

PROPOSED EIA/TIA INTERIM STANDARD

Wideband Spread Spectrum Digital Cellular System Dual-Mode Mobile Station - Base Station Compatibility Standard

April 21, 1992

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PREFACE

1
2 These technical requirements form a compatibility standard for cellular mobile telecom-
3 munications systems. They ensure that a mobile station can obtain service in any cellular
4 system manufactured according to this standard. These requirements do not address the
5 quality or reliability of that service, nor do they cover equipment performance or
6 measurement procedures.

7 To ensure compatibility (see Note 1), both radio-system parameters and call-processing
8 procedures must be specified. The equipment and interface parameters commonly
9 encountered in two-way radio systems have been updated and expanded to reflect the
10 unique radio plan upon which cellular systems are based. The sequence of call-processing
11 steps that the dual-mode mobile stations and base stations execute to establish calls has
12 been specified along with the digital control messages and analog signals that are
13 exchanged between the two stations.

14 The base station is subject to fewer compatibility requirements than the dual-mode mobile
15 station. Radiated power levels, both desired and undesired, are fully specified for dual-
16 mode mobile stations to control the RF interference that one mobile station can cause
17 another. Base stations are fixed in location and their interference is controlled by proper
18 layout and operation of the system in which the station operates. Detailed call-processing
19 procedures are specified for mobile stations to ensure a uniform response to all base
20 stations. Base station call procedures are not specified in detail because they are a part of
21 the overall design of the individual land system. However, the base station call-processing
22 procedures must be compatible with those specified for the mobile station. This approach
23 to writing the compatibility specification provides the land system designer with sufficient
24 flexibility to respond to local service needs and to account for local topography and
25 propagation conditions.

26 The basic radio-system parameters and call-processing procedures for the analog mode of
27 operation embodied in the compatibility specification were originally derived from the
28 Chicago and Baltimore-Washington developmental cellular systems and include certain
29 additions and modifications gained by experience with the operation of commercial
30 systems.

31 The basic radio-system parameters and call-processing procedures for the wideband spread
32 spectrum (CDMA) mode of operation embodied in the compatibility specification were
33 originally derived from the San Diego developmental cellular system. Most functions have
34 been verified by field trial.

35 This specification includes provisions for future service additions and expansion of system
36 capabilities. The architecture defined by this specification permits such expansion without
37 the loss of backwards compatibility to older mobile stations.

SECTION SUMMARY

1. General. This section defines the terms and numeric indications used in this document. This section also describes the time reference used in the CDMA system and the tolerances used throughout the document.

2. Requirements for Mobile Station Analog Operation. This section describes the requirements for CDMA-analog dual-mode mobile stations operating in the analog mode. A mobile station complying with these requirements will be able to operate with analog base stations complying with EIA/TIA-553, EIA/TIA/IS-54, and this document.

3. Requirements for Base Station Analog Operation. This section describes the requirements for analog base stations. A base station complying with these requirements will be able to operate in the analog mode with mobile stations complying with EIA/TIA-553, EIA/TIA/IS-54, and this document.

4. Requirements for Mobile Station Analog Options. This section describes the requirements for CDMA-analog dual-mode mobile stations which use the 32-digit dialing option on the reverse analog control channel. In addition, this section describes mobile station requirements for use of the optional extended protocol.

5. Requirements for Base Station Analog Options. This section describes the base station requirements for using the 32-digit dialing option on the reverse analog control channel. In addition, this section describes base station requirements for use of the optional extended protocol.

6. Requirements for Mobile Station CDMA Operation. This section describes the requirements for CDMA-analog dual-mode mobile stations operating in the CDMA mode. A mobile station complying with these requirements will be able to operate with CDMA base stations complying with this document.

7. Requirements for Base Station CDMA Operation. This section describes the requirements for CDMA base stations. A base station complying with these requirements will be able to operate in the CDMA mode with mobile stations complying with this document.

Appendix A. Requirements for CDMA Service Options. This appendix describes the requirements for specific CDMA service options. Service Option 1, described herein, supports two-way voice using a variable-rate vocoder.

Appendix B. CDMA Call Flow Examples. This appendix provides examples of simple call flow in the CDMA system.

Appendix C. CDMA System Layering. This appendix describes the layers of the CDMA system: the physical layer (layer 1), the link layer (layer 2), the multiplex sublayer, and the control process layer (layer 3).

Appendix D. CDMA Constants. This appendix contains tables that give specific values for the constant identifiers found in Section 6 and Section 7. These identifiers take the forms T_{20m} and N_{5m} . The subscripted numbers vary to identify the particular constant.

SECTION SUMMARY

Appendix E. CDMA Retrievable and Settable Parameters. This appendix describes the parameters that the base station can set and retrieve in the mobile station.

Appendix F. Mobile Station Database. This appendix describes a database model that can be used for dual-mode mobile stations complying with this document.

NOTES

1. Compatibility, as used in connection with this standard, is understood to mean: Any dual-mode mobile station is able to place and receive calls in any cellular system. Conversely all systems are able to place and receive calls for any mobile station. In a subscriber's home system, all call placement must be automatic. Call placement preferably should be automatic when a mobile station is in roam status.
2. The term "dual-mode mobile station" indicates a mobile station capable of both analog (FM) and wideband spread spectrum (CDMA) operation. The term "wideband spread spectrum dual-mode mobile station" is used when a confusion might arise between a dual-mode mobile station complying with this document and EIA/TIA/IS-54.
3. This compatibility specification is based on the specific United States spectrum allocation for cellular systems.
4. Technical details are included for the operation of two systems in a geographic area, System A and System B, each with a separate set of control channels.
5. "Recommended Minimum Performance Standards for 800 MHz Wideband Spread Spectrum Dual-Mode Mobile Stations" and "Recommended Minimum Performance Standards for 800 MHz Base Stations Supporting Wideband Spread Spectrum Dual-Mode Mobile Stations" provide specifications and measurement methods for cellular equipment.
6. Each cellular system is identified by a unique 15-bit digital code, the SID code (see 2.3.8). The Federal Communications Commission assigns SID codes when cellular system construction permits are issued.
7. Each dual-mode mobile station is assigned a unique 32-bit binary serial number (ESN) which cannot be changed by the subscriber without rendering the mobile station inoperative (see 2.3.2).
8. In the message formats used between the dual-mode mobile stations and base stations, some bits are marked as reserved (RSVD or RESERVED). Some or all of these reserved bits may be used in the future for additional messages. Therefore, all dual-mode mobile stations and base stations must set all bits that they are programmed to treat as reserved bits to '0' (zero) in all messages that they transmit. All mobile stations and base stations must ignore the state of all bits that they are programmed to treat as reserved bits in all messages that they receive.

NOTES

- 1
2 9. Reserved.
- 3 10. RF Emissions. Minimum advisory standards of ANSI and the processing guidelines
4 of FCC are contained in ANSI C95.1-1982 Advisory Standards and FCC Rules and
5 Regulations respectively. Members should also take notice of the more stringent
6 exposure criteria for the general public and for radio frequency carriers with low
7 frequency amplitude modulation as given in NCRP Report No.86.
- 8 11. For the optional analog extended protocol feature (see 4.2 and 5.2), the assignment
9 of message type codes (MST words) will be made using procedures developed under
10 authority of the Engineering Department of the EIA. This will ensure that the
11 feature will be implemented in an orderly manner.
- 12 12. Reserved.
- 13 13. The allocation of SID numbers is under review by EIA/TIA TR45 for potential
14 revision to accommodate international requirements. Utilization of SID numbers
15 must be coordinated.
- 16 14. Although the analog mode of operation (Sections 2, 3, 4, and 5) draws upon
17 EIA/TIA/IS-54-B, some modifications have been made. These modifications are
18 denoted by a single vertical bar (|) in the left-hand margin.
- 19 15. "Base station" refers to the functions performed on the land side, which are
20 typically distributed among a cell, a sector of a cell, and the mobile telephone
21 switching office.
- 22 16. Section 6, Section 7, and the appendices use the following verbal forms: "Shall"
23 and "shall not" identify requirements to be followed strictly to conform to the
24 standard and from which no deviation is permitted. "Should" and "should not"
25 indicate that one of several possibilities is recommended as particularly suitable,
26 without mentioning or excluding others; that a certain course of action is preferred
27 but not necessarily required; or that (in the negative form) that a certain possibility
28 or course of action is discouraged but not prohibited. "May" and "need not"
29 indicate a course of action permissible within the limits of the standard. "Can" and
30 "cannot" are used for statements of possibility and capability, whether material,
31 physical, or causal.
- 32 17. Footnotes appear at various points in this specification to elaborate and further
33 clarify items discussed in the body of the specification.
- 34 18. Unless indicated otherwise, this document presents numbers in decimal form.
35 Binary numbers are distinguished in the text by the use of single quotation marks.

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19. This document uses the following subscripts to clarify the handling of the numeric information maintained by mobile stations: “r” indicates a value received by a mobile station; “s” indicates a value stored in a mobile station’s temporary memory; “sl” indicates stored limits on values that vary; “sv” indicates a stored value that varies as a mobile station processes various tasks; “s-p” indicates a value stored in a mobile station’s semi-permanent (non-volatile) security and identification memory; and “p” indicates a value stored in a mobile station’s permanent security and identification memory.
20. The term “no requirements” indicates that this section does not impose any requirements. Other sections of this standard or other standards may impose requirements. If neither this nor any other standard or specification imposes requirements, manufacturers are free to design in accordance with good and safe engineering practices.
21. The following operators define mathematical operations:
- × indicates multiplication.
 - $\lfloor x \rfloor$ indicates the largest integer less than or equal to x : $\lfloor 1.1 \rfloor = 1$, $\lfloor 1.0 \rfloor = 1$.
 - $\lceil x \rceil$ indicates the smallest integer greater or equal to x : $\lceil 1.1 \rceil = 2$, $\lceil 2.0 \rceil = 2$.
 - \oplus indicates exclusive OR.
 - | indicates logical OR.
 - & indicates logical AND.
 - * indicates convolution.
 - $\min(x, y)$ indicates the minimum of x and y .
 - $\max(x, y)$ indicates the maximum of x and y .
 - $x \bmod y$ indicates the remainder when x is divided by y : $x \bmod y = x - y \lfloor x/y \rfloor$.
 - \in indicates “an element of.”

BRIEF CONTENTS

1

2 **1 GENERAL..... 1-1**

3 1.1 Terms and Numeric Information 1-1

4 1.2 CDMA System Time 1-45

5 1.3 Tolerances 1-45

6 **2 REQUIREMENTS FOR MOBILE STATION ANALOG OPERATION..... 2-1**

7 2.1 Transmitter 2-1

8 2.2 Receiver..... 2-6

9 2.3 Security and Identification 2-8

10 2.4 Supervision 2-26

11 2.5 Malfunction Detection..... 2-28

12 2.6 Call Processing 2-29

13 2.7 Signaling Formats 2-55

14 **3 REQUIREMENTS FOR BASE STATION ANALOG OPERATION..... 3-1**

15 3.1 Transmitter 3-1

16 3.2 Receiver..... 3-3

17 3.3 Security and Identification 3-5

18 3.4 Supervision 3-5

19 3.5 Malfunction Detection..... 3-5

20 3.6 Call Processing 3-7

21 3.7 Signaling Formats 3-19

22 **4 REQUIREMENTS FOR MOBILE STATION ANALOG OPTIONS..... 4-1**

23 4.1 32-Digit Dialing 4-1

24 4.2 Mobile Station Extended Protocol..... 4-14

25 **5 REQUIREMENTS FOR BASE STATION ANALOG OPTIONS..... 5-1**

26 5.1 32-Digit Dialing 5-1

27 5.2 Base Station Extended Protocol 5-1

BRIEF CONTENTS

1		
2	6	REQUIREMENTS FOR MOBILE STATION CDMA OPERATION..... 6-1
3	6.1	Transmitter 6-1
4	6.2	Receiver 6-44
5	6.3	Security and Identification 6-46
6	6.4	Supervision 6-58
7	6.5	Malfunction Detection 6-65
8	6.6	Call Processing..... 6-67
9	6.7	Signaling Formats 6-161
10	7	REQUIREMENTS FOR BASE STATION CDMA OPERATION 7-1
11	7.1	Transmitter 7-1
12	7.2	Receiver 7-40
13	7.3	Security and Identification 7-40
14	7.4	Supervision 7-41
15	7.5	Malfunction Detection 7-41
16	7.6	Call Processing..... 7-43
17	7.7	Signaling Formats 7-71
18		
19		
20	APPENDIX A	REQUIREMENTS FOR CDMA SERVICE OPTIONS A-1
21	APPENDIX B	CDMA CALL FLOW EXAMPLES..... B-1
22	APPENDIX C	CDMA SYSTEM LAYERING..... C-1
23	APPENDIX D	CDMA CONSTANTS D-1
24	APPENDIX E	CDMA RETRIEVABLE AND SETTABLE PARAMETERS..... E-1
25	APPENDIX F	MOBILE STATION DATABASE F-1

CONTENTS

1	1 GENERAL	1-1
2	1.1 Terms and Numeric Information	1-1
3	1.1.1 Terms	1-1
4	1.1.2 Numeric Information	1-18
5	1.1.2.1 Analog Numeric Information	1-18
6	1.1.2.2 CDMA Numeric Information	1-21
7	1.1.2.2.2 Internal Numeric Information	1-42
8	1.2 CDMA System Time	1-45
9	1.3 Tolerances	1-45
10	1.3.1 Analog System Tolerances	1-45
11	1.3.2 CDMA Tolerances	1-46
12		
13	2 REQUIREMENTS FOR MOBILE STATION ANALOG OPERATION	2-1
14	2.1 Transmitter	2-1
15	2.1.1 Frequency Parameters	2-1
16	2.1.1.1 Channel Spacing and Designation	2-1
17	2.1.1.2 Frequency Tolerance	2-2
18	2.1.2 Power Output Characteristics	2-3
19	2.1.2.1 Carrier On/Off Conditions	2-3
20	2.1.2.2 Power Output and Power Control	2-3
21	2.1.3 Modulation Characteristics	2-4
22	2.1.3.1 Voice Signals	2-4
23	2.1.3.1.1 Compressor	2-5
24	2.1.3.1.2 Pre-Emphasis	2-5
25	2.1.3.1.3 Deviation Limiter	2-5
26	2.1.3.1.4 Post Deviation-Limiter Filter	2-5
27	2.1.3.2 Wideband Data Signals	2-5
28	2.1.3.2.1 Encoding	2-5
29	2.1.3.2.2 Modulation and Polarity	2-6
30	2.1.4 Limitations on Emissions	2-6
31	2.1.4.1 Bandwidth Occupied	2-6

CONTENTS

1	2.1.4.2 Conducted Spurious Emissions	2-6
2	2.1.4.3 Radiated Spurious Emissions	2-6
3	2.2 Receiver	2-6
4	2.2.1 Frequency Parameters	2-6
5	2.2.1.1 Channel Spacing and Designation	2-6
6	2.2.2 Demodulation Characteristics	2-7
7	2.2.2.1 Voice Signals	2-7
8	2.2.2.1.1 De-Emphasis	2-7
9	2.2.2.1.2 Expander	2-7
10	2.2.3 Limitations on Emissions	2-7
11	2.2.3.1 Conducted Spurious Emissions	2-7
12	2.2.3.1.1 Suppression Inside Cellular Band	2-7
13	2.2.3.1.2 Suppression Outside Cellular Band	2-8
14	2.2.3.2 Radiated Spurious Emissions	2-8
15	2.2.4 Other Receiver Parameters	2-8
16	2.3 Security and Identification	2-8
17	2.3.1 Mobile Identification Number	2-8
18	2.3.2 Electronic Serial Number (ESN)	2-10
19	2.3.3 Station Class Mark	2-10
20	2.3.4 Registration Memory	2-11
21	2.3.4.1 Autonomous Registration Memory	2-11
22	2.3.4.2 Location Area Memory	2-11
23	2.3.5 Access Overload Class	2-12
24	2.3.6 Extended Address Method	2-12
25	2.3.7 First Paging Channel	2-12
26	2.3.8 Home System Identification	2-12
27	2.3.9 Local Control Option	2-13
28	2.3.10 Preferred Operation Selection	2-13
29	2.3.10.1 Preferred System	2-13
30	2.3.10.2 Preferred CDMA or Analog	2-13
31	2.3.11 Discontinuous Transmission	2-13

CONTENTS

1	2.3.12 Authentication, Encryption of Signaling Information/User Data	2-14
2	2.3.12.1 Authentication	2-14
3	2.3.12.1.1 Shared Secret Data (SSD)	2-14
4	2.3.12.1.2 Random Challenge Memory (RAND)	2-15
5	2.3.12.1.3 Call History Parameter (COUNTs-p)	2-15
6	2.3.12.1.4 Authentication of Mobile Station Registrations.....	2-15
7	2.3.12.1.5 Unique Challenge-Response Procedure	2-16
8	2.3.12.1.6 Authentication of Mobile Station Originations.....	2-17
9	2.3.12.1.7 Authentication of Mobile Station Terminations.....	2-19
10	2.3.12.1.8 Updating the Shared Secret Data (SSD)	2-20
11	2.3.12.1.9 CAVE Algorithm	2-25
12	2.3.12.2 Signaling Message Encryption	2-26
13	2.3.12.2.1 Signaling Message Encryption Control.....	2-26
14	2.4 Supervision	2-26
15	2.4.1 Supervisory Audio Tone	2-26
16	2.4.1.1 SAT Detection	2-27
17	2.4.1.2 SAT Transmission	2-27
18	2.4.1.3 Fade Timing Status	2-27
19	2.4.2 Signaling Tone	2-27
20	2.5 Malfunction Detection	2-28
21	2.5.1 Malfunction Timer	2-28
22	2.5.2 False Transmission	2-28
23	2.6 Call Processing	2-29
24	2.6.1 Initialization.....	2-29
25	2.6.1.1 Retrieve System Parameters	2-29
26	2.6.1.1.1 Scan Dedicated Control Channels	2-29
27	2.6.1.1.2 Update Overhead Information.....	2-30
28	2.6.1.2 Paging Channel Selection	2-31
29	2.6.1.2.1 Scan Paging Channels	2-31
30	2.6.1.2.2 Verify Overhead Information.....	2-31
31	2.6.2 Idle	2-32

CONTENTS

1	2.6.2.1 Response to Overhead Information.....	2-32
2	2.6.2.2 Page Match.....	2-36
3	2.6.2.3 Order.....	2-36
4	2.6.2.4 Call Initiation	2-37
5	2.6.2.5 Non-Autonomous Registration Initiation	2-37
6	2.6.2.6 Power Down.....	2-37
7	2.6.3 System Access.....	2-37
8	2.6.3.1 Set Access Parameters	2-37
9	2.6.3.2 Scan Access Channels	2-37
10	2.6.3.3 Retrieve Access Attempt Parameters	2-38
11	2.6.3.4 Update Overhead Information.....	2-38
12	2.6.3.5 Seize Reverse Control Channel	2-40
13	2.6.3.6 Delay After Failure.....	2-41
14	2.6.3.7 Service Request	2-41
15	2.6.3.8 Await Message	2-42
16	2.6.3.9 Await Registration Confirmation	2-44
17	2.6.3.10 Action on Registration Failure.....	2-44
18	2.6.3.11 Autonomous Registration Update.....	2-44
19	2.6.3.12 Serving-System Determination.....	2-45
20	2.6.3.13 Alternate Access Channel	2-45
21	2.6.3.14 Directed Retry.....	2-45
22	2.6.4 Mobile Station Control on the Analog Voice Channel.....	2-45
23	2.6.4.1 Loss of Radio-Link Continuity.....	2-45
24	2.6.4.2 Confirm Initial Voice Channel.....	2-45
25	2.6.4.3 Alerting	2-46
26	2.6.4.3.1 Waiting for Order	2-46
27	2.6.4.3.2 Waiting for Answer.....	2-48
28	2.6.4.4 Conversation	2-50
29	2.6.4.5 Release.....	2-53
30	2.6.4.6 Power Down.....	2-53
31	2.7 Signaling Formats.....	2-55

CONTENTS

1	2.7.1 Reverse Analog Control Channel (RECC)	2-55
2	2.7.1.1 Reverse Analog Control Channel (RECC) Messages	2-56
3	2.7.2 Reverse Analog Voice Channel (RVC)	2-64
4	2.7.2.1 Reverse Analog Voice Channel (RVC) Messages	2-65
5		
6	3 REQUIREMENTS FOR BASE STATION ANALOG OPERATION	3-1
7	3.1 Transmitter	3-1
8	3.1.1 Frequency Parameters	3-1
9	3.1.1.1 Channel Spacing and Designation	3-1
10	3.1.1.2 Frequency Tolerance	3-1
11	3.1.2 Power Output Characteristics	3-1
12	3.1.3 Modulation Characteristics	3-1
13	3.1.3.1 Analog Voice Signals	3-1
14	3.1.3.1.1 Compressor	3-2
15	3.1.3.1.2 Pre-emphasis	3-2
16	3.1.3.1.3 Deviation Limiter	3-2
17	3.1.3.1.4 Post Deviation-Limiter Filter	3-2
18	3.1.3.2 Wideband Data Signals	3-2
19	3.1.3.2.1 Encoding	3-2
20	3.1.3.2.2 Modulation and Polarity	3-3
21	3.1.4 Limitations on Emissions	3-3
22	3.1.4.1 Bandwidth Occupied	3-3
23	3.1.4.2 Conducted Spurious Emissions	3-3
24	3.1.4.3 Radiated Spurious Emissions	3-3
25	3.1.4.4 Intermodulation	3-3
26	3.2 Receiver	3-3
27	3.2.1 Frequency Parameters	3-3
28	3.2.1.1 Channel Spacing and Designation	3-3
29	3.2.2 Demodulation Characteristics	3-4
30	3.2.2.1 Analog Voice Signals	3-4
31	3.2.2.1.1 De-emphasis	3-4

CONTENTS

1	3.2.2.1.2 Expander.....	3-4
2	3.2.3 Limitations on Emissions	3-4
3	3.2.4 Other Receiver Parameters	3-4
4	3.3 Security and Identification	3-5
5	3.3.1 Authentication	3-5
6	3.3.2 Voice Privacy.....	3-5
7	3.4 Supervision.....	3-5
8	3.4.1 Supervisory Audio Tone.....	3-5
9	3.4.1.1 SAT Detection.....	3-5
10	3.4.1.2 SAT Transmission.....	3-5
11	3.4.1.3 Fade Timing Status	3-5
12	3.4.2 Signaling Tone Detection	3-5
13	3.5 Malfunction Detection	3-5
14	3.6 Call Processing	3-7
15	3.6.1 Overhead Functions for Mobile Station Initiation	3-7
16	3.6.2 Mobile Station Control on the Control Channel.....	3-7
17	3.6.2.1 Overhead Information	3-7
18	3.6.2.2 Page	3-9
19	3.6.2.3 Order.....	3-9
20	3.6.2.4 Local Control.....	3-9
21	3.6.3 Base Station Support of System Access by Mobile Stations.....	3-10
22	3.6.3.1 Overhead Information	3-10
23	3.6.3.2 Reverse Control Channel Seizure by Mobile Stations.....	3-11
24	3.6.3.3 Response to Mobile Station Messages	3-11
25	3.6.4 Mobile Station Control on Voice Channel.....	3-12
26	3.6.4.1 Loss of Radio-Link Continuity.....	3-12
27	3.6.4.2 Initial Voice Channel Confirmation	3-12
28	3.6.4.3 Alerting	3-12
29	3.6.4.3.1 Waiting for Order	3-12
30	3.6.4.3.2 Waiting for Answer.....	3-14
31	3.6.4.4 Conversation	3-15

CONTENTS

1 **3.7 Signaling Formats..... 3-19**

2 **3.7.1 Forward Analog Control Channel 3-19**

3 **3.7.1.1 Mobile Station Control Message..... 3-21**

4 **3.7.1.2 Overhead Message..... 3-29**

5 **3.7.1.2.1 System Parameter Overhead Message 3-30**

6 **3.7.1.2.2 Global Action Overhead Message 3-32**

7 **3.7.1.2.3 Registration ID Message 3-39**

8 **3.7.1.2.4 Control-Filler Message 3-40**

9 **3.7.1.3 Data Restrictions 3-42**

10 **3.7.2 Forward Analog Voice Channel..... 3-44**

11 **3.7.2.1 Mobile Station Control Message..... 3-46**

12

13 **4 REQUIREMENTS FOR MOBILE STATION ANALOG OPTIONS 4-1**

14 **4.1 32-Digit Dialing 4-1**

15 **4.1.1 Service Request - Requirement for 32-Digit Dialing Option..... 4-1**

16 **4.1.2 Signaling Formats - Requirements for 32-Digit Dialing Option..... 4-2**

17 **4.1.2.1 Reverse Analog Control Channel (RECC) - Requirement for 32-Digit**

18 **Dialing Option 4-2**

19 **4.1.2.2 RECC Messages 4-3**

20 **4.1.3 Reverse Analog Voice Channel - Requirement for 32-Digit Dialing Option 4-8**

21 **4.1.3.1 RVC Messages..... 4-9**

22 **4.2 Mobile Station Extended Protocol (See also 5.2)..... 4-14**

23 **4.2.1 RECC Extended Protocol Messages 4-15**

24 **4.2.2 RVC Extended Protocol Messages..... 4-18**

25

26 **5 REQUIREMENTS FOR BASE STATION ANALOG OPTIONS 5-1**

27 **5.1 32-Digit Dialing 5-1**

28 **5.2 Base Station Extended Protocol 5-1**

29 **5.2.1 Extended Protocol Mobile Station Control Message..... 5-1**

30 **5.2.2 Extended Protocol Overhead Message..... 5-2**

31 **5.2.3 FVC Extended Protocol Message..... 5-3**

CONTENTS

1	6 REQUIREMENTS FOR MOBILE STATION CDMA OPERATION.....	6-1
2	6.1 Transmitter.....	6-1
3	6.1.1 Frequency Parameters.....	6-1
4	6.1.1.1 Channel Spacing and Designation	6-1
5	6.1.1.2 Frequency Tolerance.....	6-1
6	6.1.2 Power Output Characteristics.....	6-1
7	6.1.2.1 Maximum Output Power	6-1
8	6.1.2.2 Output Power Limits.....	6-3
9	6.1.2.2.1 Minimum Controlled Output Power.....	6-3
10	6.1.2.2.2 Gated Output Power	6-3
11	6.1.2.2.3 Standby Output Power.....	6-4
12	6.1.2.3 Controlled Output Power	6-4
13	6.1.2.3.1 Estimated Open Loop Output Power	6-4
14	6.1.2.3.2 Closed Loop Output Power.....	6-6
15	6.1.2.4 Power Transition Characteristics	6-7
16	6.1.2.4.1 Open Loop Estimation	6-7
17	6.1.2.4.2 Closed Loop Correction.....	6-8
18	6.1.3 Modulation Characteristics.....	6-8
19	6.1.3.1 Reverse CDMA Channel Signals.....	6-8
20	6.1.3.1.1 Modulation Parameters.....	6-10
21	6.1.3.1.2 Data Rates.....	6-12
22	6.1.3.1.3 Convolutional Encoding	6-12
23	6.1.3.1.4 Code Symbol Repetition	6-12
24	6.1.3.1.5 Block Interleaving	6-13
25	6.1.3.1.6 Orthogonal Modulation.....	6-19
26	6.1.3.1.7 Variable Data Rate Transmission.....	6-21
27	6.1.3.1.7.1 Rates and Gating	6-21
28	6.1.3.1.7.2 Data Burst Randomizing Algorithm.....	6-21
29	6.1.3.1.8 Direct Sequence Spreading	6-24
30	6.1.3.1.9 Quadrature Spreading	6-27
31	6.1.3.1.10 Baseband Filtering.....	6-28

CONTENTS

1	6.1.3.2 Access Channel.....	6-31
2	6.1.3.2.1 Access Channel Time Alignment and Modulation Rate.....	6-31
3	6.1.3.2.2 Access Channel Convolutional Encoding	6-31
4	6.1.3.2.3 Access Channel Code Symbol Repetition.....	6-31
5	6.1.3.2.4 Access Channel Interleaving	6-31
6	6.1.3.2.5 Access Channel Modulation.....	6-31
7	6.1.3.2.6 Access Channel Gating.....	6-31
8	6.1.3.2.7 Access Channel Direct Sequence Spreading.....	6-31
9	6.1.3.2.8 Access Channel Quadrature Spreading.....	6-32
10	6.1.3.2.9 Access Channel Baseband Filtering	6-32
11	6.1.3.2.10 Access Channel Frame Structure.....	6-32
12	6.1.3.3 Reverse Traffic Channel.....	6-32
13	6.1.3.3.1 Reverse Traffic Channel Time Alignment and Modulation Rates	6-32
14	6.1.3.3.2 Reverse Traffic Channel Convolutional Encoding	6-32
15	6.1.3.3.3 Reverse Traffic Channel Code Symbol Repetition.....	6-33
16	6.1.3.3.4 Reverse Traffic Channel Interleaving.....	6-33
17	6.1.3.3.5 Reverse Traffic Channel Modulation.....	6-33
18	6.1.3.3.6 Reverse Traffic Channel Gating.....	6-33
19	6.1.3.3.7 Reverse Traffic Channel Direct Sequence Spreading.....	6-33
20	6.1.3.3.8 Reverse Traffic Channel Quadrature Spreading	6-33
21	6.1.3.3.9 Reverse Traffic Channel Baseband Filtering.....	6-33
22	6.1.3.3.10 Reverse Traffic Channel Frame Structure.....	6-33
23	6.1.3.3.10.1 Reverse Traffic Channel Frame Quality Indicator	6-35
24	6.1.3.3.10.2 Reverse Traffic Channel Encoder Tail Bits.....	6-35
25	6.1.3.3.10.3 Traffic Channel Preamble.....	6-37
26	6.1.3.3.10.4 Null Traffic Channel Data	6-37
27	6.1.3.3.11 Multiplex Option 1 Information Bits.....	6-37
28	6.1.3.3.11.1 Primary and Signaling Traffic with Multiplex Option 1.....	6-38
29	6.1.3.3.11.2 Secondary Traffic with Multiplex Option 1.....	6-41
30	6.1.3.3.11.3 Use of Various Information Bit Formats	6-42
31	6.1.3.3.11.4 Control of Service Options.....	6-42

CONTENTS

1	6.1.4 Limitations on Emissions	6-42
2	6.1.4.1 Bandwidth Occupied	6-42
3	6.1.4.2 Conducted Spurious Emissions	6-43
4	6.1.4.2.1 Suppression Inside Cellular Band	6-43
5	6.1.4.2.2 Suppression Outside Cellular Band	6-43
6	6.1.4.3 Radiated Spurious Emissions	6-43
7	6.1.5 Synchronization and Timing	6-43
8	6.1.5.1 Time Reference	6-43
9	6.1.5.2 PN Time Tolerance	6-44
10	6.1.6 Transmitter Performance Requirements	6-44
11	6.2 Receiver	6-44
12	6.2.1 Frequency Parameters	6-44
13	6.2.1.1 Channel Spacing and Designation	6-44
14	6.2.2 Demodulation Characteristics	6-44
15	6.2.2.1 Processing	6-44
16	6.2.2.2 Forward Traffic Channel Frame Categorization	6-44
17	6.2.2.3 Forward Traffic Channel Time Alignment	6-45
18	6.2.3 Limitations on Emissions	6-45
19	6.2.3.1 Conducted Spurious Emissions	6-45
20	6.2.3.1.1 Suppression Inside Cellular Band	6-45
21	6.2.3.1.2 Suppression Outside Cellular Band	6-46
22	6.2.3.2 Radiated Spurious Emissions	6-46
23	6.2.4 Receiver Performance Requirements	6-46
24	6.3 Security and Identification	6-46
25	6.3.1 Mobile Station Identification Number	6-46
26	6.3.2 Electronic Serial Number	6-46
27	6.3.3 Station Class Mark	6-46
28	6.3.4 Registration Memory	6-46
29	6.3.5 Access Overload Class	6-47
30	6.3.6 Reserved	6-47
31	6.3.7 Reserved	6-47

CONTENTS

1	6.3.8 Home System and Network Identification	6-47
2	6.3.9 Local Control Option	6-47
3	6.3.10 Preferred Operation Selection	6-47
4	6.3.10.1 Preferred System	6-47
5	6.3.10.2 Preferred CDMA or Analog	6-47
6	6.3.11 Discontinuous Reception	6-47
7	6.3.12 Authentication, Encryption of Signaling Information/User Data	
8	and Voice Privacy	6-47
9	6.3.12.1 Authentication	6-47
10	6.3.12.1.1 Shared Secret Data (SSD)	6-47
11	6.3.12.1.2 Random Challenge Memory (RAND)	6-48
12	6.3.12.1.3 Call History Parameter (COUNT)	6-48
13	6.3.12.1.4 Authentication of Mobile Station Registrations	6-48
14	6.3.12.1.5 Unique Challenge-Response Procedure	6-49
15	6.3.12.1.6 Authentication of Mobile Station Originations	6-50
16	6.3.12.1.7 Authentication of Mobile Station Terminations	6-51
17	6.3.12.1.8 Authentication of Mobile Station Data Bursts	6-52
18	6.3.12.1.9 Updating the Shared Secret Data (SSD)	6-53
19	6.3.12.2 Signaling Message Encryption	6-56
20	6.3.12.3 Voice Privacy	6-57
21	6.3.13 Lock Orders	6-57
22	6.3.14 Mobile Station Revision Identification	6-58
23	6.4 Supervision	6-58
24	6.4.1 Pilot Channel	6-58
25	6.4.2 Sync Channel	6-58
26	6.4.3 Paging Channel	6-58
27	6.4.4 Forward Traffic Channel	6-59
28	6.4.5 Accumulated Statistics	6-59
29	6.4.5.1 Accumulated Access Channel Statistics	6-59
30	6.4.5.2 Accumulated Reverse Traffic Channel Statistics	6-60
31	6.4.5.3 Accumulated Paging Channel Statistics	6-61

CONTENTS

1	6.4.5.4 Accumulated Forward Traffic Channel Statistics	6-62
2	6.4.5.5 Accumulated Layer Two Statistics	6-64
3	6.4.5.6 Other Monitored Quantities and Statistics	6-65
4	6.5 Malfunction Detection	6-65
5	6.5.1 Malfunction Timer	6-65
6	6.5.2 Transmit Waveform Quality	6-65
7	6.6 Call Processing	6-67
8	6.6.1 Mobile Station Initialization State	6-69
9	6.6.1.1 System Determination Substate	6-71
10	6.6.1.2 Pilot Channel Acquisition Substate	6-71
11	6.6.1.3 Sync Channel Acquisition Substate	6-72
12	6.6.1.4 Timing Change Substate	6-72
13	6.6.2 Mobile Station Idle State	6-73
14	6.6.2.1 Idle Procedures	6-74
15	6.6.2.1.1 Paging Channel Monitoring Procedures	6-74
16	6.6.2.1.1.1 General Overview	6-74
17	6.6.2.1.1.2 Non-Slotted Mode Requirements	6-76
18	6.6.2.1.1.3 Slotted Mode Requirements	6-76
19	6.6.2.1.2 Acknowledgement Procedures	6-77
20	6.6.2.1.3 Registration	6-79
21	6.6.2.1.4 Idle Handoff	6-79
22	6.6.2.1.4.1 Pilot Search	6-79
23	6.6.2.1.4.2 Idle Handoff Procedures	6-80
24	6.6.2.2 Response to Overhead Information Operation	6-81
25	6.6.2.2.1 System Parameters Message	6-82
26	6.6.2.2.1.1 Stored Parameters	6-82
27	6.6.2.2.1.2 Paging Channel Assignment Change	6-84
28	6.6.2.2.1.3 RESCAN Parameter	6-84
29	6.6.2.2.1.4 Roaming Status	6-84
30	6.6.2.2.1.5 Registration	6-84
31	6.6.2.2.2 Access Parameters Message	6-84

CONTENTS

1	6.6.2.2.3 Neighbor List Message	6-85
2	6.6.2.2.4 CDMA Channel List Message	6-86
3	6.6.2.3 Mobile Station Page Match Operation	6-86
4	6.6.2.4 Mobile Station Order and Message Processing Operation	6-87
5	6.6.2.5 Mobile Station Origination Operation	6-89
6	6.6.2.6 Mobile Station Message Transmission Operation	6-89
7	6.6.2.7 Mobile Station Power-Down Operation.....	6-89
8	6.6.3 System Access State	6-90
9	6.6.3.1 Access Procedures.....	6-91
10	6.6.3.1.1 Access Attempts	6-91
11	6.6.3.1.1.1 Overview.....	6-91
12	6.6.3.1.1.2 Requirements	6-96
13	6.6.3.1.2 Acknowledgement Procedures.....	6-98
14	6.6.3.1.3 Registration.....	6-99
15	6.6.3.1.4 Handoffs.....	6-99
16	6.6.3.2 Update Overhead Information Substate.....	6-99
17	6.6.3.3 Page Response Substate.....	6-101
18	6.6.3.4 Mobile Station Order/Message Response Substate	6-103
19	6.6.3.5 Mobile Station Origination Attempt Substate	6-104
20	6.6.3.6 Registration Access Substate.....	6-106
21	6.6.3.7 Mobile Station Message Transmission Substate.....	6-108
22	6.6.4 Mobile Station Control on the Traffic Channel State.....	6-109
23	6.6.4.1 Special Functions and Actions	6-111
24	6.6.4.1.1 Forward Traffic Channel Power Control	6-111
25	6.6.4.1.1.1 Forward Traffic Channel Power Control Initialization.....	6-111
26	6.6.4.1.1.2 Processing the Power Control Parameters Message.....	6-111
27	6.6.4.1.2 Service Options	6-112
28	6.6.4.1.2.1 Overview.....	6-112
29	6.6.4.1.2.2 Requirements	6-112
30	6.6.4.1.2.2.1 Processing the Service Option Request Order	6-112
31	6.6.4.1.2.2.2 Processing the Service Option Response Order	6-113

CONTENTS

1	6.6.4.1.2.2.3 Service Option Request Initialization.....	6-113
2	6.6.4.1.3 Acknowledgement Procedures.....	6-113
3	6.6.4.1.3.1 Messages Requiring Acknowledgement.....	6-114
4	6.6.4.1.3.1.1 Transmitting a Message and Receiving an	
5	Acknowledgement.....	6-114
6	6.6.4.1.3.1.2 Receiving a Message and Returning an	
7	Acknowledgement.....	6-115
8	6.6.4.1.3.2 Messages Not Requiring Acknowledgement.....	6-116
9	6.6.4.1.3.3 Acknowledgement Procedures Reset.....	6-117
10	6.6.4.1.4 Processing the In-Traffic System Parameters Message.....	6-117
11	6.6.4.1.5 Message Action Times.....	6-118
12	6.6.4.2 Traffic Channel Initialization Substate.....	6-118
13	6.6.4.3 Alerting.....	6-120
14	6.6.4.3.1 Waiting for Order Substate.....	6-120
15	6.6.4.3.2 Waiting for Mobile Station Answer Substate.....	6-123
16	6.6.4.4 Conversation Substate.....	6-127
17	6.6.4.5 Release Substate.....	6-131
18	6.6.5 Registration.....	6-133
19	6.6.5.1 Forms of Registration.....	6-133
20	6.6.5.1.1 Power-Up Registration.....	6-135
21	6.6.5.1.2 Power-Down Registration.....	6-135
22	6.6.5.1.3 Timer-Based Registration.....	6-135
23	6.6.5.1.4 Distance-Based Registration.....	6-136
24	6.6.5.1.5 Zone-Based Registration.....	6-136
25	6.6.5.1.6 Parameter-Change Registration.....	6-138
26	6.6.5.1.7 Ordered Registration.....	6-138
27	6.6.5.1.8 Implicit Registration.....	6-138
28	6.6.5.1.9 Traffic Channel Registration.....	6-138
29	6.6.5.2 Systems and Networks.....	6-138
30	6.6.5.3 Roaming MINs.....	6-139
31	6.6.5.4 Registration Messages.....	6-141
32	6.6.5.5 Registration Timers and Indicators.....	6-141

CONTENTS

1	6.6.5.6 Registration Procedures	6-142
2	6.6.5.6.1 Actions in the Mobile Station Initialization State	6-142
3	6.6.5.6.1.1 Power-up or Serving System Change.....	6-142
4	6.6.5.6.1.2 Timer Maintenance	6-142
5	6.6.5.6.1.3 Entering the Mobile Station Idle State	6-142
6	6.6.5.6.2 Actions in the Mobile Station Idle State.....	6-142
7	6.6.5.6.2.1 Idle Registration Procedures.....	6-143
8	6.6.5.6.2.2 Processing the Registration Fields of the	
9	System Parameters Message.....	6-144
10	6.6.5.6.2.3 Ordered Registration.....	6-144
11	6.6.5.6.2.4 Power Down.....	6-145
12	6.6.5.6.3 Actions in the System Access State.....	6-145
13	6.6.5.6.3.1 Successful Access	6-145
14	6.6.5.6.3.2 Unsuccessful Access	6-146
15	6.6.5.6.3.3 Power Down.....	6-146
16	6.6.5.6.4 Actions in the Mobile Station Control on the	
17	Traffic Channel State	6-146
18	6.6.5.6.4.1 Call Initiation	6-146
19	6.6.5.6.4.2 Timer Maintenance	6-147
20	6.6.5.6.4.3 Processing the Mobile Station Registered Message	6-147
21	6.6.5.6.4.4 Power Down.....	6-148
22	6.6.6 Handoff Procedures.....	6-148
23	6.6.6.1 Overview	6-148
24	6.6.6.1.1 Types of Handoff.....	6-148
25	6.6.6.1.2 Pilot Sets	6-149
26	6.6.6.2 Requirements.....	6-149
27	6.6.6.2.1 Pilot Search	6-149
28	6.6.6.2.2 Pilot Strength Measurements.....	6-151
29	6.6.6.2.3 Handoff Drop Timer.....	6-151
30	6.6.6.2.4 Pilot PN Phase	6-152
31	6.6.6.2.5 Handoff Messages.....	6-152
32	6.6.6.2.5.1 Processing of Forward Traffic Channel Handoff Messages.....	6-152

CONTENTS

1	6.6.6.2.5.2 Processing of Reverse Traffic Channel Handoff Messages.....	6-153
2	6.6.6.2.6 Set Maintenance.....	6-153
3	6.6.6.2.6.1 Maintenance of the Active Set	6-153
4	6.6.6.2.6.2 Maintenance of the Candidate Set	6-154
5	6.6.6.2.6.3 Maintenance of the Neighbor Set.....	6-154
6	6.6.6.2.7 Soft Handoff.....	6-155
7	6.6.6.2.7.1 Forward Traffic Channel Processing	6-155
8	6.6.6.2.7.2 Reverse Traffic Channel Power Control During Soft Handoff	6-155
9	6.6.6.2.7.3 Timing During Soft Handoff.....	6-156
10	6.6.6.2.8 CDMA to CDMA Hard Handoff	6-156
11	6.6.6.2.9 CDMA to Analog Handoff	6-156
12	6.6.6.3 Examples	6-156
13	6.6.7 Hash Functions and Randomization.....	6-158
14	6.6.7.1 Hash Function.....	6-158
15	6.6.7.2 Pseudorandom Number Generator	6-159
16	6.7 Signaling Formats.....	6-161
17	6.7.1 Access Channel	6-161
18	6.7.1.1 Access Channel Structure.....	6-161
19	6.7.1.2 Access Channel Message Structure.....	6-164
20	6.7.1.2.1 Access Channel MSG_LENGTH Field.....	6-165
21	6.7.1.2.2 Access Channel Message CRC.....	6-165
22	6.7.1.3 Access Channel Message Body Format.....	6-167
23	6.7.1.3.1 Common Fields.....	6-167
24	6.7.1.3.1.1 Common Fields	6-167
25	6.7.1.3.1.2 Common Authentication Fields	6-168
26	6.7.1.3.2 Message Body Contents	6-168
27	6.7.1.3.2.1 Initial Registration Message.....	6-169
28	6.7.1.3.2.2 Order Message	6-173
29	6.7.1.3.2.3 Data Burst Message	6-175
30	6.7.1.3.2.4 Origination Message.....	6-178
31	6.7.1.3.2.5 Page Response Message.....	6-184

CONTENTS

1	6.7.1.3.2.6 Registration Update Message	6-186
2	6.7.1.3.2.7 Authentication Challenge Response Message	6-189
3	6.7.2 Reverse Traffic Channel	6-191
4	6.7.2.1 Reverse Traffic Channel Structure	6-191
5	6.7.2.2 Reverse Traffic Channel Message Structure	6-191
6	6.7.2.2.1 Reverse Traffic Channel MSG_LENGTH Field	6-192
7	6.7.2.2.2 Reverse Traffic Channel Signaling Message CRC	6-192
8	6.7.2.3 Reverse Traffic Channel Message Body Format	6-194
9	6.7.2.3.1 Common Fields	6-194
10	6.7.2.3.1.1 Common Acknowledgement Fields	6-194
11	6.7.2.3.1.2 Common Encryption Field	6-195
12	6.7.2.3.2 Message Body Contents	6-195
13	6.7.2.3.2.1 Order Message	6-196
14	6.7.2.3.2.2 Authentication Challenge Response Message	6-198
15	6.7.2.3.2.3 Flash With Information Message	6-199
16	6.7.2.3.2.4 Data Burst Message	6-201
17	6.7.2.3.2.5 Pilot Strength Measurement Message	6-203
18	6.7.2.3.2.6 Power Measurement Report Message	6-205
19	6.7.2.3.2.7 Send Burst DTMF Message	6-207
20	6.7.2.3.2.8 Status Message	6-210
21	6.7.2.3.2.9 Origination Continuation Message	6-212
22	6.7.2.3.2.10 Handoff Completion Message	6-214
23	6.7.2.3.2.11 Parameters Response Message	6-216
24	6.7.3 Orders	6-218
25	6.7.3.1 Base Station Challenge Order	6-221
26	6.7.3.2 Service Option Request Order	6-222
27	6.7.3.3 Service Option Response Order	6-223
28	6.7.3.4 Mobile Station Reject Order	6-224
29	6.7.4 Reverse Traffic Channel Information Records	6-225
30	6.7.4.1 Feature Indicator	6-226
31	6.7.4.2 Keypad Facility	6-227

CONTENTS

1	6.7.4.3 Called Party Number	6-228
2	6.7.4.4 Calling Party Number	6-229
3	6.7.4.5 Identification	6-231
4	6.7.4.6 Call Mode	6-232
5	6.7.4.7 Terminal Information	6-233
6	6.7.4.8 MIN Information	6-235
7	6.7.4.9 Security Status.....	6-237
8	6.7.4.10 Connected Number.....	6-238
9		
10	7 REQUIREMENTS FOR BASE STATION CDMA OPERATION.....	7-1
11	7.1 Transmitter.....	7-1
12	7.1.1 Frequency Parameters.....	7-1
13	7.1.1.1 Channel Spacing and Designation	7-1
14	7.1.1.2 Frequency Tolerance.....	7-1
15	7.1.2 Power Output Characteristics.....	7-1
16	7.1.3 Modulation Characteristics.....	7-1
17	7.1.3.1 Forward CDMA Channel Signals.....	7-1
18	7.1.3.1.1 Modulation Parameters.....	7-3
19	7.1.3.1.2 Data Rates	7-5
20	7.1.3.1.3 Convolutional Encoding	7-5
21	7.1.3.1.4 Code Symbol Repetition	7-5
22	7.1.3.1.5 Block Interleaving	7-6
23	7.1.3.1.6 Data Scrambling.....	7-12
24	7.1.3.1.7 Power Control Subchannel.....	7-12
25	7.1.3.1.8 Orthogonal Covering	7-15
26	7.1.3.1.9 Quadrature Spreading	7-18
27	7.1.3.1.10 Filtering.....	7-19
28	7.1.3.1.10.1 Baseband Filtering	7-19
29	7.1.3.1.10.2 Phase Characteristics.....	7-22
30	7.1.3.2 Pilot Channel.....	7-22
31	7.1.3.2.1 Pilot PN Sequence Offset	7-22

CONTENTS

1	7.1.3.2.2 Pilot Channel Walsh Covering.....	7-24
2	7.1.3.2.3 Pilot Channel Quadrature Spreading	7-24
3	7.1.3.2.4 Pilot Channel Filtering.....	7-24
4	7.1.3.3 Sync Channel.....	7-24
5	7.1.3.3.1 Sync Channel Time Alignment and Modulation Rates	7-24
6	7.1.3.3.2 Sync Channel Convolutional Encoding	7-24
7	7.1.3.3.3 Sync Channel Code Symbol Repetition.....	7-24
8	7.1.3.3.4 Sync Channel Interleaver.....	7-24
9	7.1.3.3.5 Sync Channel Data Scrambling	7-24
10	7.1.3.3.6 Sync Channel Power Control Subchannel	7-25
11	7.1.3.3.7 Sync Channel Walsh Covering.....	7-25
12	7.1.3.3.8 Sync Channel Quadrature Spreading	7-25
13	7.1.3.3.9 Sync Channel Filtering	7-25
14	7.1.3.3.10 Sync Channel Structure	7-25
15	7.1.3.4 Paging Channel	7-25
16	7.1.3.4.1 Paging Channel Time Alignment and Modulation Rates.....	7-25
17	7.1.3.4.2 Paging Channel Convolutional Encoding.....	7-26
18	7.1.3.4.3 Paging Channel Code Symbol Repetition.....	7-26
19	7.1.3.4.4 Paging Channel Interleaving	7-26
20	7.1.3.4.5 Paging Channel Data Scrambling	7-26
21	7.1.3.4.6 Paging Channel Power Control Subchannel	7-26
22	7.1.3.4.7 Paging Channel Walsh Covering	7-26
23	7.1.3.4.8 Paging Channel Quadrature Spreading.....	7-26
24	7.1.3.4.9 Paging Channel Filtering.....	7-26
25	7.1.3.4.10 Paging Channel Structure	7-27
26	7.1.3.5 Forward Traffic Channel.....	7-27
27	7.1.3.5.1 Forward Traffic Channel Time Alignment and Modulation Rates	7-27
28	7.1.3.5.2 Forward Traffic Channel Convolutional Encoding	7-28
29	7.1.3.5.3 Forward Traffic Channel Code Symbol Repetition.....	7-28
30	7.1.3.5.4 Forward Traffic Channel Interleaving.....	7-28
31	7.1.3.5.5 Forward Traffic Channel Data Scrambling	7-28

CONTENTS

1	7.1.3.5.6 Forward Traffic Channel Power Control Subchannel.....	7-29
2	7.1.3.5.7 Forward Traffic Channel Walsh Covering.....	7-29
3	7.1.3.5.8 Forward Traffic Channel Quadrature Spreading.....	7-29
4	7.1.3.5.9 Forward Traffic Channel Filtering.....	7-29
5	7.1.3.5.10 Forward Traffic Channel Frame Structure.....	7-29
6	7.1.3.5.10.1 Forward Traffic Channel Frame Quality Indicator.....	7-31
7	7.1.3.5.10.2 Forward Traffic Channel Encoder Tail Bits.....	7-33
8	7.1.3.5.10.3 Reserved.....	7-33
9	7.1.3.5.10.4 Null Traffic Channel Data.....	7-33
10	7.1.3.5.11 Multiplex Option 1 Information Bits.....	7-33
11	7.1.3.5.11.1 Primary and Signaling Traffic with Multiplex Option 1.....	7-34
12	7.1.3.5.11.2 Secondary Traffic with Multiplex Option 1.....	7-37
13	7.1.3.5.11.3 Use of Various Information Bit Formats.....	7-38
14	7.1.3.5.11.4 Control of Service Options.....	7-38
15	7.1.4 Limitations on Emissions.....	7-38
16	7.1.4.1 Bandwidth Occupied.....	7-38
17	7.1.4.2 Conducted Spurious Emissions.....	7-38
18	7.1.4.3 Radiated Spurious Emissions.....	7-38
19	7.1.4.4 Intermodulation.....	7-39
20	7.1.5 Synchronization, Timing, and Phase.....	7-39
21	7.1.5.1 Timing Reference Source.....	7-39
22	7.1.5.2 Base Station Transmission Time.....	7-39
23	7.1.5.3 Pilot to Walsh Cover Time Tolerance.....	7-40
24	7.1.5.4 Pilot to Walsh Cover Phase Tolerance.....	7-40
25	7.2 Receiver.....	7-40
26	7.2.1 Frequency Parameters.....	7-40
27	7.2.1.1 Channel Spacing and Designation.....	7-40
28	7.2.2 Demodulation Characteristics.....	7-40
29	7.2.3 Limitations on Emissions.....	7-40
30	7.2.4 Receiver Performance Requirements.....	7-40
31	7.3 Security and Identification.....	7-40

CONTENTS

1	7.3.1 Authentication.....	7-40
2	7.3.2 Encryption.....	7-41
3	7.3.3 Voice Privacy.....	7-41
4	7.4 Supervision	7-41
5	7.4.1 Access Channel.....	7-41
6	7.4.2 Reverse Traffic Channel	7-41
7	7.5 Malfunction Detection	7-41
8	7.6 Call Processing	7-43
9	7.6.1 Pilot and Sync Channel Processing	7-43
10	7.6.1.1 Primary and Secondary CDMA Channels.....	7-43
11	7.6.1.2 Pilot Channel Operation	7-43
12	7.6.1.3 Sync Channel Operation	7-44
13	7.6.2 Paging Channel Processing	7-44
14	7.6.2.1 Paging Channel Procedures.....	7-44
15	7.6.2.1.1 CDMA Channel Determination	7-44
16	7.6.2.1.2 Paging Channel Determination	7-44
17	7.6.2.1.3 Paging Slot Determination	7-45
18	7.6.2.1.4 Message Transmission and Acknowledgement Procedures	7-45
19	7.6.2.2 Overhead Information.....	7-46
20	7.6.2.3 Mobile Station Directed Messages.....	7-47
21	7.6.3 Access Channel Processing	7-48
22	7.6.3.1 Access Channel Procedures.....	7-48
23	7.6.3.1.1 Message Reception and Acknowledgement Procedures.....	7-48
24	7.6.3.2 Reserved	7-50
25	7.6.3.3 Response to Page Response Message	7-50
26	7.6.3.4 Response to Orders	7-50
27	7.6.3.5 Response to Origination Message	7-50
28	7.6.3.6 Response to Initial Registration Message or	
29	Registration Update Message	7-51
30	7.6.3.7 Response to Data Burst Message.....	7-51
31	7.6.4 Traffic Channel Processing.....	7-51

CONTENTS

1 7.6.4.1 Special Functions and Actions..... 7-51

2 7.6.4.1.1 Forward Traffic Channel Power Control..... 7-51

3 7.6.4.1.2 Service Options..... 7-52

4 7.6.4.1.2.1 Overview 7-52

5 7.6.4.1.2.2 Requirements..... 7-52

6 7.6.4.1.2.2.1 Processing Service Option Requests..... 7-52

7 7.6.4.1.2.2.2 Processing the Service Option Response Order..... 7-53

8 7.6.4.1.2.2.3 Service Option Request Initialization..... 7-53

9 7.6.4.1.3 Acknowledgement Procedures 7-53

10 7.6.4.1.3.1 Messages Requiring Acknowledgement 7-54

11 7.6.4.1.3.1.1 Transmitting a Message and Receiving an

12 Acknowledgement 7-54

13 7.6.4.1.3.1.2 Receiving a Message and Returning an

14 Acknowledgement 7-55

15 7.6.4.1.3.2 Messages not Requiring Acknowledgement..... 7-55

16 7.6.4.1.3.3 Acknowledgement Procedures Reset..... 7-56

17 7.6.4.1.4 Message Action Times 7-56

18 7.6.4.1.5 Long Code Transition Procedures..... 7-57

19 7.6.4.2 Traffic Channel Initialization Substate 7-57

20 7.6.4.3 Alerting 7-58

21 7.6.4.3.1 Waiting for Order Substate 7-58

22 7.6.4.3.2 Waiting for Answer Substate 7-60

23 7.6.4.4 Conversation Substate..... 7-62

24 7.6.4.5 Release Substate 7-64

25 7.6.5 Registration..... 7-65

26 7.6.5.1 Registration on the Paging and Access Channels..... 7-66

27 7.6.5.2 Registration on the Traffic Channels..... 7-66

28 7.6.6 Handoff Procedures 7-66

29 7.6.6.1 Overview..... 7-66

30 7.6.6.1.1 Types of Handoff..... 7-66

31 7.6.6.1.2 The Active Set 7-67

32 7.6.6.2 Requirements 7-67

CONTENTS

1	7.6.6.2.1 Overhead Information.....	7-67
2	7.6.6.2.1.1 System Parameters	7-67
3	7.6.6.2.1.2 Neighbor List	7-67
4	7.6.6.2.2 Call Processing During Handoff	7-68
5	7.6.6.2.2.1 Processing the Pilot Strength Measurement Message.....	7-68
6	7.6.6.2.2.2. Processing the Handoff Direction Message	7-68
7	7.6.6.2.2.3 Transmitting During Handoff.....	7-69
8	7.6.6.2.2.4 Ordering Pilot Measurements From the Mobile Station.....	7-69
9	7.6.6.2.3 Active Set Maintenance	7-69
10	7.6.6.2.4 Soft Handoff	7-69
11	7.6.6.2.4.1 Receiving During Soft Handoff	7-70
12	7.6.6.2.4.2 Transmitting During Soft Handoff.....	7-70
13	7.6.6.2.5 CDMA to Analog Hard Handoff	7-70
14	7.7 Signaling Formats.....	7-71
15	7.7.1 Sync Channel	7-71
16	7.7.1.1 Sync Channel Structure.....	7-71
17	7.7.1.2 Sync Channel Message Structure	7-73
18	7.7.1.2.1 Sync Channel MSG_LENGTH Field	7-73
19	7.7.1.2.2 Sync Channel Signaling Message CRC.....	7-73
20	7.7.1.3 Sync Channel Message Body Format	7-75
21	7.7.2 Paging Channel.....	7-78
22	7.7.2.1 Paging Channel Structure	7-78
23	7.7.2.1.1 Paging Channel Slot Structure	7-78
24	7.7.2.1.2 Paging Channel Message Capsule Structure	7-80
25	7.7.2.2 Paging Channel Message Structure.....	7-81
26	7.7.2.2.1 Paging Channel MSG_LENGTH Field	7-81
27	7.7.2.2.2 Paging Channel Message CRC	7-81
28	7.7.2.3 Paging Channel Message Body Format	7-83
29	7.7.2.3.1 Reserved.....	7-83
30	7.7.2.3.2 Message Body Contents.....	7-83
31	7.7.2.3.2.1 System Parameters Message	7-84

CONTENTS

1	7.7.2.3.2.2 Access Parameters Message	7-91
2	7.7.2.3.2.3 Neighbor List Message.....	7-96
3	7.7.2.3.2.4 CDMA Channel List Message.....	7-98
4	7.7.2.3.2.5 Slotted Page Message	7-100
5	7.7.2.3.2.6 Page Message	7-102
6	7.7.2.3.2.7 Mobile Station Directed Order Message	7-104
7	7.7.2.3.2.8 Channel Assignment Message	7-106
8	7.7.2.3.2.9 Data Burst Message	7-112
9	7.7.2.3.2.10 Authentication Challenge Message	7-115
10	7.7.2.3.2.11 SSD Update Message	7-117
11	7.7.2.3.2.12 Null Message.....	7-119
12	7.7.3 Forward Traffic Channel.....	7-120
13	7.7.3.1 Forward Traffic Channel Structure.....	7-120
14	7.7.3.2 Forward Traffic Channel Message Structure	7-124
15	7.7.3.2.1 Forward Traffic Channel MSG_LENGTH Field.....	7-124
16	7.7.3.2.2 Forward Traffic Channel Signaling Message CRC	7-124
17	7.7.3.3 Forward Traffic Channel Message Body Formats	7-126
18	7.7.3.3.1 Common Fields.....	7-126
19	7.7.3.3.1.1 Common Acknowledgement Fields.....	7-126
20	7.7.3.3.1.2 Common Encryption Field.....	7-127
21	7.7.3.3.2 Message Body Contents	7-128
22	7.7.3.3.2.1 Order Message	7-128
23	7.7.3.3.2.2 Authentication Challenge Message	7-130
24	7.7.3.3.2.3 Alert With Information Message.....	7-131
25	7.7.3.3.2.4 Data Burst Message	7-133
26	7.7.3.3.2.5 Handoff Direction Message	7-135
27	7.7.3.3.2.6 Analog Handoff Direction Message.....	7-139
28	7.7.3.3.2.7 In-Traffic System Parameters Message	7-141
29	7.7.3.3.2.8 Neighbor List Update Message.....	7-144
30	7.7.3.3.2.9 Send Burst DTMF Message	7-146
31	7.7.3.3.2.10 Power Control Parameters Message	7-148

CONTENTS

1	7.7.3.3.2.11 Retrieve Parameters Message	7-150
2	7.7.3.3.2.12 Set Parameters Message	7-151
3	7.7.3.3.2.13 SSD Update Message	7-153
4	7.7.3.3.2.14 Flash With Information Message	7-154
5	7.7.3.3.2.15 Mobile Station Registered Message.....	7-156
6	7.7.4 Orders	7-158
7	7.7.4.1 Abbreviated Alert Order.....	7-162
8	7.7.4.2 Base Station Challenge Confirmation Order.....	7-163
9	7.7.4.3 Service Option Request Order.....	7-164
10	7.7.4.4 Service Option Response Order	7-165
11	7.7.4.5 Release Order.....	7-166
12	7.7.4.6 Status Request Order	7-167
13	7.7.4.7 Added MIN Rejected Order.....	7-169
14	7.7.4.8 Message Waiting Order.....	7-170
15	7.7.5 Forward Traffic Channel Information Records	7-171
16	7.7.5.1 Display	7-172
17	7.7.5.2 Called Party Number	7-173
18	7.7.5.3 Calling Party Number	7-174
19	7.7.5.4 Connected Number.....	7-176
20	7.7.5.5 Signal.....	7-178
21		
22	APPENDIX A REQUIREMENTS FOR CDMA SERVICE OPTIONS.....	A-1
23	A.1 Service Option 1: Variable Data Rate Two-Way Voice	A-1
24	A.1.1 General Description	A-1
25	A.1.2 Service Option Number	A-1
26	A.1.3 Multiplex Option.....	A-2
27	A.1.3.1 Required Multiplex Option	A-2
28	A.1.3.2 Interface to Multiplex Option 1	A-2
29	A.1.3.2.1 Transmitted Traffic Channel Frames	A-2
30	A.1.3.2.2 Received Traffic Channel Frames.....	A-3
31	A.1.3.3 Connection and Initialization.....	A-3

CONTENTS

1	A.1.3.4 Service Option Control Orders	A-4
2	A.1.3.5 Service Option Negotiation.....	A-4
3	A.1.4 Variable Rate Speech Coding Algorithm.....	A-4
4	A.1.4.1 Introduction	A-4
5	A.1.4.2 Input Audio Interface.....	A-8
6	A.1.4.2.1 Input Audio Interface in the Mobile Station.....	A-8
7	A.1.4.2.1.1 Conversion and Scaling.....	A-8
8	A.1.4.2.1.2 Digital Audio Input	A-9
9	A.1.4.2.1.3 Analog Audio Input.....	A-9
10	A.1.4.2.1.3.1 Transmit Level Adjustment.....	A-9
11	A.1.4.2.1.3.2 Band Pass Filtering	A-9
12	A.1.4.2.1.3.3 Echo Return Loss.....	A-9
13	A.1.4.2.2 Input Audio Interface in the Base Station.....	A-10
14	A.1.4.2.2.1 Sampling and Format Conversion	A-10
15	A.1.4.2.2.2 Transmit Level Adjust	A-10
16	A.1.4.2.2.3 Echo Canceling.....	A-10
17	A.1.4.3 Determining the Formant Prediction Parameters.....	A-10
18	A.1.4.3.1 Form of the Formant Synthesis Filter.....	A-10
19	A.1.4.3.2 Encoding	A-11
20	A.1.4.3.2.1 Removing the DC Component	A-11
21	A.1.4.3.2.2 Windowing the Samples	A-11
22	A.1.4.3.2.3 Computing the Autocorrelation Function.....	A-12
23	A.1.4.3.2.4 Determining the LPC Coefficients from the	
24	Autocorrelation Function.....	A-12
25	A.1.4.3.2.5 Expanding the Bandwidth.....	A-13
26	A.1.4.3.2.6 Transforming the LPC Coefficients to	
27	Line Spectrum Pairs (LSP)	A-13
28	A.1.4.3.2.7 Converting the LSP Frequencies to Transmission Codes.....	A-14
29	A.1.4.3.3 Decoding	A-17
30	A.1.4.3.3.1 Converting the LSP Transmission Codes to LSP Frequencies	A-17
31	A.1.4.3.3.2 Checking the Stability of the LSP Frequencies.....	A-18
32	A.1.4.3.3.3 Low-Pass Filtering the LSP Frequencies	A-19

CONTENTS

1	A.1.4.3.3.4 Interpolating the LSP Frequencies.....	A-20
2	A.1.4.3.3.5 Converting the Interpolated LSP Frequencies to	
3	LPC Coefficients	A-21
4	A.1.4.4 Determining the Data Rate.....	A-22
5	A.1.4.4.1 Threshold Comparing	A-22
6	A.1.4.4.2 Updating Thresholds	A-22
7	A.1.4.5 Determining the Pitch Prediction Parameters.....	A-23
8	A.1.4.5.1 Encoding.....	A-23
9	A.1.4.5.1.1 Computing the Pitch Lag and Pitch Gain.....	A-25
10	A.1.4.5.1.2 Implementing the Pitch Search Convolutions.....	A-26
11	A.1.4.5.1.3 Converting the Pitch Gain and Pitch Lag to the	
12	Transmission Codes	A-27
13	A.1.4.5.2 Decoding.....	A-27
14	A.1.4.6 Determining the Codebook Parameters.....	A-27
15	A.1.4.6.1 Encoding.....	A-27
16	A.1.4.6.1.1 Computing the Codebook Index and Codebook Gain.....	A-30
17	A.1.4.6.1.2 Implementing the Codebook Search Convolutions.....	A-31
18	A.1.4.6.1.3 Converting Codebook Parameters into Transmission Codes	A-32
19	A.1.4.6.1.3.1 Converting Codebook Parameters for All Rates Except 1/8.....	A-32
20	A.1.4.6.1.3.2 Converting Codebook Parameters for Rate 1/8.....	A-36
21	A.1.4.6.2 Decoding.....	A-38
22	A.1.4.6.2.1 Converting Codebook Transmission Codes for	
23	All Rates Except 1/8	A-38
24	A.1.4.6.2.2 Converting Codebook Transmission Codes for Rate 1/8.....	A-40
25	A.1.4.7 Data Packing	A-41
26	A.1.4.7.1 Rate 1 Parity Check Bits and Packing.....	A-41
27	A.1.4.7.1.1 Parity Check Bits.....	A-41
28	A.1.4.7.1.2 Rate 1 Packing.....	A-43
29	A.1.4.7.2 Rate 1/2 Packing	A-45
30	A.1.4.7.3 Rate 1/4 Packing	A-46
31	A.1.4.7.4 Rate 1/8 Packing	A-46
32	A.1.4.8 Decoding at the Transmitting Vocoder and the Receiving Vocoder.....	A-47

CONTENTS

1	A.1.4.8.1 Generating the Scaled Codebook Vector.....	A-48
2	A.1.4.8.1.1 Generating the Scaled Codebook Vector for	
3	All Rates Except Rate 1/8.....	A-48
4	A.1.4.8.1.2 Generating the Scaled Codebook Vector for Rate 1/8	A-48
5	A.1.4.8.2 Generating the Pitch Filter Output.....	A-49
6	A.1.4.8.3 Generating the Formant Filter Output	A-49
7	A.1.4.8.4 Updating the Memories of $W(z)$ in the Transmitting Vocoder.....	A-49
8	A.1.4.8.5 The Adaptive Postfilter in the Receiving Vocoder.....	A-50
9	A.1.4.8.6 Special Cases	A-51
10	A.1.4.8.6.1 Insufficient Frame Quality (Erased) Packets	A-51
11	A.1.4.8.6.2 Rate 1 Packets	A-52
12	A.1.4.8.6.3 Rate 1 Packets with Probable Bit Errors.....	A-52
13	A.1.4.8.6.4 Blanked Packets	A-53
14	A.1.4.8.6.5 All Ones Rate 1/8 Packets	A-53
15	A.1.4.9 Vocoder Initialization.....	A-53
16	A.1.4.10 Output Audio Interface.....	A-53
17	A.1.4.10.1 Output Audio Interface in the Mobile Station	A-53
18	A.1.4.10.1.1 Digital Audio Output.....	A-54
19	A.1.4.10.1.2 Analog Audio Output	A-54
20	A.1.4.10.1.2.1 Band Pass Filtering	A-54
21	A.1.4.10.1.2.2 Receive Level Adjustment	A-54
22	A.1.4.10.2 Output Audio Interface in the Base Station.....	A-54
23	A.1.4.10.2.1 Digital Audio Output.....	A-54
24	A.1.4.10.2.1.1 Reserved	A-54
25	A.1.4.10.2.1.2 Reserved	A-55
26	A.1.4.10.2.1.3 Receive Level Adjustment	A-55
27	A.1.4.11 Summary of Encoding and Decoding	A-56
28	A.1.4.11.1 Encoding Summary	A-56
29	A.1.4.11.2 Decoding Summary.....	A-58
30	A.1.4.12 Allowable Delays.....	A-62
31	A.1.4.12.1 Allowable Transmitting Vocoder Encoding Delay	A-62

CONTENTS

1 A.1.4.12.2 Allowable Receiving Vocoder Decoding Delay A-62

2 A.1.4.13 Summary of Service Option 1 Notation..... A-62

3

4 **APPENDIX B CDMA CALL FLOW EXAMPLES..... B-1**

5

6 **APPENDIX C CDMA SYSTEM LAYERING C-1**

7

8 **APPENDIX D CDMA CONSTANTS..... D-1**

9

10 **APPENDIX E CDMA RETRIEVABLE AND SETTABLE PARAMETERS E-1**

11

12 **APPENDIX F MOBILE STATION DATABASE F-1**

13 **F.1 Introduction F-1**

14 **F.2 Mobile Station Indicators..... F-2**

15 **F.2.1 Permanent Mobile Station Indicators..... F-2**

16 **F.2.2 Semi-permanent Mobile Station Indicators..... F-3**

17 **F.3 NAM Indicators..... F-4**

18 **F.4 MIN Indicators..... F-5**

FIGURES

1	1.2-1	System Time Line	1-47
2	2.3.12.1.1-1	Partitioning of SSD	2-14
3	2.3.12.1.4-1	Computation of AUTHR for Authentication of Mobile Station	
4		Registrations	2-16
5	2.3.12.1.5-1	Computation of AUTHU for Unique Challenge-Response	
6		Procedure	2-17
7	2.3.12.1.6-1	Computation of AUTHR for Authentication of Mobile Station	
8		Originations	2-18
9	2.3.12.1.7-1	Computation of AUTHR for Authentication of Mobile Station	
10		Terminations	2-20
11	2.3.12.1.8-1	SSD Update Message Flow.....	2-22
12	2.3.12.1.8-2	Computation of Shared Secret Data (SSD)	2-23
13	2.3.12.1.8-3	Computation of AUTHBS	2-23
14	2.7.1-1	Reverse Analog Control Channel Message Stream	
15		(Mobile-to-Base)	2-55
16	2.7.2-1	RVC Message Stream (Mobile-to-Base).....	2-64
17	3.7.1-1	Forward Analog Control Channel Message Stream	
18		(Base-to-Mobile)	3-19
19	3.7.2-1	Forward Analog Voice Channel Message Stream	
20		(Base-to-Mobile)	3-45
21	4.1.2.1-1	Reverse Control Channel Message Stream	
22		(Mobile-to-Base)	4-3
23	4.1.3-1	Reverse Analog Voice Channel Message Stream	
24		(Mobile-to-Base)	4-8
25	6.1.2.2.2-1	Transmission Envelope Mask	
26		(Single Gated-on Power Control Group).....	6-4
27	6.1.2.4.1-1	Open Loop Power Transition Mask.....	6-8
28	6.1.3.1-1	Example of Logical Reverse CDMA Channels Received	
29		at a Base Station.....	6-9
30	6.1.3.1-2	Reverse CDMA Channel Modulation Process.....	6-9
31	6.1.3.1.3-1	K = 9, Rate 1/3 Convolutional Encoder.....	6-13
32	6.1.3.1.7.1-1	Reverse CDMA Channel Variable Data Rate Transmission Example...	6-22
33	6.1.3.1.7.1-2	Access Channel Transmission Structure.....	6-23
34	6.1.3.1.8-1	Long Code Generator	6-25

FIGURES

1	6.1.3.1.8-2	Long Code Mask Format	6-26
2	6.1.3.1.9-1	Reverse CDMA Channel Signal Constellation and Phase Transition	6-28
3	6.1.3.1.10-1	Baseband Filters Frequency Response Limits	6-29
4	6.1.3.2.10-1	Access Channel Frame Structure	6-32
5	6.1.3.3.10-1	Reverse Traffic Channel Frame Structure	6-34
6	6.1.3.3.10.1-1	Reverse Traffic Channel Frame Quality Indicator Calculation at the	
7		9600bps Rate	6-36
8	6.1.3.3.10.1-2	Reverse Traffic Channel Frame Quality Indicator Calculation at the	
9		4800bps Rate	6-36
10	6.1.3.3.11.1-1	Information Bits for Primary Traffic and Signaling Traffic	6-39
11	6.1.3.3.11.2-1	Information Bits for Secondary Traffic	6-41
12	6.3.12.1.4-1	Computation of AUTHR for Authentication of	
13		Mobile Station Registrations.....	6-49
14	6.3.12.1.5-1	Computation of AUTHU for the Unique Challenge-Response	
15		Procedure	6-50
16	6.3.12.1.6-1	Computation of AUTHR for Authentication of	
17		Mobile Station Originations.....	6-51
18	6.3.12.1.7-1	Computation of AUTHR for Authentication of	
19		Mobile Station Terminations.....	6-52
20	6.3.12.1.8-1	Computation of AUTHR for Authentication of	
21		Mobile Station Data Bursts	6-53
22	6.3.12.1.9-1	Computation of Shared Secret Data (SSD)	6-55
23	6.3.12.1.9-2	Computation of AUTHBS.....	6-55
24	6.6-1	Mobile Station Call Processing States.....	6-68
25	6.6.1-1	Mobile Station Initialization State.....	6-70
26	6.6.1.4-1	Mobile Station Internal Timing.....	6-73
27	6.6.2.1.1.1-1	Mobile Station Idle Slotted Mode Structure Example	6-75
28	6.6.2.1.2-1	Time Interval for Duplicate Message Detection.....	6-79
29	6.6.3-1	System Access State.....	6-90
30	6.6.3.1.1.1-1	Access Channel Request and Response Attempts	6-93
31	6.6.3.1.1.1-2	Access Procedure	6-95
32	6.6.4-1	Mobile Station Control on the Traffic Channel State	6-110
33	6.6.4.1.3.1.1-1	Time Limit for Acknowledgement.....	6-115

FIGURES

1	6.6.4.1.3.1.2-1	Time Limit for Acknowledgement	6-116
2	6.6.4.1.3.2-1	Time Window for Detecting Duplicate Messages not Requiring	
3		Acknowledgement.....	6-117
4	6.6.5.2-1	Systems and Networks Example	6-139
5	6.6.6.3-1	Handoff Threshold Example.....	6-157
6	6.6.6.3-2	Pilot Strength Measurements Triggered by a Candidate Pilot.....	6-158
7	6.7.1.1-1	Example of Access Channel Slot Structure	6-162
8	6.7.1.1-2	Access Channel Structure	6-163
9	6.7.1.2-1	Access Channel Message Structure.....	6-164
10	6.7.1.2.2-1	Access Channel CRC Calculation.....	6-166
11	6.7.2.2-1	Reverse Traffic Channel Message Structure	6-191
12	6.7.2.2.2-1	Reverse Traffic Channel Signaling CRC Calculation	6-193
13	7.1.3.1-1	Forward CDMA Channel Structure	7-2
14	7.1.3.1-2	Example of a Forward CDMA Channel Transmitted by a	
15		Base Station.....	7-3
16	7.1.3.1.3-1	K = 9, Rate 1/2 Convolutional Encoder.....	7-5
17	7.1.3.1.6-1	Data Scrambler Function and Timing	7-12
18	7.1.3.1.7-1	Power Control Sub-Channel Structure and Puncturing.....	7-14
19	7.1.3.1.7-2	Randomization of Power Control Bit Positions.....	7-15
20	7.1.3.1.9-1	Forward CDMA Channel Signal Constellation and	
21		Phase Transition	7-19
22	7.1.3.1.10.1-1	Baseband Filters Frequency Response Limits.....	7-20
23	7.1.3.2.1-1	Forward CDMA Channel Pilot PN Sequence Offset	7-23
24	7.1.3.4.5-1	Paging Channel Long Code Mask.....	7-26
25	7.1.3.5.5-1	Forward Traffic Channel Long Code Mask.....	7-28
26	7.1.3.5.10-1	Forward Traffic Channel Frame Structure.....	7-30
27	7.1.3.5.10.1-1	Forward Traffic Channel Frame Quality Indicator Calculation	
28		at the 9600bps Rate	7-32
29	7.1.3.5.10.1-2	Forward Traffic Channel Frame Quality Indicator Calculation	
30		at the 4800bps Rate	7-32
31	7.1.3.5.11.1-1	Information Bits for Primary Traffic and Signaling Traffic.....	7-35
32	7.1.3.5.11.2-1	Information Bits for Secondary Traffic.....	7-37
33	7.6.2.1.4-1	MSG_SEQ Reuse	7-46

FIGURES

1	7.6.4.1.3.2-1	Time Requirement for the Base Station Not to Reuse a MSG_SEQ Number.....	7-56
2			
3	7.7.1.1-1	Sync Channel Structure (1200 bps) Example.....	7-72
4	7.7.1.2.2-1	Sync Channel CRC Calculation	7-74
5	7.7.2.1.1-1	Paging Channel Structure Example	7-79
6	7.7.2.2.2-1	Paging Channel CRC Calculation	7-82
7	7.7.3.1-1A	Forward Traffic Channel Structure - Blank-and-Burst at 9600 bps .	7-121
8	7.7.3.1-1B	Forward Traffic Channel Structure - Dim-and-Burst at 9600 bps	7-122
9	7.7.3.1-1C	Forward Traffic Channel Structure - Mixed Dim-and-Burst and Blank-and-Burst at 9600 bps.....	7-123
10			
11	7.7.3.2.2-1	Forward Traffic Channel Signaling CRC Calculation	7-125
12	A.1.4.1-1	Speech Synthesis Structure in the Receiving Vocoder.....	A-5
13	A.1.4.1-2	Rate 1 Bit Allocation for a Vocoder Frame.....	A-7
14	A.1.4.1-3	Rate 1/2 Bit Allocation for a Vocoder Frame.....	A-7
15	A.1.4.1-4	Rate 1/4 Bit Allocation for a Vocoder Frame.....	A-7
16	A.1.4.1-5	Rate 1/8 Bit Allocation for a Vocoder Frame.....	A-7
17	A.1.4.3.2.7-1	Converting the LSP Frequencies to Transmission Codes	A-15
18	A.1.4.3.3.1-1	Converting the LSP Transmission Codes to LSP Frequencies	A-18
19	A.1.4.5.1-1	Analysis-by-Synthesis Procedure for the Pitch Parameter Search	A-24
20			
21	A.1.4.6.1-1	Analysis-by-Synthesis Procedure for Codebook Parameter.....	A-29
22	A.1.4.6.1.3.1-1	Converting Codebook Parameter.....	A-32
23	A.1.4.6.1.3.2-1	Converting Codebook Parameter.....	A-36
24	A.1.4.6.2.1-1	Converting Codebook Transmission Codes for All Rates Except 1/8.....	A-38
25			
26	A.1.4.6.2.2-1	Converting Codebook Transmission Codes for Rate 1/8.....	A-40
27	A.1.4.8-1	Decoding at the Transmitting Vocoder	A-47
28	A.1.4.8-2	Decoding at the Receiving Vocoder	A-47
29	B-1	Simple Call Flow, Mobile Station Origination Example Using Default Service Option	B-1
30			
31	B-2	Simple Call Flow, Mobile Station Termination Example Using Default Service Option	B-2
32			
33	B-3	Simple Call Flow, Mobile Station Initiated Call Disconnect Example	B-3

FIGURES

1	B-4	Simple Call Flow, Base Station Initiated Call Disconnect Example	B-3
2	B-5	Simple Call Flow, Three-Party Calling Example.....	B-4
3	B-6	Simple Call Flow, Call-Waiting Example	B-5
4	B-7	Call Processing During Soft Handoff	B-6
5	B-8	Call Processing During Sequential Soft Handoff.....	B-7
6	C-1	Mobile Station and Base Station Layers	C-1

TABLES

1	2.1.1.1-1	Channel Numbers and Frequencies.....	2-2
2	2.1.2.2-1	Mobile Station Nominal Power Levels.....	2-4
3	2.3.3-1	Station Class Mark.....	2-11
4	2.7.1-1	Coded Digital Color Code.....	2-56
5	2.7.1.1-1	Digit Code.....	2-61
6	3.7.1.1-1	Order and Order Qualification Codes	3-26
7	3.7.1.1-2	SAT Color Code (SCC).....	3-29
8	3.7.1.2-1	Overhead Message Types.....	3-30
9	3.7.1.2.3-1	Global Action Message types	3-40
10	3.7.1.3-1	Troublesome Central Office Codes.....	3-43
11	4.1.2.1-1	Coded Digital Color Code.....	4-3
12	6.1.1.1-1	CDMA Channel Numbers and Corresponding Frequencies.....	6-2
13	6.1.1.1-2	CDMA Channel Number to CDMA Frequency Assignment	
14		Correspondence	6-3
15	6.1.2.1-1	Effective Radiated Power at Maximum Output Power.....	6-3
16	6.1.2.3.2-1	Power Level Change per Power Control Bit.....	6-7
17	6.1.3.1.1-1	Reverse Traffic Channel Modulation Parameters.....	6-11
18	6.1.3.1.1-2	Access Channel Modulation Parameters.....	6-11
19	6.1.3.1.5-1	Reverse Traffic Channel Interleaver Memory	
20		(Write Operation) (9600 bps).....	6-15
21	6.1.3.1.5-2	Reverse Traffic Channel or Access Channel Interleaver Memory	
22		(Write Operation) (4800 bps).....	6-16
23	6.1.3.1.5-3	Reverse Traffic Channel Interleaver Memory	
24		(Write Operation) (2400 bps).....	6-17
25	6.1.3.1.5-4	Reverse Traffic Channel Interleaver Memory	
26		(Write Operation) (1200 bps).....	6-18
27	6.1.3.1.6-1	64-ary Orthogonal Symbol Set	6-20
28	6.1.3.1.9-1	Reverse CDMA Channel I and Q Mapping.....	6-28
29	6.1.3.1.10-1	Coefficients h(k)	6-30
30	6.1.3.3.11-1	Reverse Traffic Channel Information Bits for Multiplex Option 1.....	6-38
31	6.1.4.2.1-1	Spurious Emission Limits When Transmitting.....	6-43
32	6.4.5.1-1	Accumulated Access Channel Statistics	6-60

TABLES

1	6.4.5.2-1	Accumulated Reverse Traffic Channel Statistics.....	6-61
2	6.4.5.3-1	Accumulated Paging Channel Statistics.....	6-62
3	6.4.5.4-1	Accumulated Forward Traffic Channel Statistics.....	6-63
4	6.4.5.5-1	Accumulated Layer 2 Statistics.....	6-64
5	6.4.5.6-1	Other Monitored Quantities and Statistics.....	6-65
6	6.5.2-1	Required Availability of Transmit Waveform Quality.....	6-66
7	6.6.6.2.1-1	Searcher Window Sizes.....	6-150
8	6.6.6.2.3-1	Handoff Drop Timer Expiration Values.....	6-151
9	6.6.7.1-1	Hash Function Modifier.....	6-159
10	6.7.1.3-1	Access Channel Messages.....	6-167
11	6.7.1.3.2.1-1	Registration Type (REG_TYPE) Codes.....	6-170
12	6.7.1.3.2.3-1	Burst Data Types.....	6-176
13	6.7.1.3.2.4-1	REQUEST_MODE Codes.....	6-180
14	6.7.1.3.2.4-2	Multiplex Options.....	6-180
15	6.7.1.3.2.4-3	Number Types.....	6-181
16	6.7.1.3.2.4-4	Numbering Plan Identification (DIGIT_MODE= '1').....	6-182
17	6.7.1.3.2.4-5	Representation of DTMF Digits.....	6-183
18	6.7.2.3-1	Reverse Traffic Channel Messages.....	6-194
19	6.7.2.3.2.7-1	Recommended DTMF Pulse Width.....	6-208
20	6.7.2.3.2.7-2	Recommended Minimum Interdigit Interval.....	6-208
21	6.7.3-1	Order and Order Qualification Codes Used on the	
22		Reverse Traffic Channel and the Access Channel.....	6-219
23	6.7.4-1	Information Record Types.....	6-225
24	6.7.4.4-1	Presentation Indicators.....	6-230
25	6.7.4.4-2	Screening Indicators.....	6-230
26	7.1.3.1.1-1	Sync Channel Modulation Parameters.....	7-4
27	7.1.3.1.1-2	Paging Channel Modulation Parameters.....	7-4
28	7.1.3.1.1-3	Forward Traffic Channel Modulation Parameters.....	7-4
29	7.1.3.1.5-1	Sync Channel Interleaver Input (Array Write Operation).....	7-7
30	7.1.3.1.5-2	Sync Channel Interleaver Output (Array Read Operation).....	7-7
31	7.1.3.1.5-3	Forward Traffic and Paging Channel Interleaver Input	
32		(Array Write Operation at 9600 bps).....	7-8

TABLES

1	7.1.3.1.5-4	Forward Traffic and Paging Channel Interleaver Output (Array Read Operation at 9600 bps).....	7-8
2			
3	7.1.3.1.5-5	Forward Traffic and Paging Channel Interleaver Input (Array Write Operation at 4800 bps).....	7-9
4			
5	7.1.3.1.5-6	Forward Traffic and Paging Channel Interleaver Output (Array Read Operation at 4800 bps).....	7-9
6			
7	7.1.3.1.5-7	Forward Traffic and Paging Channel Interleaver Input (Array Write Operation at 2400 bps).....	7-10
8			
9	7.1.3.1.5-8	Forward Traffic and Paging Channel Interleaver Output (Array Read Operation at 2400 bps).....	7-10
10			
11	7.1.3.1.5-9	Forward Traffic Channel Interleaver Input (Array Write Operation at 1200 bps).....	7-11
12			
13	7.1.3.1.5-10	Forward Traffic Channel Interleaver Output (Array Read Operation at 1200 bps).....	7-11
14			
15	7.1.3.1.8-1	64-ary Walsh Functions	7-17
16	7.1.3.1.9-1	Forward CDMA Channel I and Q Mapping.....	7-19
17	7.1.3.1.10.1-1	Coefficients $h(k)$	7-21
18	7.1.3.5.1-1	Transmitted Symbol Energy Versus Data Rate	7-27
19	7.1.3.5.11-1	Forward Traffic Channel Information Bits for Multiplex Option 1.....	7-34
20	7.7.1.3-1	Paging Channel Data Rate.....	7-77
21	7.7.2.3-1	Paging Channel Messages	7-83
22	7.7.2.3.2.1-1	Value of Zone Timer	7-86
23	7.7.2.3.2.1-2	Base Station Classes.....	7-86
24	7.7.2.3.2.3-1	Neighbor Configuration Field.....	7-97
25	7.7.2.3.2.8-1	Assignment Mode.....	7-108
26	7.7.2.3.2.8-2	Message Encryption Modes	7-109
27	7.7.2.3.2.9-1	Burst Data Types	7-113
28	7.7.3.3-1	Forward Traffic Channel Messages	7-126
29	7.7.4-1	Order and Order Qualification Codes Used on the Paging Channel and the Forward Traffic Channel.....	7-159
30			
31	7.7.4.6-1	Status Request ORDQ Values	7-167
32	7.7.5-1	Information Record Types.....	7-171
33	7.7.5.5-1	Signal Type	7-178

TABLES

1	7.7.5.5-2	Alert Pitch	7-179
2	7.7.5.5-3	Tone Signals (SIGNAL_TYPE = '00')	7-179
3	7.7.5.5-4	ISDN Alerting (SIGNAL_TYPE = '01')	7-180
4	7.7.5.5-5	IS-54B Alerting (SIGNAL_TYPE = '10')	7-181
5	A.1.3.2.1-1	Packet Types Supplied by Service Option 1	A-2
6	A.1.3.2.2-1	Packet Types Supplied by Multiplex Sublayer to Service Option 1	A-3
7	A.1.4.1-1	Parameters Used for Each Rate	A-6
8	A.1.4.1-2	Transmission Codes and Bit Allocations	A-8
9	A.1.4.3.2.7-1	Number of LSP	A-16
10	A.1.4.3.2.7-2	Maximum LSP Quantization Level	A-17
11	A.1.4.3.3.4-1	LSP	A-20
12	A.1.4.5.1.1-1	Definition of Terms for Pitch Search	A-25
13	A.1.4.6.1-1	Codebook	A-28
14	A.1.4.6.1.1-1	Definition of Terms for Codebook Search	A-30
15	A.1.4.6.1.3.1-1	Codebook Gain Prediction Filter Function $FG(x)$	A-33
16	A.1.4.6.1.3.1-2	Codebook Quantizer (Rate 1 and Rate 1/2)	A-34
17	A.1.4.6.1.3.1-4	Conversion for CBGAIN (Rate 1 and Rate 1/2)	A-35
18	A.1.4.6.2.1-1	Conversion for \hat{G}_l to \hat{G}_a	A-39
19	A.1.4.7.1.2-1	Rate 1 Packet Structure	A-43
20	A.1.4.7.2-1	Rate 1/2 Packet Structure	A-45
21	A.1.4.7.3-1	Rate 1/4 Packet Structure	A-46
22	A.1.4.7.4-1	Rate 1/8 Packet Structure	A-46
23	A.1.4.13-1	Summary of Service Option 1 Notation	A-63
24	D-1	Time Limits	D-1
25	D-2	Other Constants	D-4
26	E-1	Retrievable and Settable Parameters	E-1
27	F.2-1	Permanent Mobile Station Indicators	F-2
28	F.2.2-1	Analog Semi-Permanent Mobile Station Indicators	F-3
29	F.2.2-2	CDMA Semi-Permanent Mobile Station Indicators	F-3
30	F.3-1	NAM Indicators	F-4
31	F.4-1	MIN Indicators	F-5

1

2

3 No text.