteristic for Adequate Transmission Performance	3-18
Figure 4-1	SPCS Ring-to-Ground dc Voltage-versus-Ring-Conductor-Current Characteristics	4-13
Figure 4-2	Loop Open Test Circuit	4-14
Figure 4-3	Ground-Start Ring Ground Test Circuit	4-14
Figure 4-4	SPCS Tip-to-Ground dc Voltage-versus-Tip-Conductor-Current Characteristics for Ground-Start Interfaces with a Grounded Current Feed	4-15
Figure 4-5	Addressing State SPCS dc Voltage-versus-Tip-Conductor-Current Characteristics for Ground-Start Interfaces with Ground-Referenced Current Feeds	4-16
Figure 4-6	Alerting State SPCS dc Voltage-versus-Tip-Conductor-Current Characteristics for Ground-Start Interfaces with Ground-Referenced Current Feeds	4-17
Figure 5-1	Network Voltage – Current Characteristics at the Network Interface During the Addressing, Call-Processing, and Communications States for DTF Coin-Telephone Interfaces	5-15
Figure 7-1	Network dc Voltage-versus-Current Characteristics of Outgoing Loop-Reverse Battery Interface Loop Closure	7-8
Figure 7-2	dc Voltage-versus-Current Characteristics of a Customer-Installation Switching System (PBX)	7-9
Figure 8-1	Network Voltage-versus-Current Characteristics for Incoming Loop Reverse-Battery Interfaces	8-8
Figure 8-2	SPCS Voltage-versus-Current Characteristics for Incoming Loop Reverse-Battery Interfaces	8-9
Figure 9-1	SPCS Type I E&M Interface	9-15
Figure 9-2	SPCS Type II E&M Signaling Interface	9-16

Figure 9-3	E&M Signaling Wiring Configurations	9-17
Figure 9-4	M and SG Lead Ground Test Circuit	9-18
Figure 9-5	SB to M Lead Connection Test Circuit – A	9-18
Figure 9-6	SB to M Lead Connection Test Circuit – B	9-19
Figure 10-1	Dial Pulse Characteristics	10-15
Figure 10-2	Customer Installation Equipment Dial-Pulse Test Circuit	10-15
Figure 10-3	Customer-Installation Equipment Dial-Pulse Template	10-16
Figure 10-4	Dial-Pulse Test Circuit	10-17
Figure 10-5	SPCS Voltage-versus-Current Characteristics During the Make Interval of Loop Dial Pulses	10-18
Figure 10-6	SPCS Voltage-versus-Current Characteristics During the Make Interval of Battery-and-Ground Dial Pulses	10-19
Figure A-1	NGN Architecture	A-2
Figure A-2	RTP Payload Format for RFC 4733 Telephony Tones	A-5
Figure A-3	RTP Payload Format for RFC 4733 Named Telephone Events	A-5
Figure A-4	Example RFC 4733 Named Telephone Events RTP Payload for Conveying Intercept SIT Tone	A-12
Figure A-5	Example RFC 4733 Named Telephone Events RTP Payload for Conveying a Dime Coin-Deposit Signal	A-14
Figure A-6	Example RFC 4733 Named Telephone Events RTP Payload for Conveying a Coin Collect	A-16

List of Tables

Table 2-1	–48 Volt Power System Voltages	2–1
Table 5-1	Expanded In-Band DTF Signals	5–14
Table 5-2	Interval Between Signals from an Operator Services System	5–14
Table 10-1	Interpretation of Dial-Pulse Signals	10–4
Table 10-2	Loop Dial Pulses Received from Cable Pairs	10–5
Table 10-3	Dial Pulses Received from Transport Equipment	10–5
Table 10-4	Battery-and-Ground Dial Pulses Received from Cable Pairs	10–7
Table 10-5	E&M Dial-Pulse Characteristics	10–9
Table 10-6	Loop Dial-Pulse Characteristics	10–11
Table 10-7	Dial-Pulse Signals	10–11
Table 10-8	Battery-and-Ground Dial-Pulse Characteristics	10–12
Table 10-9	E&M Dial-Pulse Characteristics	10–14
Table 12-1	Flash Response Disabled Timing	12–1
Table 12-2	Flash Response Enabled Timing	12–2
Table 13-1	Possible Internal SPCS Connections	13–2
Table 14-1	Ringing Pattern Cadences	14–4
Table 14-2	SPCS Ringing Pattern Interval Requirements	14–4
Table 14-3	SPCS Ringing Pattern Interval Objectives	14–5
Table 14-4	Call-Waiting Tone Cadence Requirements	14–7
Table 14-5	Call-Waiting Tone Pattern Requirements	14–8
Table 15-1	Nominal Signal Frequencies for DTMF Digits	15–2
Table 16-1	Nominal Signal Frequencies for MF Codes	16–2
Table 17-1	Audible Tones Used to Generate Progress Signals	17–2
Table 17-2	Nominal Total Power of Two Frequency Call Progress Signals	17–2
Table 17-3	Cadence of Recall Dial Tones	17–3
Table 17-4	Cadence of Message-Waiting Indicator Tone	17–4
Table 17-5	Cadence of Confirmation Tone	17–4
Table 17-6	Cadence of Audible Ringing	17–5
Table 17-7	Cadence of Line Busy Tone	17–5
Table 17-8	Cadence of Reorder Tone	17–6
Table 17-9	ROH Signal Cadence	17–7
Table 18-1	Interpretation of Coin-Deposit Signals	18–3
Table 18-2	Coin Inter-Signal Tone-Off Durations	18–4
Table 18-3	Talkdown Parameters	18–5
Table 18-4	Signal Parameter Nominal Values	18–10
Table 19-1	Multiwink Coin Control Signals	19–1
Table 19-2	Interval Between Signals from an Operator Services System	19–2
Table 20-1	Expanded In-Band Signals	20–2
Table 20-2	Interval Between Signals from an Operator Services System	20–3
Table 20-3	Expanded In-Band DTF Coin Signals	20–4
Table 20-4	Interval Between Multiwink Signals from an Operator Services System	20–4
Table A-1	Event Codes for Frequencies Used for SIT Tones	A–11
Table A-2	Event Codes for Coin Control and Ringback Signaling	A–16

