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TIA/EIA/IS-95

TIA/EIA INTERIM STANDARD

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

TIA/EIA/IS-95

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PREFACE

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

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

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

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

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

This specification includes provisions for future service additions and expansion of system capabilities. The architecture defined by this specification permits such expansion without 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. Message Encryption and Voice Privacy. This appendix describes the requirements for message encryption and voice privacy. This appendix is available as a separate document whose distribution is controlled by TIA. The availability of this appendix is governed under the U.S. International Traffic and Arms Regulation (ITAR) and the Export Administration Regulations.

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.

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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 that 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. IS-98 "Recommended Minimum Performance Standards for Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations," and IS-97 "Recommended Minimum Performance Standards for Base Stations Supporting Dual-Mode Wideband Spread Spectrum Cellular 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.

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9. Reserved.

10. RF Emissions. Minimum advisory standards of ANSI and the processing guidelines of FCC are contained in ANSI C95.1-1982 Advisory Standards and FCC Rules and Regulations respectively. Members should also take notice of the more stringent exposure criteria for the general public and for radio frequency carriers with low frequency amplitude modulation as given in NCRP Report No. 86.

11. For the optional analog extended protocol feature (see 4.2 and 5.2), the assignment of message type codes (MST words) will be made using procedures described in TSB39. This will ensure that the feature will be implemented in an orderly manner.

12. Reserved.

13. The allocation of SID numbers is under review by EIA/TIA TR45 for potential revision to accommodate international requirements. Utilization of SID numbers must be coordinated.

14. Although the analog mode of operation (Sections 2, 3, 4, and 5) draws upon EIA/TIA/IS-54-B, some modifications have been made.

15. "Base station" refers to the functions performed on the land side, which are typically distributed among a cell, a sector of a cell, and a mobile switching center.

16. Section 6, Section 7, and the appendices use the following verbal forms: "Shall" and "shall not" identify requirements to be followed strictly to conform to the standard and from which no deviation is permitted. "Should" and "should not" indicate that one of several possibilities is recommended as particularly suitable, without mentioning or excluding others; that a certain course of action is preferred but not necessarily required; or that (in the negative form) that a certain possibility or course of action is discouraged but not prohibited. "May" and "need not" indicate a course of action permissible within the limits of the standard. "Can" and "cannot" are used for statements of possibility and capability, whether material, physical, or causal.

17. Footnotes appear at various points in this specification to elaborate and further clarify items discussed in the body of the specification.

18. Unless indicated otherwise, this document presents numbers in decimal form. Binary numbers are distinguished in the text by the use of single quotation marks.

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19. The following operators define mathematical operations:

    $\times$ 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: $\lceil 1.1 \rceil = 2$, $\lceil 2.0 \rceil = 2$.

    $|x|$ indicates the absolute value of x: $|-17|=17$, $|17|=17$.

    $\oplus$ indicates exclusive OR.

    min (x, y) indicates the minimum of x and y.

    max (x, y) indicates the maximum of x and y.

    x mod y indicates the remainder after dividing x by y: x mod y = x - (y $\times$ $\lfloor x/y \rfloor$).

REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. ANSI and TIA maintain registers of currently valid national standards published by them.

—*American National Standards:*

1. ANSI/EIA/TIA-553, *Mobile Station - Land Station Compatibility Specification*, September 1989.
2. ANSI T1.607-1990, *Integrated Services Digital Network (ISDN)–Layer 3 Signaling Specification for Circuit Switched Bearer Service for Digital Subscriber Signaling System Number 1 (DSS1)*, July 1990

—*Other Standards:*

2. *Common Cryptographic Algorithms*.
3. CCITT Recommendation G.162, May-June 1964.
4. CCITT Recommendation P.76, *Determination of Loudness Ratings; Fundamental Principles*, 1988.
5. CCITT Recommendation P.79, *Calculation of Loudness Ratings*, 1988.
6. EIA/IS-19-B, *Recommended Minimum Standards for 800-MHZ Cellular Subscriber Units*, May 1988.
7. EIA/IS-20-A, *Recommended Minimum Standards for 800-MHZ Cellular Land Stations*, May 1988.

REFERENCES

8. EIA/TIA/IS-41-B, *Cellular Radio-Telecommunications Intersystem Operations*, December 1992.

9. EIA/TIA/IS-54-B, *Cellular System Dual-Mode Mobile Station - Base Station Compatibility Standard*, April 1992.

10. EIA/TIA/IS-95, *Appendix A, Message Encryption and Voice Privacy.*

11. EIA/TIA/IS-97, *Recommended Minimum Performance Standards for Base Stations Supporting Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations.*

12. EIA/TIA/IS-98, *Recommended Minimum Performance Standards for Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations.*

13. IEEE Standard 269-1992, *IEEE Standard Methods for Measuring Transmission Performance of Analog and Digital Telephone Sets*, 1992.

14. IEEE Standard 661-1979, *Method for Determining objective Loudness Ratings of Telephone Connections*, 1979.

15. *Interface Specification for Common Cryptographic Algorithms.*

16. TSB16, *Assignment of Access Overload Classes in the Cellular Telecommunications Services*, March 1985.

17. TSB29-A, *International Implementation of Cellular Radiotelephone Systems Compliant with ANSI/EIA/TIA-553*, September 1992.

18. TSB39, *Message Type Assignments for the Extended Protocol Facility of ANSI/EIA/TIA-553 and EIA/TIA/IS-54.*

19. TSB50, *User Interface for Authentication Key Entry.*

20. TSB58, *Service Option Number Assignments for Wideband Spread Spectrum Digital Cellular System.*

—*Books:*

21. Knuth, D. N., *Sorting and Searching*, vol. 3 of *The Art of Computer Programming*, 3 vols., Reading, MA, Addison-Wesley, 1973.

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1 GENERAL

1.1 Terms and Numeric Information

1.1.1 Terms

Abbreviated Alert. An abbreviated alert is used to remind the mobile station user that previously selected alternative routing features are still active.

AC. See Authentication Center.

Access Attempt. A sequence of one or more access probe sequences on the Access Channel containing the same message. See also Access Probe and Access Probe Sequence.

Access Channel. A Reverse CDMA Channel used by mobile stations for communicating to the base station. The Access Channel is used for short signaling message exchanges such as call originations, responses to pages, and registrations. The Access Channel is a slotted random access channel.

Access Channel Message. The information part of an access probe consisting of the message body, length field, and CRC.

Access Channel Message Capsule. An Access Channel message plus the padding.

Access Channel Preamble. The preamble of an access probe consisting of a sequence of all-zero frames that is sent at the 4800 bps rate.

Access Channel Request Message. An Access Channel message that is autonomously generated by the mobile station. See also Access Channel Response Message.

Access Channel Response Message. A message on the Access Channel generated to reply to a message received from the base station.

Access Channel Slot. The assigned time interval for an access probe. An Access Channel slot consists of an integer number of frames. The transmission of an access probe is performed within the boundaries of an Access Channel slot.

Access Probe. One Access Channel transmission consisting of a preamble and a message. The transmission is an integer number of frames in length and transmits one Access Channel message. See also Access Probe Sequence and Access Attempt.

Access Probe Sequence. A sequence of one or more access probes on the Access Channel. The same Access Channel message is transmitted in every access probe of an access attempt. See also Access Probe and Access Attempt.

Acknowledgement. A Layer 2 response by the mobile station or the base station confirming that a signaling message was received correctly.

Action Time. The time at which the action implied by a message should take effect.

Active Set. The set of pilots associated with the CDMA Channels containing Forward Traffic Channels assigned to a particular mobile station.

Aging. A mechanism through which the mobile station maintains in its Neighbor Set the pilots that have been recently sent to it from the base station and the pilots whose handoff drop timers have recently expired.

A-key. A secret, 64-bit pattern stored in the mobile station. It is used to generate/update the mobile station's Shared Secret Data. The A-key is used in the mobile station authentication process.

Analog Access Channel. An analog control channel used by a mobile station to access a system to obtain service.

Analog Color Code. An analog signal (see Supervisory Audio Tone) transmitted by a base station on an analog voice channel and used to detect capture of a mobile station by an interfering base station or the capture of a base station by an interfering mobile station.

Analog Control Channel. An analog channel used for the transmission of digital control information from a base station to a mobile station or from a mobile station to a base station.

Analog Paging Channel. A forward analog control channel that is used to page mobile stations and send orders.

Analog Voice Channel. An analog channel on which a voice conversation occurs and on which brief digital messages may be sent from a base station to a mobile station or from a mobile station to a base station.

Authentication. A procedure used by a base station to validate a mobile station's identity.

Authentication Center (AC). An entity that manages the authentication information related to the mobile station.

Authentication Response (AUTHR). An 18-bit output of the authentication algorithm. It is used, for example, to validate mobile station registrations, originations and terminations.

Autonomous Registration. A method of registration in which the mobile station registers without an explicit command from the base station.

AWGN. Additive White Gaussian Noise.

Bad Frames. Frames classified as erasures (frame category 10) or 9600 bps frames, primary traffic only with bit errors (frame category 9). See also Good Frames.

Base Station. A station in the Domestic Public Cellular Radio Telecommunications Service, other than a mobile station, used for communicating with mobile stations. Depending upon the context, the term base station may refer to a cell, a sector within a cell, an MSC, or other part of the cellular system. See also MSC.

Base Station Authentication Response (AUTHBS). An 18-bit pattern generated by the authentication algorithm. AUTHBS is used to confirm the validity of base station orders to update the Shared Secret Data.

Base Station Random Variable (RANDBS). A 32-bit random number generated by the mobile station for authenticating base station orders to update the Shared Secret Data.

BCH Code. See Bose-Chaudhuri-Hocquenghem Code.

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No text.

Blank-and-Burst. The pre-emption of an entire Traffic Channel frame's primary traffic by signaling traffic or secondary traffic. Blank-and-burst is performed on a frame-by-frame basis.

Bose-Chaudhuri-Hocquenghem Code (BCH Code). A large class of error-correcting cyclic codes. For any positive integers m, $m \geq 3$, and $t < 2^{m-1}$, there is a binary BCH code with a block length n equal to $2^m - 1$ and $n - k \leq mt$ parity check bits, where k is the number of information bits. The BCH code has a minimum distance of at least $2t + 1$.

bps. Bits per second.

Busy-Idle Bits. The portion of the data stream transmitted by a base station on a forward analog control channel that is used to indicate the current busy-idle status of the corresponding reverse analog control channel.

Call Disconnect. The process that releases the resources handling a particular call. The disconnect process begins either when the mobile station user indicates the end of the call by generating an on-hook condition or other call release mechanism, or when the base station initiates a release.

Call History Parameter (COUNT). A modulo-64 event counter maintained by the mobile station and Authentication Center that is used for clone detection.

Candidate Set. The set of pilots that have been received with sufficient strength by the mobile station to be successfully demodulated, but have not been placed in the Active Set by the base station. See also Active Set, Neighbor Set, and Remaining Set.

CDMA. See Code Division Multiple Access.

CDMA Channel. The set of channels transmitted between the base station and the mobile stations within a given CDMA frequency assignment. See also Forward CDMA Channel and Reverse CDMA Channel.

CDMA Channel Number. An 11-bit number corresponding to the center of the CDMA frequency assignment.

CDMA Frequency Assignment. A 1.23 MHz segment of spectrum centered on one of the 30 kHz channels of the existing analog system.

Code Channel. A subchannel of a Forward CDMA Channel. A Forward CDMA Channel contains 64 code channels. Code channel zero is assigned to the Pilot Channel. Code channels 1 through 7 may be assigned to the either Paging Channels or the Traffic Channels. Code channel 32 may be assigned to either a Sync Channel or a Traffic Channel. The remaining code channels may be assigned to Traffic Channels.

Code Division Multiple Access (CDMA). A technique for spread-spectrum multiple-access digital communications that creates channels through the use of unique code sequences.

Code Symbol. The output of an error-correcting encoder. Information bits are input to the encoder and code symbols are output from the encoder. See Convolutional Code.

Continuous Transmission. A mode of operation in which Discontinuous Transmission is not permitted.

Control Mobile Attenuation Code (CMAC). A 3-bit field in the Control-Filler Message that specifies the maximum authorized power level for a mobile transmitting on an analog reverse control channel.

Convolutional Code. A type of error-correcting code. A code symbol can be considered as the convolution of the input data sequence with the impulse response of a generator function.

CRC. See Cyclic Redundancy Code.

Cyclic Redundancy Code (CRC). A class of linear error detecting codes which generate parity check bits by finding the remainder of a polynomial division.

Data Burst Randomizer. The function that determines which power control groups within a frame are transmitted on the Reverse Traffic Channel when the data rate is lower than 9600 bps. The data burst randomizer determines, for each mobile station, the pseudorandom position of the transmitted power control groups in the frame while guaranteeing that every modulation symbol is transmitted exactly once.

dBc. The ratio (in dB) of the sideband power of a signal, measured in a given bandwidth at a given frequency offset from the center frequency of the same signal, to the total inband power of the signal. For CDMA, the total inband power of the signal is measured in a 1.23 MHz bandwidth around the center frequency of the CDMA signal.

dBm. A measure of power expressed in terms of its ratio (in dB) to one milliwatt.

dBm/Hz. A measure of power spectral density. dBm/Hz is the power in one Hertz of bandwidth, where power is expressed in units of dBm.

dBW. A measure of power expressed in terms of its ratio (in dB) to one Watt.

Dedicated Control Channel. An analog control channel used for the transmission of digital control information from either a base station or a mobile station.

Deinterleaving. The process of unpermuting the symbols that were permuted by the interleaver. Deinterleaving is performed on received symbols prior to decoding.

Digital Color Code (DCC). A digital signal transmitted by a base station on a forward analog control channel that is used to detect capture of a base station by an interfering mobile station.

Dim-and-Burst. A frame in which primary traffic is multiplexed with either secondary traffic or signaling traffic.

Discontinuous Transmission (DTX). A mode of operation in which a mobile station transmitter autonomously switches between two transmitter power levels while the mobile station is in the conversation state on an analog voice channel.

Distance-Based Registration. An autonomous registration method in which the mobile station registers whenever it enters a cell whose distance from the cell in which the mobile station last registered exceeds a given threshold.

DTMF. See Dual-Tone Multifrequency.

Dual-Tone Multifrequency (DTMF). Signaling by the simultaneous transmission of two tones, one from a group of low frequencies and another from a group of high frequencies. Each group of frequencies consists of four frequencies.

E_b. The energy of an information bit.

E_c/I_0. The ratio in (dB) between the pilot energy accumulated over one PN chip period (E_c) to the total power spectral density in the received bandwidth (I_0).

Effective Radiated Power (ERP). The transmitted power multiplied by the antenna gain referenced to a half-wave dipole.

Electronic Serial Number (ESN). A 32-bit number assigned by the mobile station manufacturer, uniquely identifying the mobile station equipment.

Encoder Tail Bits. A fixed sequence of bits added to the end of a block of data to reset the convolutional encoder to a known state.

ERP. See Effective Radiated Power.

ESN. See Electronic Serial Number.

Extended Protocol. An optional expansion of the signaling messages between the base station and mobile station to allow for the addition of new system features and operational capabilities.

Fade Timer. A timer kept by the mobile station as a measure of Forward Traffic Channel continuity. If the fade timer expires, the mobile station drops the call.

Flash. An indication sent on an analog voice channel or CDMA Traffic Channel indicating that the user directed the mobile station to invoke special processing.

Foreign NID Roamer. A mobile station operating in the same system (SID) but a different network (NID) from the one in which service was subscribed. See also Foreign SID Roamer and Roamer.

Foreign SID Roamer. A mobile station operating in a system (SID) other than the one from which service was subscribed. See also Foreign NID Roamer and Roamer.

Forward Analog Control Channel (FOCC). An analog control channel used from a base station to a mobile station.

Forward Analog Voice Channel (FVC). An analog voice channel used from a base station to a mobile station.

Forward CDMA Channel. A CDMA Channel from a base station to mobile stations. The Forward CDMA Channel contains one or more code channels that are transmitted on a CDMA frequency assignment using a particular pilot PN offset. The code channels are associated with the Pilot Channel, Sync Channel, Paging Channels, and Traffic Channels. The Forward CDMA Channel always carries a Pilot Channel and may carry up to one Sync Channel, up to seven Paging Channels, and up to 63 Traffic Channels, as long as the total number of channels, including the Pilot Channel, is no greater than 64.

Forward Traffic Channel. A code channel used to transport user and signaling traffic from the base station to the mobile station.

Frame. A basic timing interval in the system. For the Access Channel, Paging Channel, and Traffic Channel, a frame is 20 ms long. For the Sync Channel, a frame is 26.666... ms long.

Frame Category. A classification of a received Traffic Channel frame based upon transmission data rate, the frame contents (primary traffic, secondary traffic, or signaling traffic), and whether there are detected errors in the frame.

Frame Offset. A time skewing of Traffic Channel frames from System Time in integer multiples of 1.25 ms. The maximum frame offset is 18.75 ms.

Frame Quality Indicator. The CRC check applied to 9600 bps and 4800 bps Traffic Channel frames.

Global Positioning System (GPS). A US government satellite system that provides location and time information to users. See Navstar GPS Space Segment / Navigation User Interfaces ICD-GPS-200 for specifications.

Good Frames. Frames not classified as bad frames. See also Bad Frames.

GPS. See Global Positioning System.

Half Frame. A 10 ms interval on the Paging Channel. Two half frames comprise a frame. The first half frame begins at the same time as the frame.

Handoff. The act of transferring communication with a mobile station from one base station to another.

Hard Handoff. A handoff characterized by a temporary disconnection of the Traffic Channel. Hard handoffs occur when the mobile station is transferred between disjoint Active Sets, the CDMA frequency assignment changes, the frame offset changes, or the mobile station is directed from a CDMA Traffic Channel to an analog voice channel. See also Soft Handoff.

Hash Function. A function used by the mobile station to select one out of N available resources. The hash function distributes the available resources uniformly among a random sample of mobile stations.

HLR. See Home Location Register.

Home Location Register (HLR). The location register to which a MIN is assigned for record purposes such as subscriber information.

Home System. The cellular system in which the mobile station subscribes for service.

Idle Handoff. The act of transferring reception of the Paging Channel from one base station to another, when the mobile station is in the *Mobile Station Idle State*.

Implicit Registration. A registration achieved by a successful transmission of an origination or page response on the Access Channel.

Interleaving. The process of permuting a sequence of symbols.

kHz. Kilohertz (10^3 Hertz).

ksps. Kilo-symbols per second (10^3 symbols per second).

Layering. A method of organization for communication protocols. A layer is defined in terms of its communication protocol to a peer layer in another entity and the services it offers to the next higher layer in its own entity.

Layer 1. See Physical Layer.

Layer 2. Layer 2 provides for the correct transmission and reception of signaling messages, including partial duplicate detection. See also Layering and Layer 3.

Layer 3. Layer 3 provides the control of the cellular telephone system. Signaling messages originate and terminate at layer 3. See also Layering and Layer 2.

Local Control. An optional mobile station feature used to perform manufacturer-specific functions.

Long Code. A PN sequence with period $2^{42}-1$ that is used for scrambling on the Forward CDMA Channel and spreading on the Reverse CDMA Channel. The long code uniquely identifies a mobile station on both the Reverse Traffic Channel and the Forward Traffic Channel. The long code provides limited privacy. The long code also separates multiple Access Channels on the same CDMA channel. See also Public Long Code and Private Long Code.

Long Code Mask. A 42-bit binary number that creates the unique identity of the long code. See also Public Long Code, Private Long Code, Public Long Code Mask, and Private Long Code Mask.

LSB. Least significant bit.

Maximal Length Sequence (m-Sequence). A binary sequence of period 2^n-1, n a positive integer, with no internal periodicities. A maximal length sequence can be generated by a tapped n-bit shift register with linear feedback.

Mcps. Megachips per second (10^6 chips per second).

Mean Input Power. The total received calorimetric power measured in a specified bandwidth at the antenna connector, including all internal and external signal and noise sources.

Mean Output Power. The total transmitted calorimetric power measured in a specified bandwidth at the antenna connector when the transmitter is active.

Message. A data structure that conveys control information or application information. A message consists of a length field (MSG_LENGTH), a message body (the part conveying the information), and a CRC.

Message Body. The part of the message contained between the length field (MSG_LENGTH) and the CRC field.

Message Capsule. A sequence of bits comprising a single message and padding. The padding always follows the message and may be of zero length.

Message CRC. The CRC associated with a message. See also Cyclic Redundancy Check.

Message Field. A basic named element in a message. A message field may consist of zero or more bits.

Message Record. An entry in a message consisting of one or more fields that repeats in the message.

MHz. Megahertz (10^6 Hertz).

MIN. See Mobile Station Identification Number.

Mobile Protocol Capability Indicator (MPCI). A 2-bit field used to indicate the mobile station's capabilities.

Mobile Station. A station in the Domestic Public Cellular Radio Telecommunications Service intended to be used while in motion or during halts at unspecified points. Mobile stations include portable units (e.g., hand-held personal units) and units installed in vehicles.

Mobile Station Class. Mobile station classes define mobile station characteristics such as slotted operation and transmission power. See Table 2.3.3-1.

Mobile Station Identification Number (MIN). The 34-bit number that is a digital representation of the 10-digit directory telephone number assigned to a mobile station.

Mobile Station Originated Call. A call originating from a mobile station.

Mobile Station Terminated Call. A call received by a mobile station (not to be confused with a disconnect or call release).

Mobile Switching Center (MSC). A configuration of equipment that provides cellular radiotelephone service. Also called the Mobile Telephone Switching Office (MTSO).

Modulation Symbol. The output of the data modulator before spreading. On the Reverse Traffic Channel, 64-ary orthogonal modulation is used and six code symbols are associated with one modulation symbol. On the Forward Traffic Channel, each code symbol (when the data rate is 9600 bps) or each repeated code symbol (when the data rate is less than 9600 bps) is one modulation symbol.

ms. Millisecond.

MSB. Most significant bit.

MSC. See Mobile Switching Center.

Multiplex Option. The ability of the multiplex sublayer and lower layers to be tailored to provide special capabilities. A multiplex option defines such characteristics as the frame format and the rate decision rules. See also Multiplex Sublayer.

Multiplex Sublayer. One of the conceptual layers of the system that multiplexes and demultiplexes primary traffic, secondary traffic, and signaling traffic.

NAM. See Number Assignment Module.

Neighbor Set. The set of pilots associated with the CDMA Channels that are probable candidates for handoff. Normally, the Neighbor Set consists of the pilots associated with CDMA Channels that cover geographical areas near the mobile station. See also Active Set, Candidate Set, and Remaining Set.

Network. A network is a subset of a cellular system, such as an area-wide cellular network, a private group of base stations, or a group of base stations set up to handle a special requirement. A network can be as small or as large as needed, as long as it is fully contained within a system. See also System.

Network Identification (NID). A number that uniquely identifies a network within a cellular system. See also System Identification.

NID. See Network Identification.

Non-Autonomous Registration. A registration method in which the base station initiates registration. See also Autonomous Registration.

Non-Slotted Mode. An operation mode of the mobile station in which the mobile station continuously monitors the Paging Channel when in the *Mobile Station Idle State*.

ns. Nanosecond.

NULL. Not having any value.

Null Traffic Channel Data. One or more frames of 16 '1's followed by eight '0's sent at the 1200 bps rate. Null Traffic Channel data is sent when no service option is active and no signaling message is being sent. Null Traffic Channel data serves to maintain the connectivity between the mobile station and the base station.

Number Assignment Module (NAM). A set of MIN-related parameters stored in the mobile station.

Numeric Information. Numeric information consists of parameters that appear as numeric fields in messages exchanged by the base station and the mobile station and information used to describe the operation of the mobile station.

OLC. See Overload Class (CDMA) or Overload Control (analog).

Optional Field. A field defined within a message structure that is optionally transmitted to the message recipient.

Order. A type of message that contains control codes for either the mobile station or the base station.

Ordered Registration. A registration method in which the base station orders the mobile station to send registration related parameters.

Overhead Message. A message sent by the base station on the Paging Channel to communicate base-station-specific and system-wide information to mobile stations.

Overload Class. The means used to control system access by mobile stations, typically in emergency or other overloaded conditions. Mobile stations are assigned one (or more) of sixteen overload classes. Access to the CDMA system can then be controlled on a per class basis by persistence values transmitted by the base station.

Overload Control (OLC). A means to restrict reverse analog control channel accesses by mobile stations. Mobile stations are assigned one (or more) of sixteen control levels. Access is selectively restricted by a base station setting one or more OLC bits in the Overload Control Global Action Message.

Packet. The unit of information exchanged between the service option applications of the base station and the mobile station.

Padding. A sequence of bits used to fill from the end of a message to the end of a message capsule, typically to the end of the frame or half frame. All bits in the padding are '0'.

Paging. The act of seeking a mobile station when a call has been placed to that mobile station.

Paging Channel (Analog). See Analog Paging Channel.

Paging Channel (CDMA). A code channel in a Forward CDMA Channel used for transmission of control information and pages from a base station to a mobile station.

Paging Channel Slot. An 80 ms interval on the Paging Channel. Mobile stations operating in the slotted mode are assigned specific slots in which they monitor messages from the base station.

Parameter-Change Registration. A registration method in which the mobile station registers when certain of its stored parameters change.

Parity Check Bits. Bits added to a sequence of information bits to provide error detection, correction, or both.

Persistence. A probability measure used by the mobile station to determine if it should transmit in a given Access Channel Slot.

Physical Layer. The part of the communication protocol between the mobile station and the base station that is responsible for the transmission and reception of data. The physical layer in the transmitting station is presented a frame by the multiplex sublayer and transforms it into an over-the-air waveform. The physical layer in the receiving station transforms the waveform back into a frame and presents it to the multiplex sublayer above it.

Pilot Channel. An unmodulated, direct-sequence spread spectrum signal transmitted continuously by each CDMA base station. The Pilot Channel allows a mobile station to acquire the timing of the Forward CDMA Channel, provides a phase reference for coherent demodulation, and provides a means for signal strength comparisons between base stations for determining when to handoff.

Pilot PN Sequence. A pair of modified maximal length PN sequences with period 2^{15} used to spread the Forward CDMA Channel and the Reverse CDMA Channel. Different base stations are identified by different pilot PN sequence offsets.

Pilot PN Sequence Offset Index. The PN offset in units of 64 PN chips of a pilot, relative to the zero offset pilot PN sequence.

Pilot Strength. The ratio of received pilot energy to overall received energy. See also E_c/I_0.

PN Chip. One bit in the PN sequence.

PN Sequence. Pseudonoise sequence. A periodic binary sequence.

Power Control Bit. A bit sent in every 1.25 ms interval on the Forward Traffic Channel to signal the mobile station to increase or decrease its transmit power.

Power Control Group. A 1.25 ms interval on the Forward Traffic Channel and the Reverse Traffic Channel. See also Power Control Bit.

Power-Down Registration. An autonomous registration method in which the mobile station registers on power down.

Power-Up Registration. An autonomous registration method in which the mobile station registers on power up.

PPM. Parts per million.

Preamble. See Access Channel Preamble and Traffic Channel Preamble.

Primary CDMA Channel. A CDMA Channel at a preassigned frequency assignment used by the mobile station for initial acquisition. See also Secondary CDMA Channel.

Primary Paging Channel (CDMA). The default code channel (code channel 1) assigned for paging on a CDMA Channel.

Primary Traffic. The main traffic stream carried between the mobile station and the base station, supporting the active primary service option, on the Traffic Channel. See also Secondary Traffic, Signaling Traffic, and Service Option.

Private Long Code. The long code characterized by the private long code mask. See also Long Code.

Private Long Code Mask. The long code mask used to form the private long code. See also Public Long Code Mask and Long Code.

Public Long Code. The long code characterized by the public long code mask.

Public Long Code Mask. The long code mask used to form the public long code. The mask contains the ESN of the mobile station. See also Private Long Code Mask and Long Code.

Punctured Code. An error-correcting code generated from another error-correcting code by deleting (i.e., puncturing) code symbols from the coder output.

Quick Repeats. Additional transmissions of identical copies of a message within a short interval to increase the probability that the message is received correctly.

Receive Objective Loudness Rating (ROLR). A perceptually weighted transducer gain of telephone receivers relating electrical excitation from a reference generator to sound pressure at the earphone. The receive objective loudness rating is normally specified in dB relative to one Pascal per millivolt. See IEEE Standard 269-1992, IEEE Standard 661-1979, CCITT Recommendation P.76, and CCITT Recommendation P.79.

Registration. The process by which a mobile station identifies its location and parameters to a base station.

Registration Zone. A collection of one or more base stations treated as a unit when determining whether a mobile station should perform zone-based registration.

Release. A process that the mobile station and base station use to inform each other of call disconnect.

Remaining Set. The set of all allowable pilot offsets as determined by PILOT_INC, excluding the pilot offsets of the pilots in the Active Set, Candidate Set, and Neighbor Set. See also Active Set, Candidate Set, and Neighbor Set.

Request. A layer 3 message generated by either the mobile station or the base station to retrieve information, ask for service, or command an action.

Response. A layer 3 message generated as a result of another message, typically a request.

Reverse Analog Control Channel (RECC). The analog control channel used from a mobile station to a base station.

Reverse Analog Voice Channel (RVC). The analog voice channel used from a mobile station to a base station.

Reverse CDMA Channel. The CDMA Channel from the mobile station to the base station. From the base station's perspective, the Reverse CDMA Channel is the sum of all mobile station transmissions on a CDMA frequency assignment.

Reverse Traffic Channel. A Reverse CDMA Channel used to transport user and signaling traffic from a single mobile station to one or more base stations.

Roamer. A mobile station operating in a cellular system (or network) other than the one from which service was subscribed. See also Foreign NID Roamer and Foreign SID Roamer.

ROLR. See Receive Objective Loudness Rating.

SAT. See Supervisory Audio Tone.

Scan of Channels. The procedure by which a mobile station examines the signal strength of each forward analog control channel.

SCI. Synchronized Capsule Indicator bit.

Search Window. The range of PN sequence offsets that a mobile station searches for a pilot.

Secondary CDMA Channel. A CDMA Channel at a preassigned frequency assignment used by the mobile station for initial acquisition. See also Primary CDMA Channel.

Secondary Traffic. An additional traffic stream that can be carried between the mobile station and the base station on the Traffic Channel. See also Primary Traffic and Signaling Traffic.

Seizure Precursor. The initial digital sequence transmitted by a mobile station to a base station on a reverse analog control channel.

Service Option. A service capability of the system. Service options may be applications such as voice, data, or facsimile.

Shared Secret Data (SSD). A 128-bit pattern stored in the mobile station (in semi-permanent memory) and known by the base station. SSD is a concatenation of two 64-bit subsets: SSD_A, which is used to support the authentication procedures, and SSD_B, which serves as one of the inputs to the process generating the encryption mask and private long code.

SID. See System Identification.

Signaling Tone. A 10 kHz tone transmitted by a mobile station on an analog voice channel to: 1) confirm orders, 2) signal flash requests, and 3) signal release requests.

Signaling Traffic. Control messages that are carried between the mobile station and the base station on the Traffic Channel. See also Primary Traffic and Secondary Traffic.

Slot Cycle. A periodic interval at which a mobile station operating in the slotted mode monitors the Paging Channel.

Slotted Mode. An operation mode of the mobile station in which the mobile station monitors only selected slots on the Paging Channel when in the *Mobile Station Idle State*.

Soft Handoff. A handoff occurring while the mobile station is in the *Mobile Station Control on the Traffic Channel State*. This handoff is characterized by commencing communications with a new base station on the same CDMA frequency assignment before terminating communications with the old base station. See also Hard Handoff.

SOM. Start-of-Message Bit.

sps. Symbols per second.

Station Class Mark (SCM). An identification of certain characteristics of a mobile station. Classes are defined in Table 2.3.3-1.

Status Information. The following status information is used to describe mobile station operation when using the analog system:

- Serving-System Status. Indicates whether a mobile station is tuned to channels associated with System A or System B.
- First Registration ID Status. A status variable used by the mobile station in association with its processing of received Registration ID messages.
- First Location Area ID Status. A status variable used by the mobile station in association with its processing of received Location Area ID messages.
- Location Registration ID Status. A status variable used by the mobile station in association with its processing of power-up registrations and location-based registrations.
- First Idle ID Status. A status variable used by the mobile station in association with its processing of the Idle Task.
- Local Control Status. Indicates whether a mobile station must respond to local control messages.
- Roam Status. Indicates whether a mobile station is in its home system.
- Termination Status. Indicates whether a mobile station must terminate the call when it is on an analog voice channel.

Supervisory Audio Tone (SAT). One of three tones in the 6 kHz region that is transmitted on the forward analog voice channel by a base station and transponded on the reverse analog voice channel by a mobile station.

Supplementary Digital Color Code (SDCC1, SDCC2). Additional bits assigned to increase the number of color codes from four to sixty four, transmitted on the forward analog control channel.

Symbol. See Code Symbol and Modulation Symbol.

Sync Channel. Code channel 32 in the Forward CDMA Channel which transports the synchronization message to the mobile station.

Sync Channel Superframe. An 80 ms interval consisting of three Sync Channel frames (each 26.666... ms in length).

System. A system is a cellular telephone service that covers a geographic area such as a city, metropolitan region, county, or group of counties. See also Network.

System Identification (SID). A number uniquely identifying a cellular system.

System Time. The time reference used by the system. System Time is synchronous to UTC time (except for leap seconds) and uses the same time origin as GPS time. All base stations use the same System Time (within a small error). Mobile stations use the same System Time, offset by the propagation delay from the base station to the mobile station. See also Universal Coordinated Time.

Timer-Based Registration. A registration method in which the mobile station registers whenever a counter reaches a predetermined value. The counter is incremented an average of once per 80 ms period.

Time Reference. A reference established by the mobile station that is synchronous with the earliest arriving multipath component used for demodulation.

TOLR. See Transmit Objective Loudness Rating.

Traffic Channel. A communication path between a mobile station and a base station used for user and signaling traffic. The term Traffic Channel implies a Forward Traffic Channel and Reverse Traffic Channel pair. See also Forward Traffic Channel and Reverse Traffic Channel.

Traffic Channel Preamble. A sequence of all-zero frames that is sent at the 9600 bps rate by the mobile station on the Reverse Traffic Channel. The Traffic Channel preamble is sent during initialization of the Traffic Channel.

Transmit Objective Loudness Rating (TOLR). A perceptually weighted transducer gain of telephone transmitters relating sound pressure at the microphone to voltage at a reference electrical termination. It is normally specified in dB relative to one millivolt per Pascal. See IEEE Standard 269-1992, IEEE Standard 661-1979, CCITT Recommendation P.76, and CCITT Recommendation P.79.

Unique Challenge-Response Procedure. An exchange of information between a mobile station and a base station for the purpose of confirming the mobile station's identity. The procedure is initiated by the base station and is characterized by the use of a challenge-specific random number (i.e., RANDU) instead of the random variable broadcast globally (RAND).

Unique Random Variable (RANDU). A 24-bit random number generated by the base station in support of the Unique Challenge-Response procedure.

Universal Coordinated Time (UTC). An internationally agreed-upon time scale maintained by the Bureau International de l'Heure (BIH) used as the time reference by nearly all commonly available time and frequency distribution systems i.e., WWV, WWVH, LORAN-C, Transit, Omega, and GPS.

UTC. Universal Temps Coordiné. See Universal Coordinated Time.

Voice Channel. See Analog Voice Channel.

Voice Mobile Attenuation Code (VMAC). A 3-bit field in the Extended Address Word commanding the initial mobile power level when assigning a mobile station to an analog voice channel.

Voice Privacy. The process by which user voice transmitted over a CDMA Traffic Channel is afforded a modest degree of protection against eavesdropping over the air.

Walsh Chip. The shortest identifiable component of a Walsh function. There are 2^N Walsh chips in one Walsh function where N is the order of the Walsh function. On the Forward CDMA Channel, one Walsh chip equals 1/1.2288 MHz, or 813.802... ns. On the Reverse CDMA Channel, one Walsh chip equals 4/1.2288 MHz, or 3.255... µs.

Walsh Function. One of 2^N time orthogonal binary functions (note that the functions are orthogonal after mapping '0' to 1 and '1' to -1).

Zone-Based Registration. An autonomous registration method in which the mobile station registers whenever it enters a zone that is not in the mobile station's zone list.

µs. Microsecond.

1.1.2 Numeric Information

Numeric information is used to describe the operation of the mobile station. The following subscripts are used to clarify the use of the numeric information:

- "s" indicates a value stored in a mobile station's temporary memory.
- "sv" indicates a stored value that varies as a mobile station processes various tasks.
- "sl" indicates the stored limits on values that vary.
- "r" indicates a value received by a mobile station over a forward analog control channel or a CDMA Forward Channel.
- "p" indicates a value set in a mobile station's permanent security and identification memory.
- "s-p" indicates a value stored in a mobile station's semi-permanent security and identification memory.

1.1.2.1 Analog Numeric Information

$ACCOLC_p$ – A four-bit number used to identify which overload class field controls access attempts.

BIS_s – Identifies whether a mobile station must check for an idle-to-busy transition on a reverse analog control channel when accessing a system.

$CCLIST_s$ – The list of analog control channels to be scanned by a mobile station processing the Directed Retry Task (see 2.6.3.14).

$CMAX_s$ – The maximum number of channels to be scanned by a mobile station when accessing a system.

$COUNT_{s\text{-}p}$ – A modulo-64 count held in the mobile station. $COUNT_{s\text{-}p}$ is maintained during power-off.

CPA_s – Identifies whether the access functions are combined with the paging functions on the same set of analog control channels.

DCC_s – A DCC value stored in a mobile station's temporary memory.

DTX_s – Identifies in what way the mobile station is permitted to use the discontinuous transmission mode on the analog voice channel.

E_s – The stored value of the E field sent on the forward analog control channel. E_s identifies whether a home mobile station must send only $MIN1_p$ or both $MIN1_p$ and $MIN2_p$ when accessing the system.

EX_p – Identifies whether home mobile stations must send $MIN1_p$ or both $MIN1_p$ and $MIN2_p$ when accessing the system. EX_p differs from E_s in that the information is stored in the mobile station's security and identification memory.

$FIRSTCHA_s$ – The number of the first analog control channel used for accessing a system.

$FIRSTCHD_s$ – The number for the first channel used as a dedicated control channel.

$FIRSTCHP_p$ – The number of the first paging channel used as a paging channel in the mobile station's "home" system.

$FIRSTCHP_s$ – The number of the first analog control channel used for paging mobile stations.

$HOME\_SID_p$ – Home System Identification. A 15-bit value that identifies the home system for a MIN supported by the mobile station.

$LASTCHA_s$ – The number of the last analog control channel used for accessing a system.

$LASTCHD_s$ – The number for the last channel used as a dedicated control channel.

$LASTCHP_s$ – The number of the last analog control channel used for paging mobile stations.

$LOCAID_s$ – The received location area identity.

$LOCAID_{s\text{-}p}$ – Identifies the current location area.

$LRCC_s$ - The last registration control channel used by a mobile station.

LREG$_s$ – The stored value of the LREG field received in the most recent Location Area Global Action Message.

LT$_s$ – Identifies whether the next access attempt is required to be the last try.

MAXBUSY$_{sl}$ – The maximum number of busy occurrences allowed on a reverse analog control channel.

MAXSZTR$_{sl}$ – The maximum number of seizure attempts allowed on a reverse analog control channel.

MIN1$_p$ – The 24-bit number that corresponds to the 7-digit directory telephone number assigned to a mobile station.

MIN2$_p$ – The 10-bit number that corresponds to the 3-digit area code assigned to a mobile station.

N$_s$ – The number of analog paging channels that a mobile station must scan.

NBUSY$_{sv}$ – The number of times a mobile station attempts to seize a reverse analog control channel and finds the reverse control channel busy.

NSZTR$_{sv}$ – The number of times a mobile station attempts to seize a reverse analog control channel and fails.

NXTREG$_{s\text{-}p}$ – Identifies when a mobile station must make its next registration to a system.

PDREG$_s$ – The stored value of the PDREG field received in the most recent Location Area Global Action Message.

PL$_s$ – The mobile station RF power level.

PUREG$_s$ – The stored value of the PUREG field received in the most recent Location Area Global Action Message.

PUREG$_{s\text{-}p}$ – The semi-permanent value of PUREG$_s$.

R$_s$ – Indicates whether registration is enabled or not.

RAND$_s$ – The stored value of RAND. See 2.3.12.1.2.

RCF$_s$ – Identifies whether the mobile station must read a Control Filler Message before accessing a system on a reverse analog control channel.

REGID$_s$ – The stored value of the last registration number (REGID$_r$) received on a forward analog control channel.

REGINCR$_s$ – Identifies increments between registrations by a mobile station.

S$_s$ – Identifies whether the mobile station must send its serial number when accessing a system.

SCC$_s$ – A digital number that is stored and used to identify which SAT frequency a mobile station should be receiving.

SCM$_p$ – Station Class Mark. Defines mobile station parameters such as power class. See Table 2.3.3-1.

SDCC1$_s$ – The SDCC value stored in a mobile station's temporary memory.

$SDCC2_s$ – The SDCC value stored in a mobile station's temporary memory.

SID_p – The home system identification stored in the mobile station's permanent security and identification memory.

SID_r – The system identification received on a paging or access channel.

SID_s – The system identification received on a dedicated control channel.

$SID_{s\text{-}p}$ – Identifies the system of current (last successful) registration.

$SSD\_A_{s\text{-}p}$ – The 64 most significant bits of the Shared Secret Data. $SSD\_A_{s\text{-}p}$ is used for support of the authentication procedures.

$SSD\_B_{s\text{-}p}$ – The 64 least significant bits of the Shared Secret Data. $SSD\_B_{s\text{-}p}$ is used for message encryption.

$WFOM_s$ – Identifies whether a mobile station must wait for an Overhead Message Train before accessing a system on a reverse analog control channel.

1.1.2.2 CDMA Numeric Information

The following are internal values stored by the mobile station in temporary memory which are not sent over the air. See Appendix F for values stored by the mobile station in permanent and semi-permanent memory.

ACC_CHAN_s - Number of Access Channels supported by the current Paging Channel.

$ACC\_MSG\_SEQ_s$ - Last received *Access Parameters Message* sequence number.

ACC_TMO_s - Access Channel acknowledgement timeout, in units of 80 ms.

$ACK\_WAITING_s[i]$ – Acknowledgement status indicator for message sequence number i. Set to YES if an acknowledgement is pending for the message; otherwise, set to NO.

AGE_s – Neighbor list age. For each pilot in the Neighbor Set, the mobile station increments this counter each time a *Neighbor List Message* is received. When AGE_s exceeds NGBHR_MAX_AGE, the pilot is deleted from the Neighbor Set.

$ANALOG\_CHAN_s$ - Analog channel number for CDMA-to-analog handoff.

$AUTH_s$ - Current authentication mode.

BAD_FRAMES_s – Bad frames count. The number of received bad frames.

$BASE\_CLASS_s$ - Base station class of the current base station.

$BASE\_ID_s$ - Base station identification of the current base station.

$BASE\_LAT_s$ - Latitude of the current base station, in units of 0.25 seconds.

$BASE\_LONG_s$ - Longitude of the current base station, in units of 0.25 seconds.

$BKOFF_s$ - Access Channel probe sequence backoff range.

$CDMACH_s$ – CDMA Channel number. The CDMA Channel number currently used by the mobile station.

$CHAN\_LST\_MSG\_SEQ_s$ – *CDMA Channel List Message* sequence number.

CODE_CHAN$_s$ - Code channel for channel assignment or CDMA-to-CDMA handoff.

CONFIG_MSG_SEQ$_s$ - Current message sequence number for the *System Parameters Message*, *Neighbor List Message* and *CDMA Channel List Message*.

COUNTER_ENABLED$_s$ – Timer-based registration indicator. Set to YES if timer-based registration is enabled; otherwise, set to NO.

CURR_ACC_MSG_SEQ – Current *Access Parameter Message* sequence number.

DAYLT$_s$ - Daylight Savings Time indicator.

DECORR - Hashing function input used to decorrelate hashing function applications for the same mobile station.

DISTANCE – Distance from registered base station to current base station, used for distance-based registration.

ENCRYPT_MODE$_s$ - Current message encryption mode.

FOR_NID_REG$_s$ - Foreign NID roamer autonomous registration enable.

FOR_SID_REG$_s$ - Foreign SID roamer authonomous registration enable.

FRAME_OFFSET$_s$ - Current Traffic Channel frame offset, in units of 1.25 msec.

HASH_KEY - Hashing function input that determines the return value. Derived from either the MIN or ESN, depending upon the application.

HOME_REG$_s$ - Home (non-roaming) autonomous registration enable.

INIT_PWR$_s$ - Initial power offset for Access Channel probes.

LC_STATE$_s$ - Long code state obtained from the *Sync Channel Message*.

LP_SEC$_s$ - Leap seconds count (offset of CDMA system time from UTC).

LTM_OFF$_s$ - Local time offset from UTC, in units of 15 minutes.

MAX_CAP_SZ$_s$ - Maximum number of Access Channel frames in an Access Channel message capsule, less 3.

MAX_REQ_SEQ$_s$ - Maximum number of access probe sequences for an Access Channel request.

MAX_RSP_SEQ$_s$ - Maximum number of access probe sequences for an Access Channel response.

MAX_SLOT_CYCLE$_s$ - Maximum value of the slot cycle index allowed by the current base station.

MEM$_s$ - Analog message encryption mode for CDMA-to-analog handoff.

MIN_P_REV$_s$ - Minimum mobile station protocol revision level required for access to the CDMA system.

MOB_TERM$_s$ - Mobile station termination indicator. Set to '1' if the mobile station will accept mobile station terminated calls in its current roaming status.

MSG_PSIST$_s$ - Persistence modifier for Access Channel message transmissions.

MSG_SEQ_ACK$_s$ – Next message sequence number for messages requiring acknowledgement.

MSG_SEQ_NOACK$_s$ – Next message sequence number for messages not requiring acknowledgement.

MSG_SEQ_RCVD$_s$[i] – Received message indicator for message sequence number i. Set to YES if message sequence number i has been received. Set to NO when message sequence number (i+4) modulo 8 has been received.

MULT_NIDS$_s$ - Multiple NID storage indicator. Set to '1' if the mobile station may store more than one entry in SID_NID_LIST$_s$ for each SID.

MULT_SIDS$_s$ - Multiple SID storage indicator. Set to '1' if the mobile station may store entries in SID_NID_LIST$_s$ having different SIDs.

NGHBR_LST_MSG_SEQ$_s$ – *Neighbor List Message* sequence number.

NGHBR_MAX_AGE$_s$ - Neighbor set maximum age for retention in the set.

NID$_s$ - Network identification. A network is a subset of the base stations within a cellular system.

NOM_PWR$_s$ - Nominal transmit power offset. A correction factor to be used by mobile stations in the open loop power estimate.

NUM_STEP$_s$ - Number of access probes in a single acess probe sequence.

PAGECH$_s$ – Current CDMA Paging Channel number.

PAGED - Indicator for a page match detected while the mobile station is in the *System Access State*.

PAGE_CHAN$_s$ - Number of Paging Channels supported on the current CDMA channel.

PAM_SZ$_s$ - Number of frames in the Access Channel preamble, less 1.

PARAMETER_REG$_s$ - Parameter-change registration enable.

PGSLOT - Value obtained from the hashing function, used to determine the mobile station's assigned Paging Channel slots.

PILOT_ARRIVAL – Time of occurrence, as measured at the mobile station antenna connector, of the earliest arriving usable multipath component of the pilot. The arrival time is measured relative to the mobile station's time reference.

PILOT_INC$_s$ – Pilot PN sequence offset index increment. The interval between pilots, in units of 64 PN chips, for base stations in a system.

PILOT_PN$_s$ - Pilot Channel PN sequence offset, in units of 64 PN chips, for a base station.

PILOT_PN_PHASE - Calculated Pilot Channel PN phase, in chips, including the PN sequence offset and the arrival time relative to the mobile station's time reference.

POWER_DOWN_REG$_s$ - Power down registration enable indicator.

POWER_UP_REG$_s$ - Power up registration enable indicator.

PRAT$_s$ - Data rate of the Paging Channels.

P_REV$_s$ - Protocol revision level supported by a base station.

PROBE_BKOFF$_s$ - Access Channel probe backoff range, in slots.

PROBE_PN_RAN$_s$ - Range for hashing function selection of the delay prior to transmission of Access Channel probes. Value is $\log_2$(range + 1).

PSIST$_s$ - Persistence value for the mobile station's overload class.

PWR_REP_DELAY$_s$ - Power report delay. The period that the mobile station waits following an autonomous *Power Measurement Report* before restarting frame counting for power control purposes.

PWR_REP_FRAMES$_s$ - Power control reporting frame count. The number of frames over which the mobile station is to count frame errors. Value is 2 × $\log_2$(frames / 5).

PWR_REP_MODE$_s$ - Power report mode indicator. Set to '1' if periodic reports are to be made, and set to '0' if reports are made only on detection of a number of errors above the specified threshold.

PWR_REP_THRESH$_s$ - Power control reporting threshold. The number of bad frames to be received in a measurement period before the mobile station is to generate a *Power Measurement Report Message*.

PWR_STEP$_s$ - Power increment for successive access probes, in units of 0.5 dB.

RA – Random access channel number. The Access Channel number generated (pseudo-randomly) by the mobile station.

RAND$_s$ - Authentication random challenge value.

RANDOM_TIME – Random time. A portion of SYS_TIME used to seed the random number generator.

REG_COUNT$_s$ – Timer-based registration count. The timer-based registration counter.

REG_COUNT_MAX$_s$ – Timer-based registration count limit. The timer-based registration counter expiration value computed from REG_PRD$_r$.

REG_DIST$_s$ - Registration distance. Distance from last registration that causes a distance-based registration to occur.

REG_ENABLED$_s$ – Autonomous registrations enabled indicator.

REG_PRD$_s$ - Registration period. The time interval between timer-based registrations. Value is 4 × $\log_2$(time / 0.08 s).

REG_PSIST$_s$ - Persistence modifier for registration accesses (except ordered registrations).

REG_ZONE$_s$ - Registation zone number of the base station.

RETRY_COUNT$_s$ – Message retransmission count. Counter used to determine when the maximum number of retransmissions has been exceeded for a given message.

RN – PN randomization delay. The delay in PN chips generated (pseudorandomly) by the mobile station prior to performing an access attempt.

RS – Inter-probe sequence backoff. The delay in slots generated (pseudorandomly) by the mobile station following an unsuccessful access probe sequence or prior to the first access probe in a response attempt.

RT – Inter-probe backoff. The delay in slots generated (pseudorandomly) by the mobile station following an unacknowledged access probe.

SCC$_s$ - SAT color code for analog channel assignment and CDMA-to-analog handoff.

SERVSYS$_s$ – Selected serving system indicator. Set to SYS_A if the current CDMA Channel is in system A's frequency band. Otherwise set to SYS_B.

SID$_s$ - System identifier.

SID_NID_LIST$_s$ – Registration SID, NID list. The SID, NID pairs in which the mobile station has registered.

SLOT_CYCLE_INDEX$_s$ - Slot cycle index. Equal to the smaller of SLOT_CYCLE_INDEX$_p$ and the received maximum slot cycle index.

SLOT_NUM – Paging Channel slot number.

SO_CUR$_s$ – Active service option number. The number of the service option active in the mobile station.

SO_REQ$_s$ – Service option request number. The number of the service option requested by the mobile station.

SRCH_WIN_A$_s$ - Search window size for the Active Set and Candidate Set.

SRCH_WIN_N$_s$ - Search window size for the Neighbor Set.

SRCH_WIN_R$_s$ - Search window size for the Remaining Set.

SYS_PAR_MSG_SEQ$_s$ – *System Parameters Message* sequence number.

SYS_TIME$_s$ - Current value of CDMA system time as received in the *Sync Channel Message*.

TA – Acknowledgement response timeout.

T_ADD$_s$ - Pilot detection threshold.

T_COMP$_s$ - Active Set versus Candidate Set comparison threshold.

T_DROP$_s$ - Pilot drop threshold.

TOTAL_ZONES$_s$ - Number of registration zones to be retained in ZONE_LIST$_s$.

TOT_FRAMES$_s$ – Total frames received. The total number of received frames, counted for Forward Traffic Channel power control.

T_TDROP$_s$ - Pilot drop timer value.

VMAC$_s$ - Analog voice mobile station attenuation code for analog channel assignment or CDMA-to-analog handoff.

ZONE_LIST$_s$ – Registration zone list. List of zones in which the mobile station has registered.

ZONE_TIMER$_s$ - Zone timer length.

1.2 CDMA System Time

All base station digital transmissions are referenced to a common CDMA system-wide time scale that uses the Global Positioning System (GPS) time scale, which is traceable to and synchronous with Universal Coordinated Time (UTC). GPS and UTC differ by an integer number of seconds, specifically the number of leap second corrections added to UTC since January 6, 1980. The start of CDMA System Time is January 6, 1980 00:00:00 UTC, which coincides with the start of GPS time.

System Time keeps track of leap second corrections to UTC but does not use these corrections for physical adjustments to the System Time clocks.

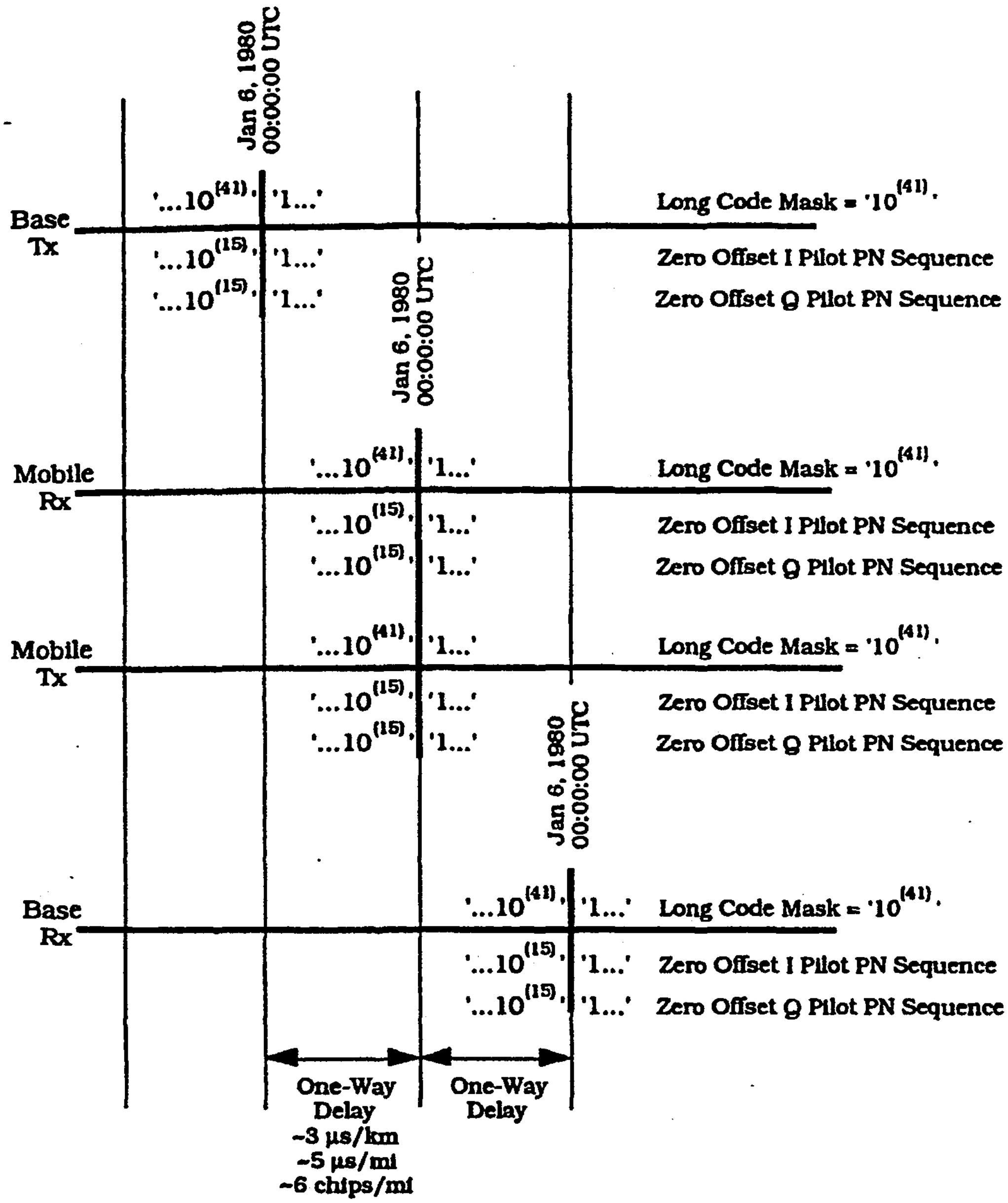
Figure 1.2-1 shows the relation of System Time at various points in the CDMA system. The long code and the zero offset pilot PN sequences for the I and Q channels (see 6.1.3.1.8, 6.1.3.1.9, 7.1.3.1.6, and 7.1.3.1.9) are shown in their initial states at the start of System Time. The initial state of the long code is that state in which the output of the long code generator is the first '1' output following 41 consecutive '0' outputs, with the binary mask consisting of '1' in the MSB followed by 41 '0's. Referring to the shift register in Figure 6.1.3.1.8-1, this implies that the 42nd bit in the shift register equals '1' and that all other bits in the shift register are equal to '0'. The initial state of the pilot PN sequence, both I and Q, is that state in which the output of the pilot PN sequence generator is the first '1' output following 15 consecutive '0' outputs. The alignment of the initial states of the long code and the pilot PN sequence does not occur again for more than 37 centuries.

From Figure 1.2-1, note that the System Time at various points in the transmission and the reception processes is the absolute time referenced at the base station antenna offset by the one-way or round-trip delay of the transmission, as appropriate. Time measurements are referenced to the transmit and receive antennas of the base station and the RF connector of the mobile station. The precise zero instant of System Time is the midpoint between the last '0' of the 41 consecutive '0' outputs and the succeeding '1' of the long code using the binary mask consisting of '1' in the MSB followed by 41 '0's.

Wherever this document refers to CDMA System time in frames, it is taken to mean an integer value t such that:

$$t = \lfloor s/0.02 \rfloor,$$

where s represents System Time in seconds.



Note: Time measurements are made at the antennas of base stations and the RF connectors of the mobile stations.

$0^{(n)}$ denotes a sequence of n consecutive zeroes.

Figure 1.2-1. System Time Line

1.3 Tolerances

1.3.1 Analog System Tolerances

Unless otherwise specified, all call-processing timers and call-processing timing values have a tolerance of ±10%. Tolerances of other parameters are provided for guidance only. Refer to IS-98 "Recommended Minimum Performance Standards for Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations" and IS-97 "Recommended Minimum Performance Standards for Base Stations Supporting Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations," for minimum standards, definitions, tolerances, and measurement methods.

1.3.2 CDMA Tolerances

Unless otherwise specified, all values indicated in Sections 6, 7, and the referenced appendices are exact unless an explicit tolerance is stated. Also refer to IS-98 "Recommended Minimum Performance Standards for Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations" and IS-97 "Recommended Minimum Performance Standards for Base Stations Supporting Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations."

No text.

2 REQUIREMENTS FOR MOBILE STATION ANALOG OPERATION

(See also Section 4 for Mobile Station Options.)

2.1 Transmitter

2.1.1 Frequency Parameters

2.1.1.1 Channel Spacing and Designation

Channel spacing shall be 30 kHz and the dual-mode mobile station transmit channel at 825.030 MHz (and the corresponding base station transmit channel at 870.030 MHz) shall be termed channel number 1. The 20 MHz range of channels 1 through 666 as shown in Table 2.1.1.1-1 for System A and System B is basic. The additional 5 MHz of channels 667 through 799 and (wrap-around) 991 through 1023 for extending System A (A', A") and B (B') is mandatory. The station class mark (SCM, see 2.3.3) shall be set appropriately.

Table 2.1.1.1-1. Channel Numbers and Frequencies

System	Bandwidth (MHz)	Number of Channels	Boundary Channel Number	Transmitter Center Frequency (MHz)	
				Mobile	Base
(Not used)		1	(990)	(824.010)	(869.010)
A''	1	33	991	824.040	869.040
			1023	825. 000	870. 000
A	10	333	1	825.030	870.030
			333	834.990	879.990
B	10	333	334	835.020	880.020
			666	844.980	889.980
A'	1.5	50	667	845.010	890.010
			716	846.480	891.480
B'	2.5	83	717	846.510	891.510
			799	848.970	893.970

In the above, the center frequency in MHz corresponding to the channel number (expressed as N) is calculated as follows.

Transmitter	Channel Number	Center Frequency (MHz)
Mobile	$1 \le N \le 799$	$0.030\ N + 825.000$
	$990 \le N \le 1023$	$0.030\ (N - 1023) + 825.000$
Base	$1 \le N \le 799$	$0.030\ N + 870.000$
	$990 \le N \le 1023$	$0.030\ (N - 1023) + 870.000$

2.1.1.2 Frequency Tolerance

The mobile station carrier frequency must be maintained within ±2.5 parts per million (ppm) of any assigned channel frequency, except during channel switching (see 2.1.2.1). This tolerance must be maintained over the ambient temperature range of -30°C to +60°C, and over the supply voltage range of ±15 percent from the nominal value.

2.1.2 Power Output Characteristics

2.1.2.1 Carrier On/Off Conditions

The carrier-off condition is defined as a power output at the transmitting antenna connector not exceeding -60 dBm. When commanded to the carrier-on condition on a reverse control channel, a mobile station transmitter must come to within 3 dB of the specified output power (see 2.1.2.2) and to within the required stability (see 2.1.1.2) within 2 ms. Conversely, when commanded to the carrier-off condition, the transmit power must fall to a level not exceeding -60 dBm within 2 ms. Whenever a transmitter is more than 1 kHz from its initial or final value during channel switching, the transmitter carrier must be inhibited to a power output level not greater than -60 dBm.

2.1.2.2 Power Output and Power Control

The maximum effective radiated power (ERP) with respect to a half wave dipole for any class mobile station transmitter is 8 dBW (6.3 Watts). An inoperative antenna assembly must not degrade the spurious emission levels as defined in 2.1.4.2. The nominal ERP for each class of mobile station transmitter is: Class I 6 dBW (4.0 Watts), Class II 2 dBW (1.6 Watts), Class III -2 dBW (0.6 Watts).

A mobile station transmitter must be capable of reducing or increasing power on command from a base station specifying the power level 0 to 7. The nominal levels are given in Table 2.1.2.2-1. Each power level must be maintained within the range of +2 dB/-4 dB of its nominal level over the ambient temperature range of -30°C to +60°C, and over the supply voltage range of ±10 percent from the nominal value, accumulative. A power change command will raise or lower power in increments of 4 dB.

All classes of mobile stations will respond to a CMAC or a VMAC command by setting their transmit power to the appropriate Mobile Station Power Level, regardless of prior Mobile Station Power Level.

Table 2.1.2.2-1. Mobile Station Nominal Power Levels

Mobile Station Power Level (PL)	Mobile Attenuation Code (MAC)	Nominal ERP (dBW) for Mobile Station Power Class		
		I	II	III
0	000	6	2	- 2
1	001	2	2	-2
2	010	- 2	- 2	- 2
3	011	- 6	- 6	- 6
4	100	-10	-10	-10
5	101	-14	-14	-14
6	110	-18	-18	-18
7	111	-22	-22	-22

2.1.3 Modulation Characteristics

2.1.3.1 Voice Signals

The modulator is preceded by the following five voice-processing stages (in the order listed):

- Transmit Audio Level Adjustment
- Compressor
- Pre-Emphasis
- Deviation Limiter
- Post Deviation-Limiter Filter

Pending the generation of a complete speech transmission plan for dual-mode cellular systems, the following requirements shall be met to ensure compatibility with the transmission plan for fixed digital speech networks.

2.1.3.1.1 Compressor

This stage is the compressor portion of a 2:1 syllabic compandor. For every 2 dB change in input level to a 2:1 compressor within its operating range, the change in output level is a nominal 1 dB. The compressor must have a nominal attack time of 3 ms and a nominal recovery time of 13.5 ms as defined by the CCITT (Reference: Recommendation G162, CCITT Plenary Assembly, Geneva, May-June 1964, Blue Book, Vol. 111, P. 52). The nominal reference input level to the compressor is that corresponding to a 1000 Hz acoustic tone at the expected nominal speech volume level. This level must produce a nominal ±2.9 kHz peak frequency deviation of the transmitted carrier.

2.1.3.1.2 Pre-Emphasis

The pre-emphasis characteristic must have a nominal +6 dB/octave response between 300 and 3000 Hz.

2.1.3.1.3 Deviation Limiter

For audio (voice) inputs applied to the transmitter voice-signal processing stages, a dual-mode mobile station operating in analog mode must limit the instantaneous frequency deviation to ±12 kHz. This requirement excludes supervision signals (see 2.4) and wideband data signals (see 2.1.3.2).

2.1.3.1.4 Post Deviation-Limiter Filter

The deviation limiter must be followed by a low-pass filter whose characteristics are:

Frequency Band	Attenuation Relative to 1000 Hz
3000 - 5900 Hz	≥ 40 log (f/3000) dB
5900 - 6100 Hz	≥ 35 dB
6100 - 15000 Hz	≥ 40 log (f/3000) dB
above 15000 Hz	≥ 28 dB

2.1.3.1.5 Transmit Level Adjustment

The mobile station shall have a transmit objective loudness rating (TOLR) equal to -46 dB, when transmitting to a reference base station (see 3.2.2.1). The loudness ratings are described in IEEE Standard 661-1979. Measurement techniques are described in IS-98 "Recommended Minimum Performance Standards for Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations."

2.1.3.2 Wideband Data Signals

2.1.3.2.1 Encoding

The reverse control channel (RECC) and reverse voice channel (RVC) wideband data streams (see 2.7) must be further encoded such that each nonreturn-to-zero binary one is transformed to a zero-to-one transition, and each nonreturn-to-zero binary zero is transformed to a one-to-zero transition.

2.1.3.2.2 Modulation and Polarity

The filtered wideband data stream must then be used to modulate the transmitter carrier using direct binary frequency shift keying. A one (i.e., high state) into the modulator must correspond to a nominal peak frequency deviation 8 kHz above the carrier frequency, and a zero into the modulator must correspond to a nominal peak frequency deviation 8 kHz below the carrier frequency.

2.1.4 Limitations on Emissions

2.1.4.1 Bandwidth Occupied

Modulation products outside the region ±20 kHz from the carrier shall not exceed a level of 26 dB below the unmodulated carrier. Modulation products outside the region of ±45 kHz from the carrier shall not exceed a level of 45 dB below the unmodulated carrier. Modulation products outside the region of ±90 kHz from the carrier shall not exceed a level of (a) 60 dB below the unmodulated carrier, or (b) 43 plus 10 $\log_{10}$ (mean output power in Watts) dB below the unmodulated carrier, whichever is the higher level of power. Measurement techniques are defined in the current IS-98 "Recommended Minimum Performance Standards for Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations."

2.1.4.2 Conducted Spurious Emissions

Refer to IS-98 "Recommended Minimum Performance Standards for Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations."

2.1.4.3 Radiated Spurious Emissions

Refer to IS-98 "Recommended Minimum Performance Standards for Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations."

2.2 Receiver

2.2.1 Frequency Parameters

2.2.1.1 Channel Spacing and Designation

Channel spacing shall be 30 kHz and the dual-mode mobile station receive channel at 870.030 MHz (and the corresponding base station receive channel at 825.030 MHz) shall be termed channel number 1. The 20 MHz range of channels 1 through 666 as shown in Table 2.1.1.1-1 for System A and System B is basic. The additional 5 MHz of channels 667 through 799 and (wrap-around) 991 through 1023 for extending Systems A and B is mandatory. In either case, the station class mark (SCM, see 2.3.3) shall be set appropriately.

2.2.2 Demodulation Characteristics

2.2.2.1 Voice Signals

The demodulator is followed by the following three voice-signal processing stages:

- De-emphasis
- Expandor
- Receive Audio Level Adjustment

Pending the generation of a complete speech transmission plan for dual-mode cellular systems, the following requirements shall be met to ensure compatibility with the transmission plan for fixed digital speech networks.

2.2.2.1.1 De-Emphasis

The de-emphasis characteristic must have a nominal -6 dB per octave response between 300 and 3000 Hz.

2.2.2.1.2 Expandor

This stage is the expandor portion of a 2:1 syllabic compandor. For every 1 dB change in input level to a 1:2 expandor, the change in output level is a nominal 2 dB. The signal expansion must follow all other demodulation signal processing (including the 6 dB/octave de-emphasis and filtering). The expandor must have a nominal attack time of 3 ms and a nominal recovery time of 13.5 ms as defined by the CCITT (Reference: Recommendation G162, CCITT Plenary Assembly, Geneva, May-June 1964, Blue Book, Vol. 111, P. 52). The nominal reference input level to the expandor is that corresponding to a 1000 Hz tone from a carrier with a ±2.9 kHz peak frequency deviation.

2.2.2.1.3 Audio Level Adjustment

The mobile station shall have a nominal receive objective loudness rating (ROLR) equal to 51 dB when receiving from a reference base station (see 3.1.3.1). The loudness ratings are described in IEEE Standard 661-1979. Measurement techniques are described in IS-98 "Recommended Minimum Performance Standards for Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations."

2.2.3 Limitations on Emissions

2.2.3.1 Conducted Spurious Emissions

2.2.3.1.1 Suppression Inside Cellular Band

Any RF signals emitted in the mobile station's receive band must not exceed -80 dBm, as measured at the antenna connector. Additionally, signals in the mobile station's transmit band must not exceed -60 dBm, as measured at the antenna connector.

2.2.3.1.2 Suppression Outside Cellular Band

Refer to IS-98 "Recommended Minimum Performance Standards for Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations."

2.2.3.2 Radiated Spurious Emissions

Refer to IS-98 "Recommended Minimum Performance Standards for Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations."

2.2.4 Other Receiver Parameters

System performance is predicated upon receivers meeting IS-98 "Recommended Minimum Performance Standards for Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations."

2.3 Security and Identification

2.3.1 Mobile Identification Number

The mobile identification number (MIN) is a 34-bit binary number which is derived from a 10-digit directory telephone number by the following procedure.

	$MIN2_p$	$MIN1_p$		
	NPA	NXX	X	XXX
bits	10	10	4	10

(1) The first three digits are mapped into 10 bits (corresponding to $\{MIN2_p\}$) by the following coding algorithm:

(a) Represent the 3-digit field as $D_1 D_2 D_3$ with the digit 0 having the value 10.

(b) Compute $100D_1 + 10D_2 + D_3 - 111$.

(c) Convert the result in step (b) to binary by a standard decimal-to-binary conversion (see table below).

(2) The second three digits are mapped into the 10 most significant bits of $MIN1_p$ by the coding algorithm described in (1).

(3) The last four digits are mapped into the 14 least-significant bits of $MIN1_p$ as follows:

(a) The thousands digit should be mapped into four bits by a Binary-Coded-Decimal (BCD) conversion, as specified in the table below.

(b) The last three digits are mapped into 10 bits by the coding algorithm described in (1).

DECIMAL-TO-BINARY CONVERSION		THOUSANDS-DIGIT BCD MAPPING PROCEDURE	
Decimal Number	Binary Number	Thousands Digit	Binary Sequence
1	0000000001	1	0001
2	0000000010	2	0010
3	0000000011	3	0011
4	0000000100	4	0100
		5	0101
		6	0110
		7	0111
998	1111100110	8	1000
999	1111100111	9	1001
		0	1010

In the following example the 10-digit directory telephone number 321-456-7890 is encoded into MIN2 and MIN1 using the procedure described above:

- MIN2. The 10-bit MIN2 is derived from the first three digits of the telephone number (i.e., 321):

  (a) $D_1 = 3; D_2 = 2; D_3 = 1$.

  (b) $100\,D_1 + 10\,D_2 + D_3 - 111 = 100(3) + 10(2) + (1) - 111 = 210$.

  (c) 210 in binary is '00 1101 0010'.

  Therefore MIN2 is '00 1101 0010'.

- MIN1. The 10 most significant bits of MIN1 are derived from the second three digits of the telephone number (i.e., 456):

  (a) $D_1 = 4; D_2 = 5; D_3 = 6$

  (b) $100\,D_1 + 10\,D_2 + D_3 - 111 = 100(4) + 10(5) + (6) - 111 = 345$.

  (c) 345 in binary is '0101 0110 01'.

The next four most significant bits of MIN1 are derived from the thousands digit of the telephone number (i.e., 7) by BCD conversion:

7 in BCD is '0111'.

The 10 least significant bits of MIN1 are derived from the last three digits of the telephone number (i.e., 890):

(a) $D_1 = 8; D_2 = 9; D_3 = 10$.

(b) $100\,D_1 + 10\,D_2 + D_3 - 111 = 100(8) + 10(9) + (10) - 111 = 789$.

(c) 789 in binary is '11 0001 0101'.

Therefore MIN1 is '0101 0110 0101 1111 0001 0101'.

2.3.2 Electronic Serial Number (ESN)

The ESN is a 32-bit binary number that uniquely identifies the mobile station to any cellular system. It must be factory-set and not readily alterable in the field. Modification of the ESN will require a special facility not normally available to subscribers. The circuitry that provides the ESN must be isolated from fraudulent contact and tampering. Electronic storage devices mounted in sockets or connected with a cable are deemed not to comply with this requirement. Attempts to change the ESN circuitry must render the mobile station inoperative.

The bit allocation of the ESN shall be as follows:

BITS	31 24	23 18	17 0
	MFR CODE	RESERVED	SERIAL NUMBER
	<—	ESN	—>

At the time of issuance of initial type acceptance, the manufacturer shall be assigned a Manufacturer's (MFR) Code within the eight most-significant bits (bit 31 through bit 24) of the 32-bit serial number. Bits 23 through 18 shall be reserved (initially all zero), and bits 17 through 0 shall be uniquely assigned by each manufacturer. When a manufacturer has used substantially all possible combinations of serial numbers within bits 17 through 0, the manufacturer may submit notification to the FCC. The FCC will allocate the next sequential binary number within the reserve block (bits 23 through 18).

2.3.3 Station Class Mark

Class-of-station information referred to as the station class mark (SCM_p) must be stored in a mobile station. The digital representation of this class mark is specified in Table 2.3.3-1.

Table 2.3.3-1. Station Class Mark

Function	Bit(s)	Setting	
Reserved	7	Always 0	0XXXXXXX
Dual Mode	6	CDMA Only	X0XXXXXX
		Dual Mode	X1XXXXXX
Slotted Class	5	Non-Slotted	XX0XXXXX
		Slotted	XX1XXXXX
IS-54 Power Class	4	Always 0	XXX0XXXX
25 MHz Bandwidth	3	Always 1	XXXX1XXX
Transmission	2	Continuous	XXXXX0XX
		Discontinuous	XXXXX1XX
Power Class	1 - 0	Class I	XXXXXX00
		Class II	XXXXXX01
		Class III	XXXXXX10
		Reserved	XXXXXX11

The least significant 5 bits of the dual-mode SCM are used when operating in the analog mode (see 2.7.1.1); all bits are used when operating in the CDMA mode.

2.3.4 Registration Memory

(See 6.3.4 for registration memory when operating in the CDMA mode.)

2.3.4.1 Autonomous Registration Memory

A single 21-bit (20 data bits plus an overflow bit) next registration indicator ($NXTREG_{s-p}$) and corresponding 15-bit system identification indicator (SID_{s-p}) pair must be retained when the mobile station power is turned off. The data retention time under power-off condition must be longer than 48 hours. If the integrity of the stored data can not be guaranteed after the mobile station is disconnected from the vehicle battery, then the memory must be set to zero when power is re-applied to the mobile station.

2.3.4.2 Location Area Memory

A 12-bit location area identifier ($LOCAID_{s-p}$) must be stored in the mobile station and used to identify changes in location area (see 2.6.2.1). The $LOCAID_{s-p}$ value must be retained when the mobile station power is turned off. The data retention time under power-off condition must be longer than 48 hours. If the integrity of the stored data cannot be guaranteed after the mobile station is disconnected from the vehicle battery, then the memory must be set to zero when power is re-applied to the mobile station.

A 1-bit power-up registration identifier ($PUREG_{s-p}$) must be stored in the mobile station and used to identify changes in the power-up registration flag (see 2.6.2.1). The $PUREG_{s-p}$ value must be retained when the mobile station power is turned off. The data retention time under power-off condition must be longer than 48 hours. If the integrity of the stored data cannot be guaranteed after the mobile station is disconnected from the vehicle battery, then the memory must be set to zero when power is re-applied to the mobile station.

2.3.5 Access Overload Class

A 4-bit overload class indicator ($ACCOLC_p$) is used to identify which overload class controls access attempts by the mobile station (see 2.6.3.4 and 6.6.3.1).

The mobile station shall store a 4-bit access overload class ($ACCOLC_p$). Mobile stations that are not for test or emergency use should be assigned to overload classes ACCOLC 0 through ACCOLC 9 according to a uniform distribution. Mobile stations designated for test use should be assigned to ACCOLC 10, while mobile stations designated for emergency use should be assigned to ACCOLC 11. ACCOLC 12 through ACCOLC 15 are reserved.[1]

2.3.6 Extended Address Method

A 1-bit access method indicator (EX_p) must be stored in the mobile station and used to determine if the extended address word must be included in all access attempts (see 2.6.3.7).

2.3.7 First Paging Channel

An 11-bit first paging channel ($FIRSTCHP_p$) must be stored in the mobile station and used to identify the channel number of the first paging channel when the mobile station is "home" (see 2.6.1.1.2).

2.3.8 Home System Identification

A 15-bit system identification indicator ($HOME\_SID_p$) must be stored in the mobile station and used to identify the mobile station's home system (see 2.6.1.1.2). The bit allocation of the system identification indicator shall be as follows:

14 — 13	12 — 0
INTL CODE	SYSTEM NUMBER

[1]For more information, refer to EIA Telecommunications Systems Bulletin No. 16 (March 1985), "Assignment of Access Overload Classes in the Cellular Telecommunications Services."

The international (INTL) codes (bits 14 and 13) shall be allocated as follows:

BIT 14	BIT 13	
0	0	United States
0	1	Other countries
1	0	Canada
1	1	Mexico

Bits 12 through 0 will be assigned to each U.S. system by the FCC. See EIA/TIA Telecommunications Services Bulletin TSB29 (International Implementation of Cellular Radiotelephone Systems Compliant with ANSI/EIA/TIA-533) for international SID coding requirements.

2.3.9 Local Control Option

A means must be provided within the mobile station to enable or disable the local control option.

2.3.10 Preferred Operation Selection

2.3.10.1 Preferred System

A means shall be provided within the mobile station to identify the preferred system as either System A or System B. In addition, the mobile station may provide a means for allowing operation only with System A or System B.

2.3.10.2 Preferred CDMA or Analog

A means may be provided within the mobile station to identify the preferred operation type as either CDMA mode or analog mode. In addition, the mobile station may provide a means for allowing operation only with the analog or CDMA mode.

2.3.11 Discontinuous Transmission

Discontinuous transmission refers to the ability of certain mobile stations to switch autonomously between two transmitter power-level states ("DTX-high" and "DTX-low") while the mobile station is in the conversation state on an analog voice channel. Discontinuous transmission is not permitted in any state other than the conversation state.

In the DTX-high state, the transmitter radiates at the power level indicated by the most recent power-controlling order (initial-voice-channel-designation, handoff, or power-change order) received by the mobile station. In this state the mobile station must transpond SAT at all times, except for the normal suspensions of SAT covered in 2.4.1.

In the DTX-low state, the transmitter radiates at a power level determined by the DTX-high-state power level ("DTX-high level") and the DTX$_8$ indicator that is copied from the DTX field in Word 2 of the System Parameter Overhead Message (see 3.7.1.2.1). If the DTX$_8$ indicator is set to '10', the DTX-low level must equal or exceed a level that is 8 dB below the DTX-high level. If the DTX$_8$ indicator is set to '11', no minimum applies to the DTX-low level; that is, the transmitter may be turned off or it may be turned on at any level up to the DTX-high level. In the DTX-low state, the mobile station must not transpond SAT. If the DTX$_8$ indicator is set to '00', only the DTX-high state (that is "continuous transmission") is permitted. The DTX$_8$ indicator setting of '01' is reserved.

When a mobile station switches from the DTX-high state to the DTX-low state, it must pass through a transition state in which the transmitted power is at the DTX-high level but SAT is not transponded. The sequence must be as follows: starting in the DTX-high state, enter the transition state; remain in the transition state 300 ms; enter the DTX-low state.

When a mobile station switches from the DTX-low state to the DTX-high state, it must begin transponding SAT immediately after changing the power level, except for the normal suspensions of SAT covered in 2.4.1. Each time that the mobile station enters the DTX-high state, it must remain in that state for at least 1.5 seconds, unless it enters the DTX-high state in response to an audit order in which case it must remain in that state for at least 5 seconds. (Note that any requirement for the mobile station to remain in the DTX-high state for a certain minimum time interval does not prohibit the mobile station from leaving the conversation state before the interval ends.)

2.3.12 Authentication, Encryption of Signaling Information/User Data

Note: Messages received during the authentication procedures that are unrelated to the authentication process shall also be processed.

2.3.12.1 Authentication

Authentication is the process by which information is exchanged between a mobile station and base station for the purpose of confirming the identity of the mobile station. A successful outcome of the authentication process occurs only when it can be demonstrated that the mobile station and base station possess identical sets of shared secret data.

The authentication algorithms are described in "Common Cryptographic Algorithms." The interface (input and output parameters) for the algorithms are described in "Interface Specification for Common Cryptographic Algorithms." Table 2.3.12.1-1 summarizes the setting of the input parameters of the Auth_Signature procedure for each of its uses in this standard.

Table 2.3.12.1-1. Auth_Signature Input Parameters

Procedure	RAND_CHALLENGE	ESN	AUTH_-DATA	SSD_-AUTH	SAVE_-REGISTERS
Registration (2.3.12.1.4)	$\mathrm{RAND_s}$	$\mathrm{ESN_p}$	MIN1	SSD_A	FALSE
Unique Challenge (2.3.12.1.5)	256 × RANDU + (8 LSBs of MIN2)	$\mathrm{ESN_p}$	MIN1	SSD_A	FALSE
Originations (2.3.12.1.6)	$\mathrm{RAND_s}$	$\mathrm{ESN_p}$	Digits	SSD_A	TRUE
Terminations (2.3.12.1.7)	$\mathrm{RAND_s}$	$\mathrm{ESN_p}$	MIN1	SSD_A	TRUE
Base Station Challenge (2.3.12.1.8)	RANDBS	$\mathrm{ESN_p}$	MIN1	SSD_A_-NEW	FALSE

2.3.12.1.1 Shared Secret Data (SSD)

SSD is a 128-bit pattern stored in the mobile station (in semi-permanent memory) and readily available to the base station. As depicted in Figure 2.3.12.1.1-1, SSD is partitioned into two distinct subsets. Each subset is used to support a different process.

Contents	SSD_A	SSD_B
Length (bits)	64	64

Figure 2.3.12.1.1-1. Partitioning of SSD

Specifically,

SSD_A is used to support the authentication procedures; and

SSD_B is used to support CDMA voice privacy (see 6.3.12.3), and message confidentiality for CDMA and analog.

SSD is generated according to the procedures specified in 2.3.12.1.8 or 6.3.12.1.9.

2.3.12.1.2 Random Challenge Memory (RAND)

A 32-bit value held in the mobile station. When received on the forward analog control channel, it is the concatenation of the last RAND1_A and RAND1_B values received in Random Challenge A and Random Challenge B Global Action Messages appended to the overhead message train. Both RAND1_A and RAND1_B must be received on the same control channel and in the same Overhead Message Train in order for a valid RAND to exist.

When received on the CDMA Paging Channel, it is equal to the RAND value received in the last *Access Parameters Message* (see 7.7.2.3.2.2).

$RAND_s$ is used in conjunction with SSD_A and other parameters, as appropriate, to authenticate mobile station originations, terminations and registrations.

2.3.12.1.3 Call History Parameter ($COUNT_{s-p}$)

A modulo-64 count held in the mobile station. $COUNT_{s-p}$ is updated at the mobile upon receipt of a Parameter Update Order (see Table 3.7.1.1-1) on the FVC. $COUNT_{s-p}$ is also updated by the mobile station when a *Parameter Update Order* is received on the CDMA Forward Traffic Channel (see 7.7.4).

2.3.12.1.4 Authentication of Mobile Station Registrations

When the information element AUTH in the System Parameter Overhead Message is set to 1, and the mobile station attempts to register, the following authentication-related procedures shall be performed:

- In the mobile station,
  - set the input parameters of the Auth_Signature procedure (see "Interface Specification for Common Cryptographic Algorithms," section 2.3) as illustrated in Figure 2.3.12.1.4-1;
  - set the SAVE_REGISTERS input parameter to FALSE;
  - execute the Auth_Signature procedure;
  - set AUTHR equal to the 18-bit output AUTH_SIGNATURE;
  - send AUTHR together with RANDC (eight most significant bits of RAND) and $COUNT_{s-p}$ to the base station (Authentication Word C of RECC Autonomous Registration Order Message).
- At the base station,
  - compare the received values for RANDC, and optionally COUNT, with the internally stored values associated with the received MIN/ESN;
  - compute AUTHR as described above, except use the internally stored value of SSD_A; and
  - compare the value for AUTHR computed internally with the value of AUTHR received from the mobile station.

If any of the comparisons by the base station fail, the base station may deem the registration attempt unsuccessful, initiate the Unique Challenge-Response Procedure (see 2.3.12.1.5), or commence the process of updating the SSD (see 2.3.12.1.8).

    - RVC in Words 1 and 2 of a Base Station Challenge Order message if the mobile station is tuned to an analog voice channel (see 2.6.4 and 2.7.2.1).

- set the input parameters of the Auth_Signature procedure (see "Interface Specification for Common Cryptographic Algorithms," section 2.3) as illustrated in Figure 2.3.12.1.8-3;
- set the SAVE_REGISTERS input parameter to FALSE;
- execute the Auth_Signature procedure;
- set AUTHBS equal to the 18-bit output AUTH_SIGNATURE.

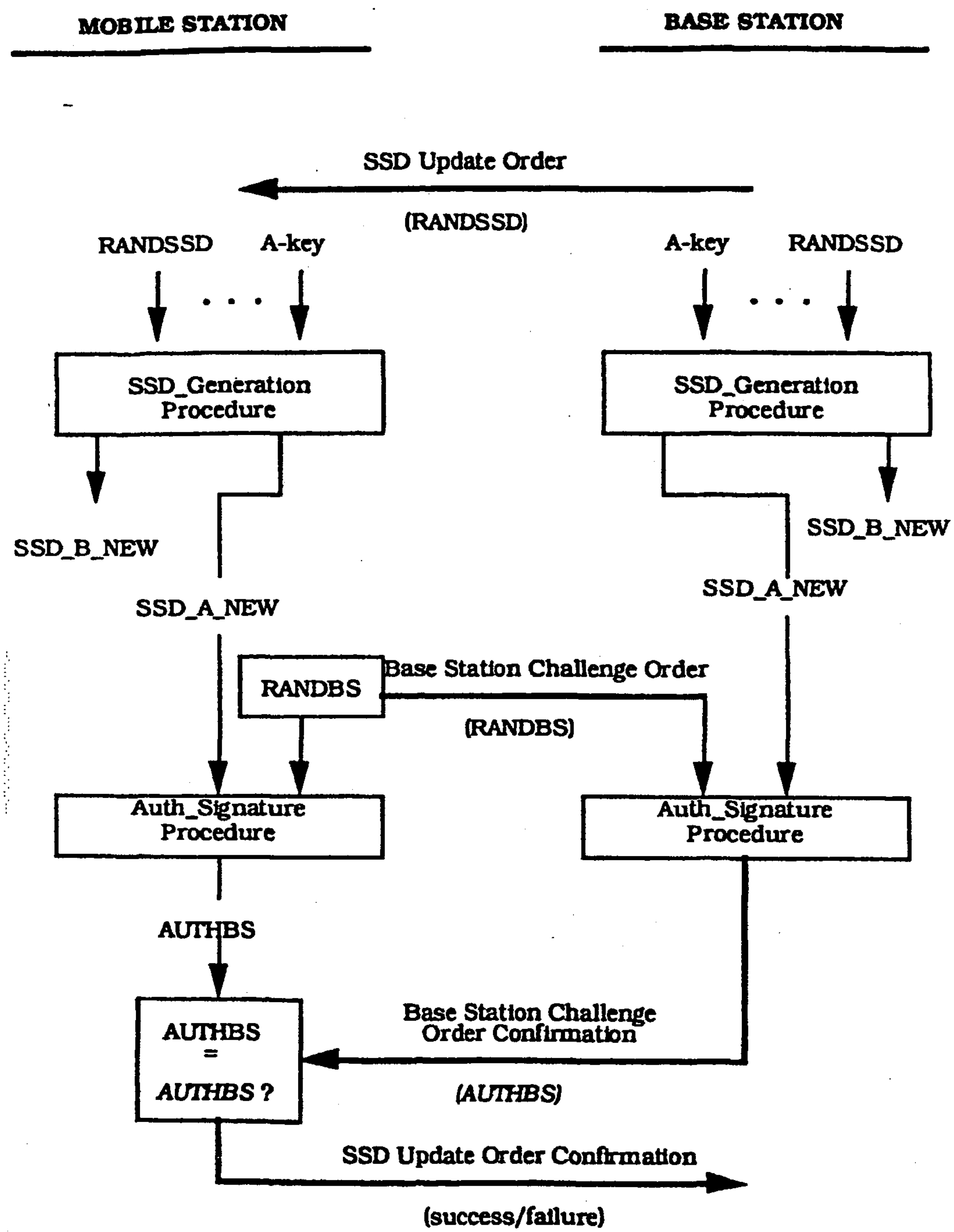


Figure 2.3.12.1.8-1. SSD Update Message Flow

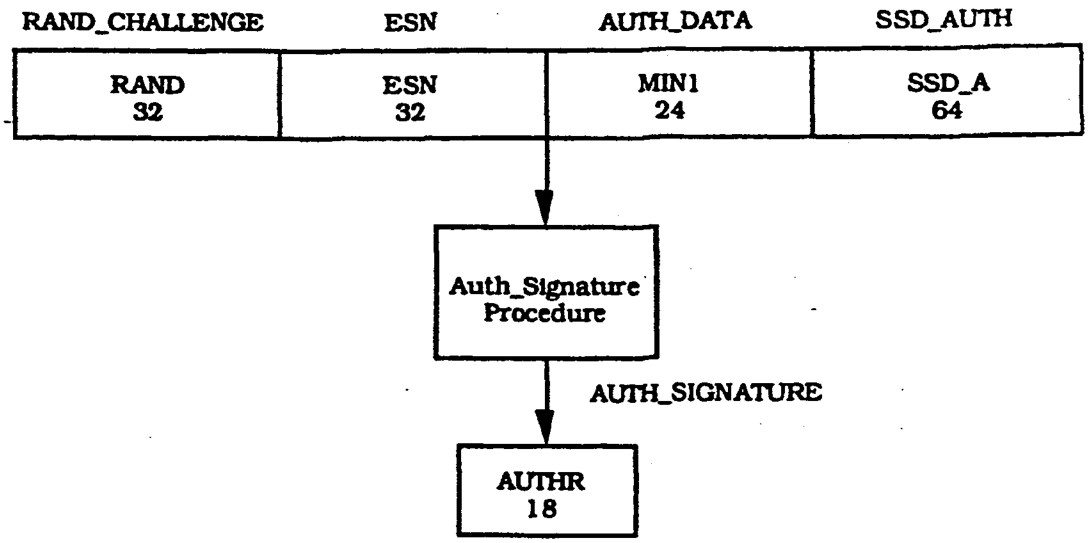


Figure 2.3.12.1.4-1. Computation of AUTHR for Authentication of Mobile Station Registrations

2.3.12.1.5 Unique Challenge-Response Procedure

The Unique Challenge-Response Procedure is initiated by the base station and can be carried out over the control and/or analog voice channels.

More specifically:

- At the base station,
    - a 24-bit, random pattern referred to as RANDU is generated and sent to the mobile station via:
        - the FOCC in Word 3-Unique Challenge Order Word of a mobile station control message if the procedure is to be initiated on a forward control channel (see 3.6.2.3 and 3.7.1.1); or
        - the FVC in Word 2-Unique Challenge Order Word of a mobile station control message if the mobile station has been assigned to a voice channel (see 3.6.4 and 3.7.2.1).
    - set the input parameters of the Auth_Signature procedure (see "Interface Specification for Common Cryptographic Algorithms," section 2.3) as illustrated in Figure 2.3.12.1.5-1. The 24 most significant bits of the RAND_CHALLENGE input parameter shall be filled with RANDU, and the 8 least significant bits of RAND_CHALLENGE shall be filled with the 8 least significant bits of MIN2;
    - set the SAVE_REGISTERS input parameter to FALSE;
    - execute the Auth_Signature procedure;

- set AUTHU equal to the 18-bit output AUTH_SIGNATURE.
- At the mobile station,
  - compute AUTHU as described above using the received RANDU and its internally stored values for the remaining input parameters;
  - send AUTHU to the base station via:
    - the RECC in WORD C-Unique Challenge Order Confirmation Word of an order confirmation message if the mobile station is not tuned to a voice channel (see 2.6.2.3 and 2.7.1.1); or
    - the RVC in a Unique Challenge Order Confirmation message if the mobile station is tuned to an analog voice channel (see 2.6.4 and 2.7.2.1).

Upon receipt of the Unique Challenge Order Confirmation from the mobile station, the base station compares the received value for AUTHU to that generated/stored internally. If the comparison fails, the base station may deny further access attempts by the mobile station, drop the call in progress, or initiate the process of updating the SSD (see 2.3.12.1.8).

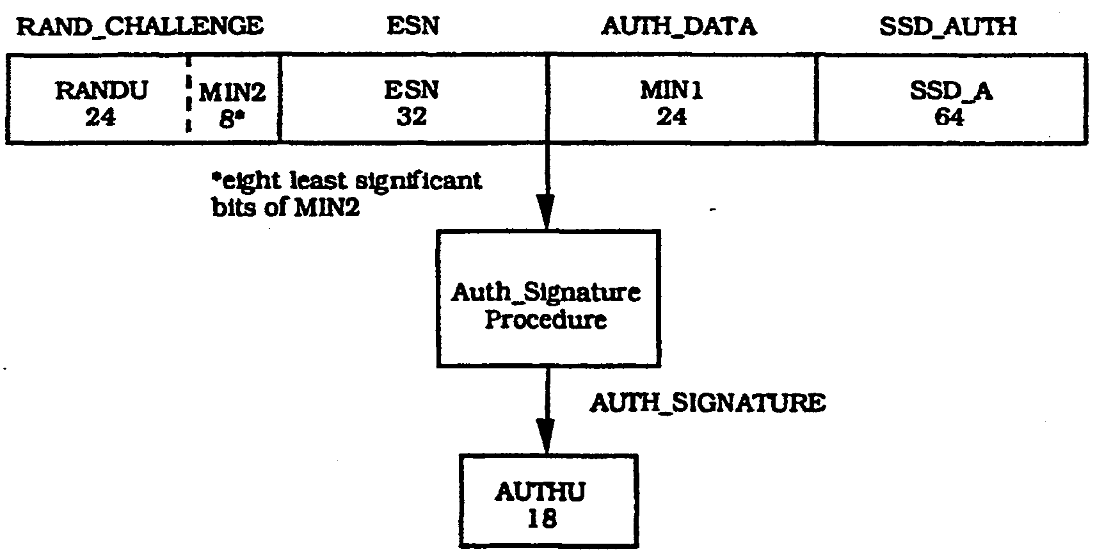


Figure 2.3.12.1.5-1. Computation of AUTHU for Unique Challenge-Response Procedure

2.3.12.1.6 Authentication of Mobile Station Originations

When the information element AUTH in the System Parameter Overhead Message is set to '1', and the mobile station attempts to originate a call, the following authentication-related procedures shall be performed:

- In the mobile station,
  - set the input parameters of the Auth_Signature procedure (see "Interface Specification for Common Cryptographic Algorithms," section 2.3) as illustrated in Figure 2.3.12.1.6-1. The AUTH_DATA input parameter shall contain the last six digits transmitted by the mobile station.

    The exact procedure is that MIN1 is used to initially fill the AUTH_DATA input parameter and then the last dialed digits entered by the subscriber are used to replace all or part of this initial value. If a full 6 digits are dialed, the first digit of the 6 that was dialed is used as the most significant 4 bits of AUTH_DATA, the second digit is the next less-significant 4 bits of AUTH_DATA, and so forth. If less than 6 digits are dialed, then the least significant 4 bits of AUTH_DATA are the last dialed digit, the second-last dialed digit becomes the next more-significant 4 bits of AUTH_DATA, and so on up to the first of the dialed digits;
  - set the SAVE_REGISTERS input parameter to TRUE;
  - execute the Auth_Signature procedure;
  - set AUTHR equal to the 18-bit output AUTH_SIGNATURE;
  - send AUTHR together with RANDC (eight most significant bits of RAND) and $COUNT_{s-p}$ to the base station (Authentication Word C of the RECC Origination Message).
- At the base station,
  - compare the received values for RANDC, and optionally COUNT, with the internally stored values associated with the received MIN/ESN;
  - compute AUTHR as described above, except use the internally stored value of SSD_A; and
  - compare the value for AUTHR computed internally with the value of AUTHR received from the mobile station.

If the comparisons at the base station are successful, the appropriate channel assignment procedures are commenced. Once assigned to an analog voice channel, the base station may, at the discretion of the system operator, issue a Parameter Update Order (see Table 3.7.1.1-1) to the mobile station on the FVC. Mobile stations confirm the receipt of Parameter Update Orders by sending Parameter Update Confirmations on the RVC.

If any of the comparisons by the base station fail, the base station may deny service, initiate the Unique Challenge-Response procedure (see 2.3.12.1.5), or commence the process of updating the SSD (see 2.3.12.1.8).

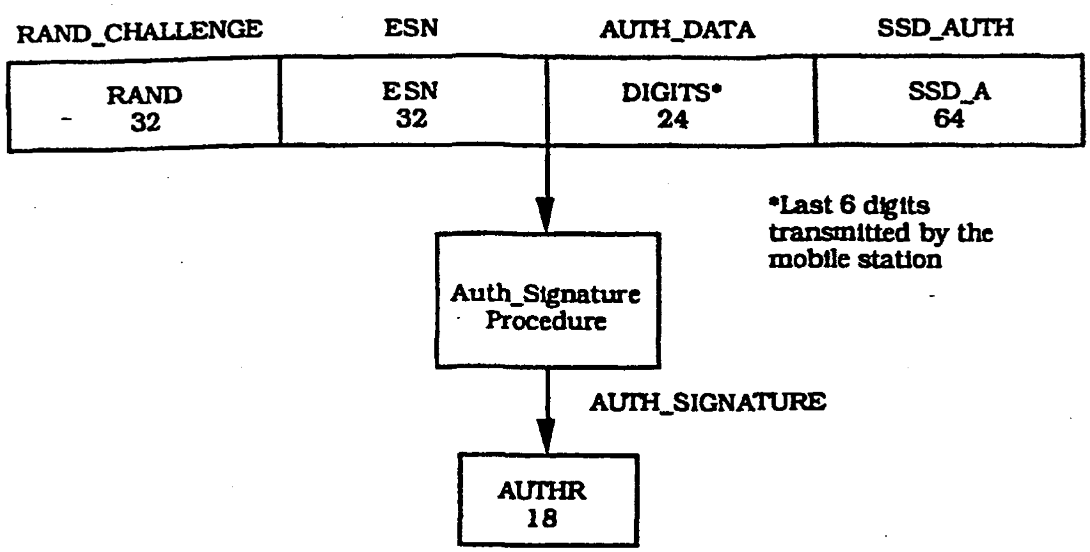


Figure 2.3.12.1.6-1. Computation of AUTHR for Authentication of Mobile Station Originations

2.3.12.1.7 Authentication of Mobile Station Terminations

When the information element AUTH in the System Parameter Overhead Message is set to 1, and a "Page Match" occurs, the following authentication-related procedures shall be performed:

- In the mobile station,
  - set the input parameters of the Auth_Signature procedure (see "Interface Specification for Common Cryptographic Algorithms," section 2.3) as illustrated in Figure 2.3.12.1.7-1;
  - set the SAVE_REGISTERS input parameter to TRUE;
  - execute the Auth_Signature procedure;
  - set AUTHR equal to the 18-bit output AUTH_SIGNATURE;
  - send AUTHR together with RANDC (eight most significant bits of RAND) and $COUNT_{s-p}$ to the base station (Authentication Word C of the RECC Page Response Message).
- At the base station,
  - compare the received values for RANDC, and optionally COUNT, with the internally stored values associated with the received MIN/ESN;
  - compute AUTHR as described above, except use the internally stored value of SSD_A; and
  - compare the value for AUTHR computed internally with the value of AUTHR received from the mobile station.

If the comparisons at the base station are successful, the appropriate channel assignment procedures are commenced. Once assigned to an analog voice channel, the base station may, at the discretion of the system operator, issue a Parameter Update Order (see Table 3.7.1.1-1) to the mobile station on the FVC. Mobile stations confirm the receipt of Parameter Update Orders by sending Parameter Update Confirmations on the RVC.

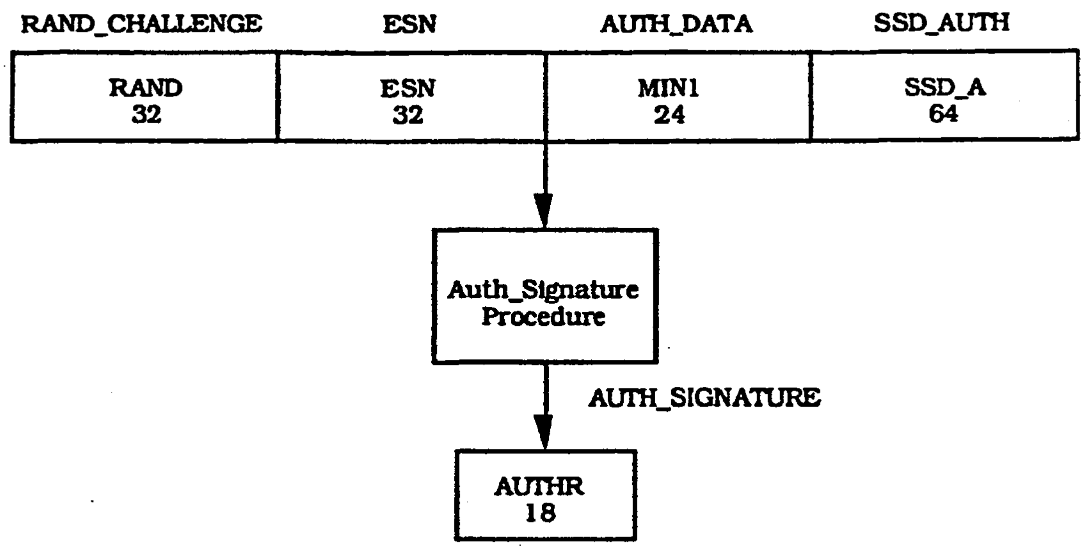


Figure 2.3.12.1.7-1. Computation of AUTHR for Authentication of Mobile Station Terminations

If any of the comparisons by the base station fail, the base station may deny service, initiate the Unique Challenge procedure (see 2.3.12.1.5), or commence the process of updating the SSD (see 2.3.12.1.8).

2.3.12.1.8 Updating the Shared Secret Data (SSD)

Updating the SSD involves the SSD_Generation procedure (see "Interface Specification for Common Cryptographic Algorithms," section 2.2.1), initialized with mobile station specific information, random data and the mobile station's A-key.

The A-key is:

- 64 bits long;
- assigned to the mobile station;
- stored in the mobile station's permanent security and identification memory; and
- is known only to the mobile station and its associated Home Location Register/Authentication Center (HLR/AC).

Notes

1. The last item in the above list is intended to enhance the security of the mobile station's secret data by eliminating the need to pass the A-key itself from system to system as the subscriber roams. As a consequence, SSD updates are carried out only in the mobile station and its associated HLR/AC, not in the serving system. The serving system obtains a copy of the SSD computed by the HLR/AC via intersystem communication (see EIA/TIA IS-41) with the mobile station's HLR/AC.
2. Since the SSD Update procedure involves multiple transactions and can be started on one channel and completed on another channel, call processing and signaling text above and beyond that normally included in this portion of the document has been included here for the sake of added clarity.

An A-key must be entered into the mobile station. See "User Interface for Authentication Key Entry," TSB 50, for details.

More specifically, updating the SSD in the mobile station proceeds as follows (see Figure 2.3.12.1.8-1):

- At the base station,
    - send an SSD Update Order, with the RANDSSD field set to the same 56-bit random number used in the HLR/AC computations, to the mobile station on the:
        - FOCC in Word 3-First SSD Update Order Word, Word 4-Second SSD Update Order Word and Word 5-Third SSD Update Order Word of a mobile station control message if the mobile station has not been assigned to an analog voice channel (see 3.6.2.3 and 3.7.1.1); or
        - FVC in Word 2-First SSD Update Order Word, Word 3-Second SSD Update Order Word and Word 4-Third SSD Update Order Word of a mobile station control message if the mobile station has been assigned to an analog voice channel (see 3.6.4 and 3.7.2.1).
- In the mobile station,
    - upon receipt of the SSD Update Order, set the input parameters of the SSD_Generation procedure (see "Interface Specification for Common Cryptographic Algorithms," section 2.2.1) as illustrated in Figure 2.3.12.1.8-2;
    - execute the SSD_Generation procedure;
    - set SSD_A_NEW and SSD_B_NEW to the outputs of the SSD_Generation procedure;
    - select a 32-bit random number, RANDBS, and send it to the base station in a Base Station Challenge Order on the:
        - RECC in Word C-Base Station Challenge Word if the mobile station is not tuned to an analog voice channel (see 2.6.2.3 and 2.7.1.1); or

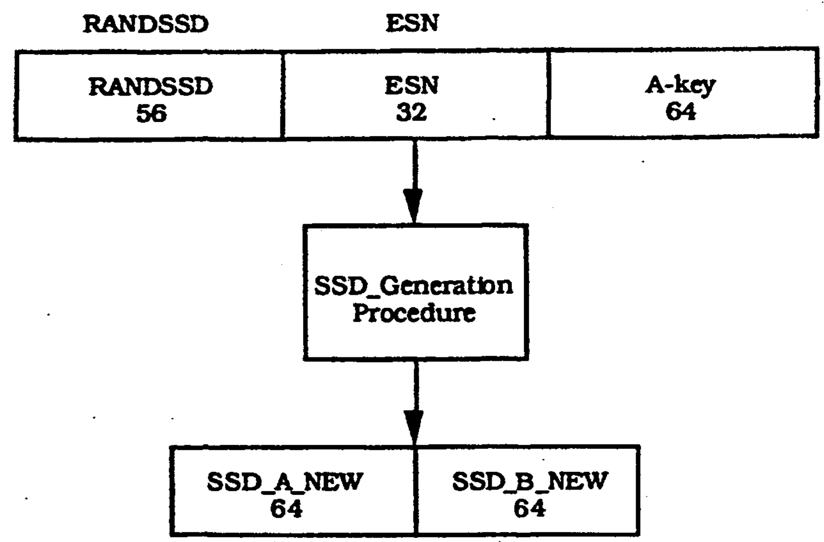


Figure 2.3.12.1.8-2. Computation of Shared Secret Data (SSD)

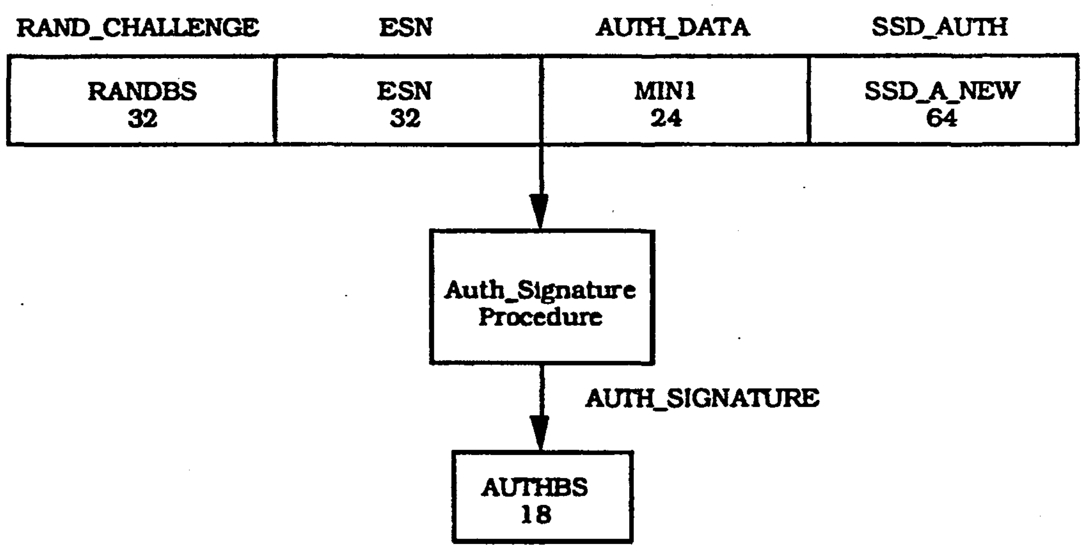


Figure 2.3.12.1.8-3. Computation of AUTHBS

- In the base station,
  - upon receipt of the Base Station Challenge Order, set the input parameters of the Auth_Signature procedure (see "Interface Specification for Common Cryptographic Algorithms," section 2.3) as illustrated in Figure 2.3.12.1.8-3, where RANDBS is set to the value received in the Base Station Challenge Order;
  - set the SAVE_REGISTERS input parameter to FALSE;

- execute the Auth_Signature procedure;
  - set AUTHBS equal to the 18-bit output AUTH_SIGNATURE;
    - acknowledge receipt of the Base Station Challenge Order by including AUTHBS in the Base Station Challenge Order Confirmation message, which is sent on the:
      - FOCC in Word 3-Base Station Challenge Order Confirmation Word of a mobile station control message if the mobile station has not yet been assigned to an analog voice channel (see 3.6.2.3, 3.6.3.3 and 3.7.1.1); or
      - FVC in Word 2-Base Station Challenge Order Confirmation of a mobile station control message if the mobile station has been assigned to an analog voice channel (see 3.6.4 and 3.7.2.1).

- In the mobile station,
  - upon receipt of the Base Station Challenge Order Confirmation, compare the AUTHBS received to that generated internally;
  - acknowledge receipt of the SSD Update Order as follows:
    - if the comparison at the mobile station is successful, execute the SSD_Update procedure (see "Interface Specification for Common Cryptographic Algorithms," section 2.2.2) to set SSD_A and SSD_B to SSD_A_NEW and SSD_B_NEW, respectively, and:
      - if the mobile station is not tuned to an analog voice channel
        - send an order confirmation message to the base station on the RECC with:
          - the "T" field in Word A-Abbreviated Address Word set to '0' to identify the message as an Order Confirmation;
          - the "ORDER" field in Word B-Extended Address Word set to '10101' to signify confirmation of the SSD Update Order;
          - the "ORDQ" field in Word B-Extended Address Word set to '001' to denote the successful completion of the SSD Update process; and
          - all other fields set as described in 2.7.1.1 and in the references cited therein.
      - if the mobile station is tuned to an analog voice channel,
        - send an Order Confirmation message to the base station on the RVC with:
          - the "T" field set to '1' to identify the message as an order confirmation;

        - the "ORDER" field set to '10101' to signify confirmation of the SSD Update order;
        - the "ORDQ" field set to '001' to denote the successful completion of the SSD Update process; and
        - all other fields set as described in 2.7.2.1 and in the references cited therein.
- if the comparison at the mobile station fails, discard SSD_A_NEW and SSD-B_NEW, and:
    - if the mobile station is not tuned to an analog voice channel,
        - send an order confirmation message to the base station on the RECC with:
            - the "T" field in Word A-Abbreviated Address Word set to '0' to identify the message as an Order Confirmation;
            - the "ORDER" field in Word B-Extended Address Word set to '10101' to signify confirmation of the SSD Update Order;
            - the "ORDQ" field in Word B-Extended Address Word set to '000' to denote the unsuccessful completion of the SSD Update process; and
            - all other fields set as described in 2.7.1.1 and in the references cited therein.
    - if the mobile station is tuned to an analog voice channel,
        - send an Order Confirmation message to the base station on the RVC with:
            - the "T" field set to '1' to identify the message as an order confirmation;
            - the "ORDER" field set to '10101' to signify confirmation of the SSD Update order;
            - the "ORDQ" field set to '000' to denote the unsuccessful completion of the SSD Update process; and
            - all other fields set as described in 2.7.2.1 and in the references cited therein.

In the base station, if the SSD Update Confirmation received from the mobile station indicates a success, set SSD_A and SSD_B to the values received from the HLR/AC (see EIA/TIA IS-41).

2.3.12.1.9 Authentication Procedures

The availability of authentication algorithm information is governed under the U.S. International Traffic and Arms Regulation (ITAR) and the Export Administration Regulations. TIA will act as the focal point and facilitator for making such information available. Procedures for distribution of this information will be contained in the Technology Transfer Control Plan which applies to "Common Cryptographic Algorithms." The Technology Transfer Control Plan will be available from TIA.

2.3.12.2 Signaling Message Encryption

In an effort to enhance the authentication process, and to protect sensitive subscriber information (e.g., PINs), provisions have been made to allow for the encryption of a select subset of FVC and RVC signaling messages. See Appendix A for the list of messages and fields to be encrypted.

Consult "Interface Specification for Common Cryptographic Algorithms," section 2.5 for a description of how the algorithm is initialized and applied.

2.3.12.2.1 Signaling Message Encryption Control

Signaling message encryption is controlled on a per-call basis. The default value is "off." To activate signaling message encryption for a mobile station assigned to an analog voice channel, the base station must send a Message Encryption Mode Order with the Order Qualifier field set to '001'. Signaling message encryption can also be activated during CDMA to analog handoff by the base station sending an *Analog Handoff Direction Message* with the MEM field set equal to '1'.

The data used to initialize the algorithm is computed based on parameters in effect at the time the AUTHR appended to the origination/page response message was computed (see 2.3.12.1.6 and 2.3.12.1.7). For a call initiated via the CDMA Access Channel, the data used to initialize the algorithm is computed based on parameters in effect at the time the AUTHR appended to the *Origination Message* or *Page Response Message* was computed (see 6.3.12.1.6 and 6.3.12.1.7).

Once activated, signaling message encryption can be deactivated by the base station by sending a Message Encryption Mode Order with the Order Qualifier field set to '000'.

In all cases both the base station and mobile station shall continue to operate in their present mode until the message sent to the mobile station has been properly acknowledged.

2.4 Supervision

2.4.1 Supervisory Audio Tone

The supervisory audio tone (SAT) will be one of three frequencies: 5970, 6000, or 6030 Hz. The SAT is added to the voice transmission by a base station (see 3.4.1). A mobile station must detect, filter, and modulate the transmitted voice channel carrier with this tone. Transmission of the SAT by a mobile station must be suspended during transmission of wideband data on the reverse voice channel (see 2.7.2), but must not be suspended when signaling tone is sent (see 2.4.2).

While a valid SAT is detected and the measured SAT determination does not agree with the SAT color code (SCC_T) received in the Mobile Station Control Message (see 3.7.1.1 and 3.7.2), the receiver audio must be muted.

2.4.1.1 SAT Detection

A mobile station must make the following decisions to determine which SAT, if any, is present:

Measured Frequency of Incoming Signal	Measured SAT Determination	Where
$f \leq f_1$	No valid SAT	f_1 = 5955 ±5Hz
$f_1 \leq f < f_2$	SAT = 5970	f_2 = 5985 ±5Hz
$f_2 \leq f < f_3$	SAT = 6000	f_3 = 6015 ±5Hz
$f_3 \leq f < f_4$	SAT = 6030	f_4 = 6045 ±5 Hz
$f_4 \leq f$	No valid SAT	
No SAT Received	No valid SAT	

The determination of SAT is not required to be made continuously but should be performed at least every 250 ms.

2.4.1.2 SAT Transmission

The transmission requirements for the SAT signal, including time delays in the transmitter, receiver, and any equalization circuits, are summarized as follows:

Condition	Requirement
Steady-state phase difference between received and transmitted SAT at 5970, 6000, and 6030 Hz	May have any average phase but must remain within a ±10° band
Phase Step Response	Settle to within 10° of final steady state phase difference in ≤ 250 ms
Tone Modulation Index	1/3 radian ±10% (Δf ~ ±2 kHz)

2.4.1.3 Fade Timing Status

When an SAT determination is made a mobile station must perform the following:

- If no valid SAT is detected or the measured SAT determination does not agree with the SAT color code (SCC_T) received in the mobile station control message (see 3.7.1.1 and 3.7.2), the fade timing status must be enabled (see 2.6.4.1).
- Otherwise, the fade timing status must be disabled (see 2.6.4.1).

2.4.2 Signaling Tone

Signaling tone must be 10 kHz ±1 Hz and produce a nominal frequency deviation of ±8 kHz.

2.5 Malfunction Detection

2.5.1 Malfunction Timer

A timer separate from and independent of all other functions must be running continuously whenever power is applied to the transmitter of a mobile station. If the mobile station is software-controlled, sufficient reset commands must be interspersed throughout the mobile station logic program to ensure that the timer never expires as long as the proper sequence of operations is taking place; similar means must be provided, as appropriate, in hardware-controlled designs. If the timer expires, a malfunction must be assumed and the mobile station must be inhibited from transmitting. The maximum time allowed for expiration of the timer is 60 seconds.

This supersedes the requirement for a transmitter carrier-on indicator.

2.5.2 False Transmission

A protection circuit must be provided to minimize the possibility of false transmitter operation caused by component failure within the mobile station.

2.6 Call Processing

The following sections describe mobile station operation as controlled by a base station. Frequent references are made to the corresponding sections in the base station section and to the messages that flow between a base station and a mobile station. It is helpful to read 2.6 and 3.6 in parallel and examine the message formats in 2.7 and 3.7 at the same time.

When power is applied to a mobile station, it shall enter the *System Determination Substate* of the *Mobile Station Initialization State* with a power-up indication (see 6.6.1.1).

2.6.1 Initialization

2.6.1.1 Retrieve System Parameters

If the First-Idle ID status is enabled (see 6.6.1.1), the mobile station must:

- Set the Location-Registration ID status to enabled.
- Set the first-registration ID status to enabled.
- Set the first-location-area ID status to enabled.
- Set $PUREG_s = 0$, $PDREG_s = 0$, $LREG_s = 0$, $LRCC_s = 0$, $SID_s = 0$ and $SID_r = 0$.

The mobile station must then set the serving-system status according to the following algorithm:

- If $SERVSYS_s = SYS\_A$, set the serving-system status to enabled.
- If $SERVSYS_s = SYS\_B$, set the serving-system status to disabled.

The mobile station must then enter the Scan Dedicated Control Channels Task (see 2.6.1.1.1).

2.6.1.1.1 Scan Dedicated Control Channels

If SID_r is not equal to SID_s, the mobile station shall set registration increment ($REGINCR_s$) to its default value of 450, set the first-registration ID status to enabled, set the first-location-area ID status to enabled, set $LRCC_s = 0$ and set $RAND_s = 0$.

If the serving-system status is enabled, a mobile station must:

- Set $FIRSTCHD_s$ to the first dedicated control channel for System A (834.990 MHz/879.990 MHz).
- Set $LASTCHD_s = FIRSTCHD_s - 21 + 1$.

If the serving-system status is disabled, a mobile station must:

- Set $FIRSTCHD_s$ to the first dedicated control channel for System B (835.020 MHz/880.020 MHz).
- Set $LASTCHD_s = FIRSTCHD_s + 21 - 1$.

The mobile station examines the signal strength on each of the channels $FIRSTCHD_s$ TO $LASTCHD_s$.

The mobile station must then enter the Update Overhead Information Task (see 2.6.1.1.2).

2.6.1.1.2 Update Overhead Information

Overhead messages are sent in a group called an overhead message train (see 3.7.1.2). The mobile station must use the value given in the NAWC (number of additional words coming) field of the System Parameter Overhead Message in the train to determine that all messages of the train have been received. The END field must be used as a cross-check. For NAWC counting purposes, inserted control filler messages (see 3.7.1) must not be counted as part of the overhead message train.

If the mobile station receives a BCH-code-correct but unrecognizable System Parameter Overhead Message, the mobile station must count that message as part of the train for NAWC counting purposes, but must not attempt to execute the message.

The mobile station must tune to the strongest dedicated control channel and, within 3 seconds, receive a System Parameter Overhead Message (see 3.7.1.2) and update the following numeric information:

- System identification (SID_s). Set the 14 most significant bits of SID_s to the value of the SID 1 field. Set the least significant bit of SID_s to '1' if the serving-system status is enabled; otherwise, set the bit to '0'.
- Number of paging channels (N_s). Set N_s to 1 plus the value of the N - 1 field.
- First paging channel ($FIRSTCHP_s$). Set $FIRSTCHP_s$ according to the following algorithm:
  - If $SID_s = HOME\_SID_p$, $FIRSTCHP_s = FIRSTCHP_p$
  - If $SID_s \neq HOME\_SID_p$, $FIRSTCHP_s = FIRSTCHD_s$
- Last paging channel ($LASTCHP_s$). Set $LASTCHP_s$ according to the following algorithm:
  - If the serving-system status is enabled, $LASTCHP_s = FIRSTCHP_s - N_s + 1$.
  - If the serving-system status is disabled, $LASTCHP_s = FIRSTCHP_s + N_s - 1$.

If SID_r is not equal to SID_s, the mobile station shall set registration increment ($REGINCR_s$) to its default value of 450, set the first-registration ID status to enabled, set the first-location-area ID status to enabled, set $LRCC_s = 0$ and set $RAND_s = 0$.

The mobile station must then enter the Paging Channel Selection Task (see 2.6.1.2).

If the mobile station cannot complete this task on the strongest dedicated control channel, it shall tune to the second strongest dedicated control channel and attempt to complete this task within a second 3-second interval. If it cannot complete this task on either of the two strongest control channels, the mobile station must enter the the *System Determination Substate* of the *Mobile Station Initialization State* (see 6.6.1.1).

2.6.1.2 Paging Channel Selection

2.6.1.2.1 Scan Paging Channels

The mobile station must examine the signal strength on each of channels $FIRSTCHP_s$ to $LASTCHP_s$ (see 2.6.1.1.2).

The mobile station must then enter the Verify Overhead Information Task (see 2.6.1.2.2).

2.6.1.2.2 Verify Overhead Information

The mobile station must set the Wait-for-Overhead-Message bit ($WFOM_s$) to '0'; the mobile station must then tune to the strongest paging channel and, within 3 seconds, receive an overhead message train (see 3.7.1.2) and update the following:

- *System identification:* Set the 14 most significant bits of SID_r to the value of the SID1 field. Set the least significant bit of SID_r to '1' if the serving-system status is enabled; otherwise, set the bit to '0'.
- ROAM *status:* The mobile station must compare the received system identification (SID_r) with the stored system identification (SID_s). If $SID_r = SID_s$, the mobile station must compare SID_s with $HOME\_SID_p$. If $HOME\_SID_p = SID_s$, the mobile station must set the ROAM status to disabled. If $HOME\_SID_p \neq SID_s$, the mobile station must set the ROAM status to enabled. If $SID_r \neq SID_s$, the mobile station must enter the *System Determination Substate* of the *Mobile Station Initialization State* (see 6.6.1.1).
- *Local control status:* If the local control option is enabled within the mobile station (see 2.3.9) and the bits of the home system identification ($HOME\_SID_p$) that comprise the group identification match the corresponding bits of SID_s, then the local control status must be enabled. Otherwise, the local control status must be disabled.

If the Initialization Task was entered with an origination or page response indication, the mobile station must also update the following numeric values:

- *Serial number bit* (S_s): Set S_s to the value in the S field.
- *Registration bit* (R_s): If the roam status is disabled, set R_s to the value of the REGH field; if the roam status is enabled, set R_s to the value of the REGR field.
- *Extended address bit* (E_s): Set E_s to the value in the E field.
- *Authentication bit* ($AUTH_s$): Set $AUTH_s$ to the value in the AUTH field.
- *Discontinuous transmission bit* (DTX_s): Set DTX_s to the value of the DTX field.
- *Number of paging channels* (N_s): Set N_s to 1 plus the value of the N-1 field.
- *Read-control-filler bit* (RCF_s): Set RCF_s to the value of the RCF field.
- *Combined paging/access bit* (CPA_s): Set CPA_s to the value of the CPA field.
- *Number of access channels* ($CMAX_s$): Set $CMAX_s$ to 1 plus the value of the CMAX-1 field.

- Determine control channel boundaries for accessing the system ($FIRSTCHA_s$ and $LASTCHA_s$) by using the following algorithm:
  - If the serving-system status is enabled,
    - If $CPA_s = 1$, set $FIRSTCHA_s$ to $FIRSTCHP_s$ for System A.
    - If $CPA_s = 0$, set $FIRSTCHA_s$ to $FIRSTCHP_s$ for System A minus N_s.
    - $LASTCHA_s = FIRSTCHA_s - CMAX_s + 1$.
  - If the serving-system status is disabled,
    - If $CPA_s = 1$, set $FIRSTCHA_s$ to $FIRSTCHP_s$ for System B.
    - If $CPA_s = 0$, set $FIRSTCHA_s$ to $FIRSTCHP_s$ for System B plus N_s.
    - $LASTCHA_s = FIRSTCHA_s + CMAX_s - 1$.

If the Initialization Task was entered with an origination indication, the mobile station must enter the System Access Task with an "origination" indication (see 2.6.3).

If the Initialization Task was entered with a page response indication, the mobile station must enter the System Access Task with a "page response" indication (see 2.6.3).

If the Initialization Task was entered with a wait for page indication, the mobile station must enter the Idle Task with a "wait for page" indication.

Otherwise, the mobile station must enter Idle at the Response to Overhead Information Task (see 2.6.2.1).

If the mobile station cannot complete this task on the strongest paging channel, it may tune to the second strongest paging channel and attempt to complete this task within a second 3-second interval. If it cannot complete this task on either of the two strongest control channels, the mobile station must enter the the *System Determination Substate* of the *Mobile Station Initialization State* (see 6.6.1.1).

2.6.2 Idle

During the Idle Task, a mobile station must execute each of the following four (sub)tasks (see 2.6.2.1, 2.6.2.2, 2.6.2.3, and 2.6.2.4) at least every 46.3 ms, the periodicity of word blocks on the forward control channel. If the Idle Task was entered with a wait for page indication, the mobile station must not enter the *System Determination Substate* of the *Mobile Station Initialization State* (see 6.6.1.1) for at least 6 seconds after entering the Idle Task. Otherwise, if the mobile station is not listening to a control channel of the preferred system, it may exit this task and enter the *System Determination Substate* of the *Mobile Station Initialization State*.

2.6.2.1 Response to Overhead Information

Whenever a mobile station receives an overhead message train (see 3.7.1.2), the mobile station must update SID_r (see 2.6.1.5) and then compare SID_s with SID_r. If $SID_s \neq SID_r$, the mobile station must exit the Idle Task and enter the *System Determination Substate* of the *Mobile Station Initialization State* (see 6.6.1.1).

If $SID_s = SID_r$, the mobile station shall update the following numeric values using information contained in the System Parameter Overhead Message:

- *Serial number bit* (S_s): Set S_s to the value in the S field.
- *Registration bit* (R_s): If the roam status is disabled, set R_s to the value of the REGH field; if the roam status is enabled, set R_s to the value of the REGR field.
- *Extended address bit* (E_s): Set E_s to the value in the E field.
- *Authentication bit* ($AUTH_s$): Set $AUTH_s$ to the value in the AUTH field.
- *Discontinuous transmission bit* (DTX_s): Set DTX_s to the value of the DTX field.
- *Number of paging channels* (N_s): Set N_s to 1 plus the value of the N - 1 field.
- *Read-control-filler bit* (RCF_s): Set RCF_s to the value of the RCF field.
- *Combined paging/access bit* (CPA_s): Set CPA_s to the value of the CPA field.
- *Number of access channels* ($CMAX_s$): Set $CMAX_s$ to 1 plus the value of the CMAX - 1 field.
- Determine control channel boundaries for accessing the system ($FIRSTCHA_s$ and $LASTCHA_s$) by using the following algorithm:
  - If the serving-system status is enabled,
    - If $CPA_s = 1$, set $FIRSTCHA_s$ to $FIRSTCHP_s$ for System A.
    - If $CPA_s = 0$, set $FIRSTCHA_s$ to $FIRSTCHP_s$ for System A minus N_s.
    - $LASTCHA_s = FIRSTCHA_s - CMAX_s + 1$.
  - If the serving-system status is disabled,
    - If $CPA_s = 1$, set $FIRSTCHA_s$ to $FIRSTCHP_s$ for System B.
    - If $CPA_s = 0$, set $FIRSTCHA_s$ to $FIRSTCHP_s$ for System B plus N_s.
    - $LASTCHA_s = FIRSTCHA_s + CMAX_s - 1$.

If $SID_s = SID_{s-p}$, $PUREG_{s-p} = 1$ and the First-Idle ID status is enabled the mobile station shall initiate an autonomous registration by entering the System Access Task (see 2.6.3) with a "registration" indication.

The mobile station must then respond as indicated to each of the following messages, if received in the overhead message train. The order in which the mobile station must respond to the messages, if two or more are received, is given by their order in the following list:

1. *Local Control Messages:* If the local control status is enabled (see 2.6.1.2.2) the mobile station must respond to the Local Control Messages.
2. *New Access Channel Set Message:*
   - The mobile station must set $FIRSTCHA_s$ to the value of the NEWACC field of the message.

- The mobile station must set $LASTCHA_S$ according to the following algorithm:
  - If the serving-system status is enabled, $LASTCHA_S = NEWACC_T - CMAX_S + 1$.
  - If the serving-system status is disabled, $LASTCHA_S = NEWACC_T + CMAX_S - 1$.

3. *Registration Increment Message:* The mobile station must set $REGINCR_S$ to the value of the REGINCR field in the message.
4. *Location Area Message:* The mobile station must set $PUREG_S$, $PDREG_S$, $LREG_S$ and $LOCAID_S$ to the values contained in the corresponding fields of the received message and then set $PUREG_{S-p}$ equal to $PUREG_S$.

- If this message is received while first-idle ID status is disabled, location-registration ID status is disabled, first-registration ID status is enabled, first-location-area ID status is enabled, and the mobile station is tuned to a control channel different from $LRCC_S$, then the mobile station shall set first-location-area ID status to disabled.
- If $PUREG_S = 1$ and the location-registration ID status is enabled the mobile station must set the first-registration ID status to enabled (see 2.6.1.1.2) and set first-location-area ID status to disabled (see 2.6.1.1.2). The mobile station must then initiate an autonomous registration by entering the System Access Task (see 2.6.3) with a "registration" indication.
- If $LOCAID_{S-p} \neq LOCAID_S$ and $LREG_S = 1$ the mobile station must do the following:
  - if the first-location-area ID status is disabled the mobile station must set the first-registration ID status to enabled (see 2.6.1.1.2) and then initiate an autonomous registration by entering the System Access Task (2.6.3) with a "registration" indication.
  - if the first-location-area ID status is enabled and $PUREG_{S-p} = 1$, the mobile station must set the first-location-area ID status to disabled (see 2.6.1.1.2) and then enter the Autonomous Registration Update Task (see 2.6.3.11), supplying a "success" indication.
  - if the first-location-area ID status is enabled and $PUREG_{S-p} = 0$, the mobile station must set the first-location-area ID status to disabled (see 2.6.1.1.2) and then initiate an autonomous registration by entering the System Access Task (see 2.6.3) with a "registration" indication.

  Otherwise, the mobile station shall set the first-location-area ID status to disabled (see 2.6.1.1.2).
- The mobile station shall continue to process messages in the overhead message train.

5. *Random Challenge A Message:* The mobile station must set the corresponding portion of its internal $RAND1_s$ to the value of the RAND1_A field in the Global Action Message (see 2.3.12.1.2 for updating of RAND).

6. *Random Challenge B Message:* The mobile station shall set the corresponding portion of its internal $RAND1_s$ to the value of the RAND1_B field in the Global Action Message (see 2.3.12.1.2 for updating of RAND).

7. *Registration ID Message:* The mobile station must perform the following:

   - If this message is received while first-idle ID status is disabled, location-registration ID status is disabled, first-registration ID status is enabled, first-location-area ID status is enabled, and the mobile station is tuned to a control channel different from $LRCC_s$, then the mobile station shall set first-registration ID status to disabled.

   - The mobile station must set $REGID_s$ to the value of the REGID field of the received message. If the first-registration ID status is enabled, the location-registration ID status is disabled, and $SID_s = SID_{s-p}$, the mobile station must do the following:

     - set the first-registration ID status to disabled (see 2.6.1.1.2).

     - if autonomous registration is enabled, the mobile station must enter the Autonomous Registration Update Task (see 2.6.3.11), supplying a "success" indication.

     - the mobile station shall continue to process information in the overhead message stream.

     Otherwise, the mobile station shall set the first-registration ID status to disabled (see 2.6.1.1.2) and proceed as follows

   - If SID_s equals the SID_{s-p} value stored in the registration memory, the mobile station must perform the following:

     - The mobile station must use the following (or an equivalent) algorithm to review the $NXTREG_{s-p}$ associated with the SID_{s-p} to determine if $REGID_s$ has cycled through zero:

       + If $NXTREG_{s-p}$ is greater than or equal to $REGID_s + REGINCR_s + 5$, then $NXTREG_{s-p}$ must be replaced by the greater of 0 or $NXTREG_{s-p} - 2^{20}$.

       + Otherwise do not change $NXTREG_{s-p}$.

     - The mobile station must then compare $REGID_s$ with the $NXTREG_{s-p}$ associated with the SID_{s-p}.

       + If $REGID_s$ is greater than or equal to $NXTREG_{s-p}$ and autonomous registration is enabled, the mobile station must set the first-registration ID status to disabled (see 2.6.1.1.2) and then enter the System Access Task with a "registration" indication (see 2.6.3).

       + If $REGID_s$ is greater than or equal to $NXTREG_{s-p}$ and autonomous registration is not enabled, then set $NXTREG_{s-p}$ equal to $REGID_s$.

+ Otherwise, the mobile station must ignore the message and continue to process messages in the overhead message train.

- If SID_s is not equal to the SID_{s-p} value stored in the registration memory, the mobile station must perform the following:

  - If autonomous registration is enabled, the mobile station shall set the first-registration ID status to disabled (see 2.6.1.1.2). The mobile station shall then enter the System Access Task with a "registration" indication supplied (see 2.6.3).

  - Otherwise, the mobile station must ignore the message and continue to process messages in the overhead message train.

8. *CDMA Capability Message:* If CDMA_AVAIL equals '1' and the preferred mode of operation is CDMA, the mobile station may exit this task and enter the *System Determination Substate* of the *Mobile Station Initialization State* (see 6.6.1.1).

9. *Rescan Message:* The mobile station must immediately exit this task and enter the *System Determination Substate* of the *Mobile Station Initialization State* (see 6.6.1.1).

10. *Any Other Message:* Ignore message.

2.6.2.2 Page Match

The mobile station must monitor mobile station control messages for page messages (see 3.7.1.1).

- If the ROAM status is disabled, the mobile station must attempt to match $MIN1_p$ to $MIN1_r$ for one-word messages and both $MIN1_p$ and $MIN2_p$ to $MIN1_r$ and $MIN2_r$, respectively, for two-word messages. All decoded MIN bits must match to cause the mobile station to respond to the message.

- If the ROAM Status is enabled, the mobile station must attempt to match both $MIN1_p$ and $MIN2_p$ to $MIN1_r$ and $MIN2_r$, respectively. All decoded MIN bits must match to cause the mobile station to respond to the order.

When a match occurs, the mobile station must enter the System Access Task with a "page response" indication (see 2.6.3).

2.6.2.3 Order

The mobile station must monitor mobile station control messages for orders and must attempt to match both $MIN1_p$ and $MIN2_p$ to $MIN1_r$ and $MIN2_r$, respectively. All decoded MIN bits must match to cause the mobile station to respond to the order. The responses to the following orders are:

- *Abbreviated Alert:* The mobile station must enter the System Access Task (see 2.6.3) with an "order confirmation" indication.

- *Audit order:* The mobile station must enter the System Access Task (see 2.6.3) with an "order confirmation" indication.

- *Local control order:* The action to be taken depends on the local control field.

- *SSD update order:* The mobile station computes SSD-A_NEW and SSD-B_NEW and selects a RANDBS as described in 2.3.12.1.8. The mobile station must then enter the System Access Task (see 2.6.3) with a "base station challenge" indication.
- *Unique challenge order:* The mobile station executes the Unique Challenge procedure as in 2.3.12.1.5. The mobile station must then enter the System Access Task (see 2.6.3) with an "order confirmation" indication.
- *Message waiting order:* If the mobile station is capable of performing Message Waiting Notification, the mobile station shall indicate the presence of messages waiting based on the information contained in the message type field of the Message Waiting order (i.e., 0 for clear or no messages, other non-zero values indicate the number of messages waiting). The mobile station then enters the System Access Task (see 2.6.3) with an "order confirmation" indication.
- *Any other order:* Ignore order.

2.6.2.4 Call Initiation

When the user initiates a call, the System Access Task (see 2.6.3) must be entered with an "origination" indication.

2.6.2.5 Reserved

2.6.2.6 Power Down

If the mobile station is intentionally removed from the air interface while in the Idle Task and $PDREG_s = 1$ the mobile station must initiate an autonomous registration by entering the System Access Task (see 2.6.3) with a "power down registration" indication.

2.6.3 System Access

2.6.3.1 Set Access Parameters

If a mobile station power down occurs during a system access and $PDREG_s = 1$ the mobile station must terminate its access procedures and initiate an autonomous registration by entering the System Access Task (see 2.6.3) with a "power down registration" indication.

When the System Access Task is started, a timer, called the access timer, must be set as follows:

- If this is an origination, to a maximum of 12 seconds.
- If this is a page response, to a maximum of 6 seconds.
- If this is an order response, to a maximum of 6 seconds.
- If this is a registration other than power down registration, to a maximum of 6 seconds.
- If this is a power down registration, to a maximum of 3 seconds.
- If this is a Base Station Challenge, to a maximum of 6 seconds.

The mobile station must set the last-try code (LT_S) to '0' and then enter the Scan Access Channels Task (see 2.6.3.2).

2.6.3.2 Scan Access Channels

The mobile station must examine the signal strength on each of the channels $FIRSTCHA_S$ to $LASTCHA_S$ and choose up to two channels with the strongest signals. See 2.6.2.1 Response to Overhead Information Task for access channel set determination.

The mobile station must then tune to the strongest access channel and enter the Retrieve Access Attempts Parameters Task (see 2.6.3.3).

2.6.3.3 Retrieve Access Attempt Parameters

The mobile station must set the maximum-number-of-seizure-attempts allowed ($MAXSZTR_{SI}$) to a maximum of 10, and the maximum-number-of-busy-occurrences ($MAXBUSY_{SI}$) to a maximum of 10.

The mobile station must then initialize the following to zero:

- Number of busy occurrences ($NBUSY_{SV}$)
- Number of unsuccessful seizure attempts ($NSZTR_{SV}$)

The mobile station must then examine the read control-filler bit (RCF_S).

- If $RCF_S = 0$, the mobile station must then within 400 ms (+100 ms, -0 ms) set DCC_S to the value in the DCC field of a received message, set $SDCC1_S$ and $SDCC2_S$ to 0, and set the power level (PL_S) to 0.
- If $RCF_S = 1$, the mobile station must then within 1000 ms (+100 ms, -0 ms) read a Control-Filler Message, set DCC_S, $WFOM_S$, $SDCC1_S$ and $SDCC2_S$ to the values in the DCC, WFOM, SDCC1 and SDCC2 fields of the message, respectively, and set PL_S to the power level given by Table 2.1.2.2-1 for the value of the CMAC field of the message and the mobile station power class (see 2.1.2.2, 2.3.3, and 3.7.1.2.4).

If the DCC field or the Control-Filler Message is not received within the time allowed, then the mobile station must examine the access timer. If the access timer has expired, the mobile station must enter the Serving-System Determination Task (see 2.6.3.12). If the access timer has not expired, the mobile station must enter the Alternate Access Channel Task (see 2.6.3.13).

The mobile station must then set BIS_S to '1' and examine the $WFOM_S$ bit.

- If $WFOM_S = 1$, the mobile station must enter the Update Overhead Information Task (see 2.6.3.4).
- If $WFOM_S = 0$, the mobile station must wait a random delay. Each time it waits a random delay, a random delay must be generated with the time uniformly distributed in the interval 0 to 92 ±1 ms and, if quantized, with granularity no more than 1 ms. The mobile station must then enter the Seize Reverse Control Channel Task (see 2.6.3.5).

2.6.3.4 Update Overhead Information

If this task is not completed within 1.5 seconds, the mobile station must exit this task and enter the Serving-System Determination Task (see 2.6.3.12). If the Update Overhead Information Task is completed, the mobile station must enter the Seize Reverse Control Channel Task (see 2.6.3.5).

The mobile station must receive an overhead message train (see 3.7.1.2).

If the access is a registration, an origination, or a page response, the mobile station shall perform the following:

- Update System Identification (SID_r). Set the 14 most significant bits of SID_r to the value of the SID1 field. Set the least significant bit of SID_r to '1' if the serving-system status is enabled; otherwise, set the bit to '0'.
- If the access is a registration, the mobile station must compare SID_r with SID_s. If SID_r is not equal to SID_s, the mobile station must exit the Update Overhead Information Task and enter the Serving System Determination Task (see 2.6.3.12). Otherwise, the mobile station shall continue to process this task.
- If this access is an origination or a page response, the mobile station must compare SID_r with SID_{s-p}. If SID_r does not equal SID_{s-p}, the mobile station must set $RAND_s$ equal to zero.

The mobile station must act as indicated below in response to the following global action messages, if received in the message train:

- *Overload Control Message.*
  - If this access is an origination, the mobile station must examine the value of the overload class field (OLC) identified by $ACCOLC_p$. If the identified OLC field is set to '0', the mobile station must exit this task and enter the Serving-System Determination Task (see 2.6.3.12); if the identified OLC field is set to '1', the mobile station must continue to respond to messages in the overhead message train.
  - Otherwise, the mobile station must continue to respond to messages in the overhead message train.
- *Access Type Parameters Message:* The busy-idle status bit (BIS_s) must be set to the value of the BIS field of the received message.
- *Random Challenge A Message:* The mobile station must set the corresponding portion of its internal $RAND1_s$ to the value of the RAND1_A field in the Global Action Message (see 2.3.12.1.2 for updating of RAND).
- *Random Challenge B Message:* The mobile station must set the corresponding portion of its internal RAND1s to the value of the RAND1_B field in the Global Action Message (see 2.3.12.1.2 for updating of RAND).
- *Access Attempt Parameters Message:* The mobile station must update the following parameters:
  - If this access is a page response,

  + Maximum number of seizure tries allowed ($MAXSZTR_{SI}$) must be set to the value of the MAXSZTR-PGR field of the received message.
  + Maximum number of busy occurrences allowed ($MAXBUSY_{SI}$) must be set to the value of the MAXBUSY-PGR field of the received message.
- Otherwise,
  + Maximum number of seizure tries allowed ($MAXSZTR_{SI}$) must be set to the value of the MAXSZTR-OTHER field of the received message.
  + Maximum number of busy occurrences allowed ($MAXBUSY_{SI}$) must be set to the value of the MAXBUSY-OTHER field of the received message.

If the access is a registration access, the mobile station must respond as indicated to the registration identification message, if received in the overhead message train:

- The mobile station must set $REGID_S$ to the value of the REGID field in the message.

After the overhead message train is received and processed as required above, the mobile station must wait a random time. Each time this task is executed, a different random delay must be generated, distributed uniformly in the interval 0 to 750 ms, and if quantized, with granularity no greater than 1 ms. At the end of the delay, the mobile station must enter the Seize Reverse Control Channel Task (see 2.6.3.5).

2.6.3.5 Seize Reverse Control Channel

The mobile station must read the busy-idle bits of the channel (see 3.7.1).

- If the channel is busy, the mobile station must increment $NBUSY_{SV}$ by 1.
  - If $NBUSY_{SV}$ exceeds $MAXBUSY_{SI}$, then the mobile station must exit this task and enter the Serving-System Determination Task (see 2.6.3.12).
  - If $NBUSY_{SV}$ does not exceed $MAXBUSY_{SI}$, then the mobile station must exit this task and the Delay After Failure Task must be executed (see 2.6.3.6).
- If the channel is idle, then the mobile station must set $NBUSY_{SV}$ to zero, turn on the transmitter at the power level indicated by PL_S (see 2.6.3.3 and 2.1.2.2), wait the proper delay (see 2.1.2.1) until the transmitter is within 3 dB of the required power level, and then start to send the message to the base station (see 2.7.1).

If BIS_S = 0, then the mobile station must enter the Service Request Task (see 2.6.3.7); if BIS_S = 1, then upon starting to send the message, the mobile station must continuously monitor the busy-idle bits of the channel.

- If the channel becomes busy before the first 56 bits of the message are sent, the mobile station must immediately stop sending the message and turn off the transmitter.
- If the channel fails to change to busy by the time the mobile station has sent 104 bits, then the mobile station must immediately stop sending the message and turn off the transmitter.

In either of these cases, the mobile station must then increment the count of seizure failures ($NSZTR_{sv}$) by 1 and compare the result with the maximum number of seizure attempts allowed ($MAXSZTR_{sl}$).

- If $NSZTR_{sv}$ exceeds $MAXSZTR_{sl}$, the mobile station must exit this task and enter the Serving-System Determination Task (see 2.6.3.12).
- If $NSZTR_{sv}$ does not exceed $MAXSZTR_{sl}$, the mobile station must exit this task and enter the Delay After Failure Task (see 2.6.3.6).

- If the busy-idle status changes to busy after 56 bits and before 104 bits are sent, then the mobile station must enter the Service Request Task (see 2.6.3.7).

2.6.3.6 Delay After Failure

The mobile station must examine the access timer. If the access timer has expired, the mobile station must enter the Serving-System Determination Task (see 2.6.3.12). If the access timer has not expired, the mobile station must wait a random time. Each time it enters this task, it must generate a random time, uniformly distributed in the interval 0 to 200 ms, and if quantized, with granularity no greater than 1 ms. The mobile station must then enter the Seize Reverse Control Channel Task (see 2.6.3.5).

2.6.3.7 Service Request

The mobile station must continue to send its message to the base station. The information that must be sent is as follows (with the formats given in 2.7.1):

- Word A must always be sent.
- If:
  - $E_s = 1$, or
  - $LT_s = 1$, or
  - $AUTH_s = 1$, or
  - the ROAM status is enabled, or
  - the ROAM status is disabled and $EX_p = 1$, or
  - the access is an "order confirmation," or
  - the access is a "registration," or
  - the access is a "base station challenge," or
  - the mobile station was paged with a two-word Mobile Station Control Message, or
  - $RCF = 1$,

  Word B must be sent.

- Word C must be sent as per the following table:

S_s Bit	Type of System Access			
	Registration, Origination or Page Response where $AUTH_s = 0$	**Registration, Origination or Page Response where $AUTH_s = 1$**	**Unique Challenge Order Confirmation**	**Base Station Challenge**
0	Send no Word C	Send Authentication Word C	Send Unique Challenge Order Confirmation Word C	Send Base Station Challenge Word C
1	Send Serial Number Word C	Send Serial Number Word C and Authentication Word C	Send Serial Number Word C and Unique Challenge Order Confirmation Word C	Send Serial Number Word C and Base Station Challenge Word C

- If the access is an "origination,"

  word D must be sent.
- If the access is an "origination" and 9 to 16 digits were dialed,

  word E must be sent.

When the mobile station has sent its complete message, it must continue to send unmodulated carrier for a nominal duration of 25 ms and then turn off the transmitter.

The next task to be entered depends on the type of access by the mobile station:

- If the access is an order confirmation, the mobile station must enter the Serving-System Determination Task (see 2.6.3.12).
- If the access is an origination, the mobile station must enter the Await Message Task (see 2.6.3.8).
- If the access is a page response, the mobile station must enter the Await Message Task (see 2.6.3.8).
- If the access is a registration request other than a power down registration the mobile station must enter the Await Registration Confirmation Task (see 2.6.3.9). If the registration is a power down registration the mobile station shall power down.
- If the access is a base station challenge, the mobile station must enter the Await Message Task (see 2.6.3.8).

2.6.3.8 Await Message

If this task is not completed within 5 seconds, the mobile station must exit this task and enter the Serving System Determination Task (see 2.6.3.12).

The mobile station must monitor mobile station control messages (see 3.7.1.1). If the mobile station sent Word B as part of the Service Request (see 2.6.3.7), then the mobile station must attempt to match $MIN1_p$ and $MIN2_p$ to $MIN1_r$ and $MIN2_r$, respectively; otherwise, the mobile station must attempt to match only $MIN1_p$ to $MIN1_r$.

The mobile station must respond as indicated to any of the following messages if all decoded MIN bits match.

If the access is an origination or page response:

- *Initial Voice Channel Designation Message* (see 3.7.1.1): The mobile station must update the parameters as set in the message and delete all entries from SID_NID-_LIST$_s$. If $R_s = 1$ the mobile station must enter the Autonomous Registration Update Task (see 2.6.3.11), supplying a "success" indication. Then enter the Confirm Initial Voice Channel Task (see 2.6.4.2).

- *Directed-Retry Message* (see 3.7.1.1): If the mobile station is equipped for directed retry, it must respond to the Directed-Retry Message as follows:

  If the mobile station encounters the start of a new message before it receives all four words of the Directed-Retry Message, it must exit this task and enter the Serving-System Determination Task (see 2.6.3.12).

  The mobile station must set the last-try code (LT_s) according to the ORDQ field of the message:

  - If ORDQ = '000', set LT_s to '0'.
  - If ORDQ = '001', set LT_s to '1'.

  The mobile station must then clear $CCLIST_s$ and examine each CHANPOS field in Words 3 and 4 of the message. For each nonzero CHANPOS field, the mobile station must calculate a corresponding channel number according to the following algorithm:

- If LOCAL/MSG_TYPE = '00000' and the serving-system status is enabled, subtract CHANPOS from $FIRSTCHA_s + 1$.

- If LOCAL/MSG_TYPE = '00000' and the serving-system status is disabled, add CHANPOS to $FIRSTCHA_s - 1$.

- If LOCAL/MSG_TYPE = '00001' and the serving-system status is enabled, set $FIRSTCHA_s$ to the first dedicated control channel for System A (834.990 MHz/879.990 MHz) and subtract CHANPOS from $FIRSTCHA_s + 1$. The mobile must also set $AUTH_s$ to '0'.

- If LOCAL/MSG_TYPE = '00001' and the serving-system status is disabled, set $FIRSTCHA_s$ to the first dedicated control channel for System B (835.020 MHz/880.020 MHz) and add CHANPOS to $FIRSTCHA_s - 1$. The mobile must also set $AUTH_s$ to '0'.

- If LOCAL/MSG_TYPE = '00010' and the serving-system status is enabled, set $FIRSTCHA_s$ to the first dedicated control channel for System A (834.990 MHz/879.990 MHz) and subtract CHANPOS from $FIRSTCHA_s$ + 1. The mobile must also set $AUTH_s$ to '1'.
- If LOCAL/MSG_TYPE = '00010' and the serving-system status is disabled, set $FIRSTCHA_s$ to the first dedicated control channel for System B (835.020 MHz/880.020 MHz) and add CHANPOS to $FIRSTCHA_s$ - 1. The mobile must also set $AUTH_s$ to '1'.

The mobile station must then determine whether each channel number is within the set allocated to cellular systems, and if so, list the channel number in $CCLIST_s$.

After completing its response to the Directed-Retry Message, the mobile station must examine the access timer. If the access timer has expired, the mobile station must enter the Serving-System Determination Task (see 2.6.3.12). If the access timer has not expired, the mobile station must enter the Directed-Retry Task (see 2.6.3.14).

If the access is an origination:

- *Intercept:* The mobile station must enter the Serving-System Determination Task (see 2.6.3.12).
- *Reorder:* The mobile station must enter the Serving-System Determination Task (see 2.6.3.12).

If the access is a page response:

- *Release:* The mobile station must enter the Serving-System Determination Task (see 2.6.3.12).

If the access is a Base Station Challenge:

- *Base Station Challenge Order Confirmation:* The mobile station compares the AUTHBS received in the Base Station Challenge Order Confirmation message to that computed internally. The mobile station must then acknowledge receipt of the SSD Update Order with a success or failure indication as described in 2.3.12.1.8 by entering the System Access Task (see 2.6.3) with an "order response" indication (see 2.6.3.1). If the mobile station fails to receive the Base Station Challenge Order Confirmation within 5 seconds of when the Base Station Challenge Order was transmitted, terminate the SSD update process.

If the access is an origination and the user terminates a call during this task, the termination status must be enabled so that the call can be released on a voice channel (see 2.6.4.4) instead of on a control channel.

2.6.3.9 Await Registration Confirmation

If this task is not completed within 5 seconds, the mobile station must exit this task and enter the Action on Registration Failure Task (see 2.6.3.10).

The mobile station must monitor mobile station control messages (see 3.7.1.1). If the mobile station sent Word B as part of the Service Request (see 2.6.3.7), then the mobile station must attempt to match $MIN1_p$ and $MIN2_p$ to $MIN1_r$ and $MIN2_r$, respectively; otherwise, the mobile station must attempt to match only $MIN1_p$ to $MIN1_r$.

The mobile station must respond as indicated to any of the following messages if all decoded MIN bits match:

- *Release Order* (see 3.7.1.1): The mobile station must exit this task and enter the Action on Registration Failure Task (see 2.6.3.10).
- *Order Confirmation* (see 3.7.1.1): The mobile station must delete all entries from $SID\_NID\_LIST_s$. If autonomous registration is enabled or $PUREG_{s\text{-}p} = 1$, or $LREG_s = 1$, the mobile station must enter the Autonomous Registration Update Task (see 2.6.3.11), supplying a "success" indication; the mobile station must then enter the Serving-System Determination Task (see 2.6.3.12). Otherwise, the mobile station must enter the Serving-System Determination Task (see 2.6.3.12).

2.6.3.10 Action on Registration Failure

If autonomous registration is enabled or $PUREG_{s\text{-}p} = 1$ or $LREG_s = 1$, the mobile station must enter the Autonomous Registration Update Task (see 2.6.3.11), supplying a "failure" indication; the mobile station must then enter the Serving-System Determination Task (see 2.6.3.12). Otherwise, the mobile station must enter the Serving-System Determination Task (see 2.6.3.12).

2.6.3.11 Autonomous Registration Update

If the first-location area ID status is enabled, the first-registration ID status is enabled, the first-idle ID status is enabled and if a "success" indication was supplied to this task, the mobile station must set the location-registration ID status to disabled.

If the first-location-area ID status is disabled and a "success" indication was supplied to this task, the mobile station must set $LOCAID_{s\text{-}p}$ equal to $LOCAID_s$ and must set location-registration ID status to disabled.

If the first-registration ID status is disabled and a "success" indication was supplied to this task, the mobile station must set $SID_{s\text{-}p}$ equal to SID_s, set $NXTREG_{s\text{-}p}$ equal to $REGID_s$ + $REGINCR_s$ and set location-registration ID status to disabled.

If the first-registration ID status is disabled and a "failure" indication was supplied to this task, the mobile station must do the following:

- generate a random number ($NRANDOM_{sv}$). Each time this step is executed, a random number must be generated, uniformly distributed in the interval 0 to 10, and with granularity no more than 1.
- set $NXTREG_{s\text{-}p}$ equal to $REGID_s + NRANDOM_{sv}$.

If a "success" indication was supplied to this task, the mobile station must set $LRCC_s$ equal to the current control channel.

The mobile station must set the first-idle ID status to disabled and then return to the invoking task.

2.6.3.12 Serving-System Determination

If this task is entered as a result of a power down registration attempt the mobile station must immediately power down. Otherwise, the mobile station shall proceed as follows:

- If the preferred mode of operation is CDMA or the serving-system status does not correspond to the preferred system, the mobile station may enter the *System Determination Substate* of the *Mobile Station Initialization State* (see 6.6.1.1); otherwise, it must enter the Paging Channel Selection Task (see 2.6.1.2).

2.6.3.13 Alternate Access Channel

If the mobile station is tuned to the strongest access channel, it may tune to the second strongest channel and then enter the Retrieve Access Attempt Parameters Task (see 2.6.3.3). Otherwise, it must enter the Serving-System Determination Task (see 2.6.3.12).

2.6.3.14 Directed Retry

The mobile station must examine the signal strength on each of the channels listed in $CCLIST_s$ and choose up to two channels with the strongest signals. The mobile station must then tune to the strongest access channel and enter the Retrieve Access Attempts Parameters Task (see 2.6.3.3).

2.6.4 Mobile Station Control on the Analog Voice Channel

2.6.4.1 Loss of Radio-Link Continuity

While the mobile station is tuned to a voice channel, it must monitor the fade timing status (see 2.4.1.3). If the fade timing status is enabled, a fade timer must be started; each time the fade timing status is disabled, the timer must be reset. If the timer counts to 5 seconds, the mobile station must turn off its transmitter and enter the Serving-System Determination Task (see 2.6.3.12).

2.6.4.2 Confirm Initial Voice Channel

Within 100 ms of the receipt of the Initial Voice Channel Designation Message (see 3.7.1.1), the mobile station must determine whether the channel number is within the set allocated to cellular systems, and do the following:

- If it is within the allocated set, the mobile station must tune to the designated voice channel, turn on the transmitter at the power level indicated by the VMAC field of the Initial Voice Channel Designation Message (see 2.1.2.2 and 3.7.1.1), turn on the SAT transponder (see 2.4.1), and set the stored SAT Color Code (SCC_s) to the value of the SCC field of the Initial Voice Channel Designation Message (see 3.7.1.1). Discontinuous transmission (see 2.3.11) is prohibited while the mobile station is in this task. That is, a mobile station capable of discontinuous-transmission operation must remain in the DTX-high state.

- If this is an origination access, the mobile station then must enter the Conversation Task (see 2.6.4.4).
- If this is a page response access, the mobile station then must enter the Waiting for Order Task (see 2.6.4.3.1).

• Otherwise, the mobile station must enter the Serving-System Determination Task (see 2.6.3.12).

2.6.4.3 Alerting

2.6.4.3.1 Waiting for Order

Discontinuous transmission (see 2.3.11) is prohibited while the mobile station is in this task. That is, a mobile station capable of discontinuous-transmission operation must remain in the DTX-high state. When this task is entered, an order timer must be set to 5 seconds. The following may occur:

• If this task is entered as a result of receiving an *Analog Handoff Direction Message* (see 6.6.6.2.9), the mobile station must use the VMAC, ANALOG_CHAN, and SCC values obtained from the *Analog Handoff Direction Message* to perform the following operations: adjust power level, tune to new channel, adjust to new SAT, and set SCC_s to the value of the SCC field of the message (see 2.4.1). The mobile station must then turn on the transmitter, and reset the fade timer. The mobile station must set the message encryption mode to that indicated by the MEM value obtained from the *Analog Handoff Direction Message*. The mobile station may compare the SID value obtained from the *Analog Handoff Direction Message* with $HOME\_SID_p$. If $SID_r = HOME\_SID_p$, the mobile station may set the ROAM status to disabled. If $SID_r \neq HOME\_SID_p$, the mobile station may set the ROAM status to enabled. The mobile station must remain in the Waiting for Order Task.

• If the order timer expires the mobile station must turn off the transmitter; then the mobile station must enter the Serving-System Determination Task (see 2.6.3.12).

• The mobile station may receive a Base Station Challenge Order Confirmation as part of the SSD Update process (see 2.3.12.1.8). The mobile station must compare the AUTHBS received in the Base Station Challenge Order Confirmation message with that computed internally. The mobile station must then acknowledge receipt of the SSD Update Order with a success or failure indication as described in 2.3.12.1.8. If the mobile station fails to receive the Base Station Challenge Order Confirmation within 5 seconds of when the Base Station Challenge Order was transmitted, terminate the SSD update process. Reset the order timer to 5 seconds and remain in the Waiting for Order Task.

• Within 100 ms of the receipt of any of the orders listed below (see 3.7.2), the mobile station must compare SCC_s to the present SAT color code (PSCC) field in the received message. If $SCC_s \neq$ PSCC, the order must be ignored. If SCC_s = PSCC, the action to be taken for each order is as follows:

- *Handoff (to Analog Voice Channel):* Turn on signaling tone for 50 ms, turn off signaling tone, turn off transmitter, adjust power level, tune to new channel, adjust to new SAT, set SCC_S to the value of the SCC field of the message (see 2.4.1), turn on transmitter, reset fade timer, remain in the Waiting for Order Task, and reset the order timer to 5 seconds.
- *Handoff (to Digital Traffic Channel):* Requires further study.
- *Alert* and *Alert With Info:* Turn on signaling tone, wait 500 ms, and enter the Waiting for Answer Task (see 2.6.4.3.2).
- *Release:* Enter Release Task (see 2.6.4.5).
- *Audit:* Send order confirmation message to base station (see 2.7.2), remain in the Waiting for Order Task, and reset the order timer to 5 seconds.
- *Message Waiting Order:* If the mobile station is capable of performing Message Waiting Notification, the mobile station shall indicate the presence of messages waiting based on the information contained in the message type field of the Message Waiting order (i.e., 0 for clear or no messages, other non-zero values indicate the number of messages waiting). The mobile station must send an order confirmation to the base station (see 2.7.2), reset the order timer to 5 seconds and remain in the Waiting for Order Task.
- *Maintenance:* Turn on signaling tone, wait 500 ms, and enter the Waiting for Answer Task (see 2.6.4.3.2).
- *Change Power:* Adjust the transmitter to the power level indicated by the order qualification code (see 3.7.1.1 and 2.1.2.2) and send order confirmation message to base station (see 2.7.2). Remain in the Waiting for Order Task, and reset the order timer to 5 seconds.
- *Local Control:* If the local control status is enabled (see 2.6.1.2.2) and a local control order is received, the local control field must be examined to determine the action and confirmation to take.
- *Page:* Reply with Page Response. The mobile station must remain in the Waiting for Order Task and reset the order timer to 5 seconds.
- *Serial Number Request:* Reply with Serial Number Response Message. The mobile station must remain in the Waiting for Order Task, and reset the order timer to 5 seconds.
- *SSD Update Order:* The mobile station computes SSD_A_NEW and SSD_B_NEW and selects a RANDBS as described in 2.3.12.1.8. Within 5 seconds, the mobile station must reply with a Base Station Challenge Order. Remain in the Waiting for Order Task and reset the order timer to 5 seconds.
- *Unique Challenge Order:* The mobile station executes the Unique Challenge procedure as in 2.3.12.1.5. Within 5 seconds, the mobile station must send an order confirmation message to the base station (see 2.7.2). Remain in the current task and reset the order timer to 5 seconds.

- *Message Encryption Mode Order:* The base station is activating/deactivating signaling message encryption. If the order qualifier field in the received message is set to '001', activate signaling message encryption. If the order qualifier field in the received message is set to '000', deactivate signaling message encryption. In either case, send an order confirmation message to the base station (see 2.7.2), remain in the Waiting for Order Task and reset the order timer to 5 seconds.

- *Parameter Update Order:* Increment $COUNT_{s-p}$ (see 2.3.12.1.3), send an order confirmation message to the base station (see 2.7.2) and reset the order timer to 5 seconds. Remain in the Waiting for Order Task.

- *Any other order:* Ignore order.

2.6.4.3.2 Waiting for Answer

Discontinuous transmission (see 2.3.11) is prohibited while the mobile station is in this task. That is, a mobile station capable of discontinuous-transmission operation must remain in the DTX-high state. When this task is entered, an alert timer must be set to 65 seconds (-0, +20%). The following may occur:

- If this task is entered as a result of receiving an *Analog Handoff Direction Message* (see 6.6.6.2.9), the mobile station must use the VMAC, ANALOG_CHAN, and SCC values obtained from the *Analog Handoff Direction Message* to perform the following operations: adjust power level, tune to new channel, adjust to new SAT, and set SCC_s to the value of the SCC field of the message (see 2.4.1). The mobile station must then turn on the transmitter, reset the fade timer, and turn on the signaling tone. The mobile station must set the message encrpyption mode to that indicated by the MEM value obtained from the *Analog Handoff Direction Message*. The mobile station may compare the SID value obtained from the *Analog Handoff Direction Message* with $HOME\_SID_p$. If $SID_r = HOME\_SID_p$, the mobile station may set the ROAM status to disabled. If $SID_r \neq HOME\_SID_p$, the mobile station may set the ROAM status to enabled. The mobile station must remain in the Waiting for Answer Task.

- If the alert timer expires the mobile station must turn off the transmitter; then the mobile station must enter the Serving-System Determination Task (see 2.6.3.12).

- If the user answers, signaling tone must be turned off and the Conversation Task (see 2.6.4.4) must be entered.

- The mobile station may receive a Base Station Challenge Order Confirmation as part of the SSD Update process (see 2.3.12.1.8). The mobile station must compare the AUTHBS received in the Base Station Challenge Order Confirmation Message with that computed internally. The mobile station must then acknowledge receipt of the SSD Update Order with a success or failure indication as described in 2.3.12.1.8. If the mobile station fails to receive the Base Station Challenge Order Confirmation within 5 seconds of when the Base Station Challenge Order was transmitted, terminate the SSD update process. Remain in the Waiting for Answer Task.

- Within 100 ms of the receipt of any of the orders listed below, the mobile station must compare SCC_S to the PSCC field in the received message. If $SCC_S \neq$ PSCC, the order must be ignored. If SCC_S = PSCC, the action to be taken for each order is as follows:
  - *Handoff (to Analog Voice Channel):* Turn off signaling tone for 500 ms, turn on signaling tone for 50 ms, turn off signaling tone, turn off transmitter, adjust power level, tune to new channel, adjust to new SAT, set SCC_S to the value of the SCC field of the message (see 2.4.1), turn on transmitter, reset fade timer, and turn on signaling tone. Then remain in the Waiting for Answer Task.
  - *Handoff (to Digital Traffic Channel):* Requires further study.
  - *Alert and Alert With Info:* Remain in the Waiting for Answer Task, and reset the alert timer to 65 seconds.
  - *Stop Alert:* Turn off signaling tone, and enter the Waiting for Order Task (see 2.6.4.3.1).
  - *Release:* Turn off signaling tone, wait 500 ms, and then enter the Release Task (see 2.6.4.5).
  - *Audit:* Send order confirmation message to base station (see 2.7.2) and remain in the Waiting for Answer Task.
  - *Message Waiting:* If the mobile station is capable of performing Message Waiting Notification, the mobile station shall indicate the presence of messages waiting based on the information contained in the message type field of the Message Waiting order (i.e., 0 for clear or no messages, other non-zero values indicate the number of messages waiting). The mobile station must send an order confirmation to the base station (see 2.7.2) and remain in the Waiting for Answer Task.
  - *Maintenance:* Remain in the Waiting for Answer Task, and reset the alert timer to 65 seconds.
  - *Change Power:* Adjust the transmitter to the power level indicated by the order qualification code (see 3.7.1.1 and 2.1.2.2) and send order confirmation message to base station (see 2.7.2). Remain in the Waiting for Answer Task.
  - *Local Control:* If the local control status is enabled (see 2.6.1.2.2) and a local control order is received, the local control field must be examined to determine the action and confirmation to take.
  - *Page:* Reply with Page Response. The mobile station must remain in the Waiting for Answer Task.
  - *Serial Number Request:* Reply with Serial Number Response Message. The mobile station must remain in the Waiting for Answer Task.

- *SSD Update Order:* The mobile station computes SSD-A_NEW and SSD-B_NEW and selects a RANDBS as described in 2.3.12.1.8. Within 5 seconds, the mobile station must then reply with a Base Station Challenge Order. Remain in the Waiting for Answer Task.

- *Unique Challenge Order:* The mobile station executes the Unique Challenge procedure as in 2.3.12.1.5. Within 5 seconds, the mobile station must send an order confirmation message to the base station (see 2.7.2). Remain in the current task.

- *Message Encryption Mode Order:* The base station is activating/deactivating signaling message encryption. If the order qualifier field in the received message is set to '001', activate signaling message encryption. If the order qualifier field in the received message is set to '000', deactivate signaling message encryption. In either case, send an order confirmation message to the base station (see 2.7.2) and remain in the Waiting for Answer Task.

- *Parameter Update Order:* Increment $COUNT_{s-p}$ (see 2.3.12.1.3) and send an order confirmation message to the base station (see 2.7.2). Remain in the Waiting for Answer Task.

- *Any other order:* Ignore order.

2.6.4.4 Conversation

When this task is entered, a release-delay timer must be set to 500 ms. If the termination status is enabled (see 2.6.3.8), the mobile station must set the termination status to disabled, wait 500 ms and then enter the Release Task (see 2.6.4.5).

Discontinuous transmission (see 2.3.11) must be inhibited for 1.5 seconds after the mobile station enters this task. That is, for at least 1.5 seconds after entering this task, a mobile station capable of discontinuous-transmission operation must remain in the DTX-high state.

In the conversation state, the following may occur:

- If this task is entered as a result of receiving an *Analog Handoff Direction Message* (see 6.6.6.2.9), the mobile station must use the VMAC, ANALOG_CHAN, and SCC values obtained from the *Analog Handoff Direction Message* to perform the following operations: adjust power level, tune to new channel, adjust to new SAT, and set SCC_s to the value of the SCC field of the message (see 2.4.1). The mobile station must then turn on the transmitter, and reset the fade timer. The mobile station must set the message encryption mode to that indicated by the MEM value obtained from the *Analog Handoff Direction Message*. The mobile station may compare the SID value obtained from the *Analog Handoff Direction Message* with $HOME\_SID_p$. If $SID_r = HOME\_SID_p$, the mobile station may set the ROAM status to disabled. If $SID_r \neq HOME\_SID_p$, the mobile station may set the ROAM status to enabled. The mobile station must remain in the Conversation Task.

- If the user terminates the call, the release-delay timer must be examined. If the timer has expired, the Release Task must be entered (see 2.6.4.5). If the timer has not expired, the mobile station must wait until the timer expires and then enter the Release Task.
- If the user requests a flash, the mobile station must take the following steps. Mobile stations capable of discontinuous-transmission operation (see 2.3.11) must inhibit discontinuous transmission for 1.5 seconds; that is, for at least 1.5 seconds the mobile station must remain in the DTX-high state. Immediately following the flash, a mobile station not capable of discontinuous transmission or a mobile station capable of discontinuous transmission but in the DTX-high state must turn on signaling tone for 400 ms.

  If the mobile station is capable of discontinuous transmission and is in the DTX-low state or the transition state when the flash occurs, the mobile station must enter the DTX-high state and wait 200 ms. Then it must turn on signaling tone for 400 ms. If a valid order (one that is not ignored) is received while processing a flash, the flash must be terminated immediately and the order must be processed. Flashes so terminated are not considered valid.
- The mobile station may receive a Base Station Challenge Order Confirmation as part of the SSD Update process (see 2.3.12.1.8). The mobile station must compare the AUTHBS received in the Base Station Challenge Order Confirmation Message with that computed internally. The mobile station must then acknowledge receipt of the SSD Update Order with a success or failure indication as described in 2.3.12.1.8. If the mobile station fails to receive the Base Station Challenge Order Confirmation within 5 seconds of when the Base Station Challenge Order was transmitted, terminate the SSD update process. Remain in the Conversation Task.
- Within 100 ms of the receipt of any of the orders listed below, the mobile station must compare SCC_s to the PSCC field in the received message. If $SCC_s \neq$ PSCC, the order must be ignored. If $SCC_s =$ PSCC, the mobile station must take the following steps. Except for the audit order, mobile stations capable of discontinuous-transmission operation (see 2.3.11) must inhibit discontinuous transmission for 1.5 seconds; that is, for at least 1.5 seconds the mobile station must remain in the DTX-high state. Upon receipt of the audit order, mobile stations capable of discontinuous transmission must inhibit discontinuous transmission for at least 5 seconds. Immediately after determining that $SCC_s =$ PSCC a mobile station not capable of discontinuous transmission or a mobile station capable of discontinuous transmission but in the DTX-high state must take the actions specified below for each order.

If the mobile station is capable of discontinuous transmission and is in the DTX-low state or the transition state when the order arrives, the mobile station must enter the DTX-high state and wait 200 ms. Then it must take the actions specified below for each order.

- *Handoff (to Analog Voice Channel):* Turn on signaling tone for 50 ms, turn off signaling tone, turn off transmitter, adjust power level, tune to new channel, adjust to new SAT, set SCC_s to the value of the SCC field of the message (see 2.4.1), turn on transmitter, reset fade timer, and remain in the Conversation Task.
- *Handoff (to Digital Traffic Channel):* Requires further study.
- *Send Called-Address:*
  + If received within 10 seconds of the completion of the last valid flash, send the called-address to the base station (see 2.7.2) and remain in the Conversation Task.
  + Otherwise, ignore the order and remain in the Conversation Task.
- *Disable DTMF Order:* Send an order confirmation message to the base station (see 2.7.2). The mobile station must then disable its DTMF tone generator until the Called Address message sent to the base station in response to the next Send Called-Address message received by the mobile station has been completely transmitted. The mobile station must remain in the Conversation Task.
- *Alert and Alert With Info:* Turn on signaling tone, wait 500 ms, and then enter the Waiting for Answer Task (see 2.6.4.3.2).
- *Release:* Examine the release-delay timer. If the timer has expired, the mobile station must enter the Release Task (see 2.6.4.5). If the timer has not expired, the mobile station must wait until the timer expires and then enter the Release Task.
- *Audit:* Send order confirmation message to base station (see 2.7.2) and remain in the Conversation Task.
- *Flash With Info:* Send order confirmation message to the base station (see 2.7.2) and remain in the Conversation Task.
- *Message Waiting:* If the mobile station is capable of performing Message Waiting Notification, the mobile station shall indicate the presence of messages waiting based on the information contained in the message type field of the Message Waiting order (i.e., 0 for clear or no messages, other non-zero values indicate the number of messages waiting). The mobile station must send an order confirmation to the base station (see 2.7.2) and remain in the Conversation Task.
- *Maintenance:* Turn on signaling tone, wait 500 ms, and then enter the Waiting for Answer Task (see 2.6.4.3.2).

- *Change Power:* Adjust the transmitter to the power level indicated by the order qualification code (see 3.7.1.1 and 2.1.2.2) and send order confirmation message to base station (see 2.7.2). Remain in the Conversation Task. If the mobile station is capable of discontinuous transmission and is in the DTX-low state or the transition state when this order arrives, the mobile station must immediately enter the DTX-high state at the power level indicated in the order.
- *Local Control:* If the local control status is enabled (see 2.6.1.2.2) and a local control order is received, the local control field must be examined to determine the action and confirmation to take.
- *Page:* Reply with Page Response. The mobile station must remain in the Conversation Task.
- *Serial Number Request:* Reply with Serial Number Response Message. The mobile station must remain in the Conversation Task.
- *SSD Update Order:* The mobile station computes SSD-A_NEW and SSD-B_NEW and selects a RANDBS as described in 2.3.12.1.8. Within 5 seconds, the mobile station must then reply with a Base Station Challenge Order. Remain in the Conversation Task.
- *Unique Challenge Order:* The mobile station executes the Unique Challenge procedure as in 2.3.12.1.5. Within 5 seconds, the mobile station must send an order confirmation message to the base station (see 2.7.2). Remain in the Conversation Task.
- *Message Encryption Mode Order:* The base station is activating/deactivating signaling message encryption. If the order qualifier field in the received message is set to '001', activate signaling message encryption. If the order qualifier field in the received message is set to '000', deactivate signaling message encryption. In either case, send an order confirmation message to the base station (see 2.7.2) and remain in the Conversation Task.
- *Parameter Update Order:* Increment $COUNT_{s-p}$ (see 2.3.12.1.3) and send an order confirmation message to the base station (see 2.7.2). Remain in the Conversation Task.
- *Any other order:* Ignore order.

2.6.4.5 Release

Discontinuous transmission (see 2.3.11) is prohibited while the mobile station is in this task. That is, a mobile station capable of discontinuous-transmission operation must remain in the DTX-high state. Any mobile station in the DTX-low state must immediately enter the DTX-high state, wait 200 ms. While in the DTX-high state, the mobile station shall do the following:

- Send signaling tone for 1.8 seconds. If a flash (see 2.6.4.4) was being sent when this task was entered, signaling tone must continue to be sent for no more than 1.8 seconds.

- Stop sending signaling tone.
- Turn off the transmitter.

The mobile station must then enter the Serving-System Determination Task (see 2.6.3.12).

2.6.4.6 Power Down

If the mobile station is intentionally removed from the air interface while it is tuned to an analog voice channel the mobile station must immediately prohibit discontinuous transmission (see 2.3.11). That is, a mobile station capable of discontinuous-transmission operation must remain in the DTX-high state. Any mobile station in the DTX-low state must immediately enter the DTX-high state, wait 200 ms. While in the DTX-high state, the mobile station shall do the following:

- If $PDREG_s = 1$ the mobile station must send an autonomous registration message with a power down indication on the reverse voice channel.
- Send signaling tone for 1.8 seconds. If a flash (2.6.4.4) was being sent when this task was entered, signaling tone must continue to be sent for no more than 1.8 seconds.
- Stop sending signaling tone, turn off the transmitter and then power down.

2.7 Signaling Formats

In the message formats used between the mobile stations and base stations, some bits are marked as reserved (RSVD). Some or all of these reserved bits may be used in the future for additional messages. Therefore, all 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.

2.7.1 Reverse Analog Control Channel (RECC)

The reverse analog control channel (RECC) is a wideband data stream sent from the mobile station to the base station. This data stream must be generated at a 10 kbps ±1 bit/second rate. Figure 2.7.1-1 depicts the format of the RECC data stream.

Information element	Length (bits)	
DOTTING = 1010...010	30	↑
WORD SYNC = 11100010010	11	Seizure Precursor
CODED DCC [Coded per Table 2.7.1-1]	7	↓
1st Word Repeated 5 times	240	
2nd Word Repeated 5 times	240	
3rd Word Repeated 5 times	240	
...		

Figure 2.7.1-1. Reverse Analog Control Channel Message Stream (Mobile-to-Base)

All messages begin with the RECC seizure precursor that is composed of a 30-bit dotting sequence (1010...010), an 11-bit word sync sequence (11100010010), and the coded digital color code (DCC). The 7-bit coded DCC is obtained by translating the received DCC according to Table 2.7.1-1.

Table 2.7.1-1. Coded Digital Color Code

Received DCC	7-Bit Coded DCC
00	0000000
01	0011111
10	1100011
11	1111100

Each word contains 48 bits, including parity, and is repeated five times; it is then referred to as a word block. A word is formed by encoding 36 content bits into a (48, 36) BCH code that has a distance of 5, (48, 36; 5). The left-most bit (i.e., earliest in time) shall be designated the most-significant bit. The 36 most-significant bits of the 48-bit field shall be the content bits. The generator polynomial for the code is the same as for the (40, 28; 5) code used on the forward control channel (see 3.7.1).

2.7.1.1 Reverse Analog Control Channel (RECC) Messages

Each RECC message can consist of one to six words. The types of messages to be transmitted over the reverse control channel are:

- Page Response Message
- Origination Message
- Order Confirmation Message
- Order Message

These messages are made up of combinations of the following five words. Note: If included, Words are to be transmitted in the order shown.

Word A - Abbreviated Address Word

Information element	Length (bits)
F	1
NAWC	3
T	1
S	1
E	1
ER	1
SCM (3-0)	4
MIN1	24
P	12

Word B - Extended Address Word

Information element	Length (bits)
F = 0	1
NAWC	3
LOCAL/MSG_TYPE	5
ORDQ	3
ORDER	5
LT	1
EP	1
SCM(4)	1
MPCI	2
SDCC1	2
SDCC2	2
$MIN2_{33-24}$	10
P	12

Word C - Serial Number Word

Information element	Length (bits)
F = 0	1
NAWC	3
ESN	32
P	12

Word C - Authentication Word

Information element	Length (bits)
F = 0	1
NAWC	3
COUNT	6
RANDC	8
AUTHR	18
P	12

Word C - Unique Challenge Order Confirmation Word

Information element	Length (bits)
F = 0	1
NAWC	3
RSVD = 000...000	14
AUTHU	18
P	12

Word C - Base Station Challenge Word

Information element	Length (bits)
F = 0	1
NAWC	3
RANDBS	32
P	12

Word D - First Word of the Called-Address

Information element	Length (bits)
F = 0	1
NAWC	3
1st DIGIT	4
2nd DIGIT	4
3rd DIGIT	4
4th DIGIT	4
5th DIGIT	4
6th DIGIT	4
7th DIGIT	4
8th DIGIT	4
P	12

Word E - Second Word of the Called-Address

Information element	Length (bits)
F = 0	1
NAWC = 0	3
9th DIGIT	4
10th DIGIT	4
11th DIGIT	4
12th DIGIT	4
13th DIGIT	4
14th DIGIT	4
15th DIGIT	4
16th DIGIT	4
P	12

The interpretation of the data fields is as follows:

F – First word indication field. Set to '1' in first word and '0' in subsequent words.

NAWC – Number of additional words coming field.

T – T field. Set to '1' to identify the message as an origination or an order; set to '0' to identify the message as an order response or page response.

S – Send serial number field. If the serial number word is sent, set to '1'; if the serial number word is not sent, set to '0'.

E – Extended address field. If the extended address word is sent, set to '1'; if the extended address word is not sent, set to '0'.

EP – The Extended Protocol (EP) bit is used to indicate to the system that the mobile station is capable of using the Extended Protocol.

ER – The Extended Protocol Reverse Channel (ER) bit is used to indicate that the current message is in the Extended Protocol. If the ER bit is a "zero" (0), the message format of 2.7.1.1 above, is being used. If the ER bit is a "one" (1), the Extended Protocol message format is being used.

COUNT – A modulo-64 count maintained by the mobile station and used for authentication and anti-fraud purposes.

RANDC – An 8-bit number used to confirm the last RAND received by the mobile station.

SCM(4-0) – The station class mark field (see 2.3.3).

MPCI – '00' indicates EIA-553 or IS-54-A mobile station.

'01' Reserved. (used to indicate EIA/TIA IS-54-B dual-mode mobile station).

'10' indicates CDMA-capable dual-mode mobile station.

'11' reserved.

SDCC1 – Supplementary Digital Color Codes

SDCC2 – Supplementary Digital Color Codes

ORDER – Order field. Identifies the order type (see Table 3.7.1.1-1).

ORDQ – Order qualifier field. Qualifies the order confirmation to a specific action (see Table 3.7.1.1-1).

LOCAL – Local control field. This field is specific to each system. The ORDER field must be set to local control (see Table 3.7.1.1-1) for this field to be interpreted.

MESSAGE TYPE – Message type field. Qualifies the order to a specific action (see Table 3.7.1.1-1)

LT – Last-try code field (see 2.6.3.8).

MIN1 – First part of the mobile identification number field (see 2.3.1).

MIN2 – Second part of the mobile identification number field (see 2.3.1).

ESN – Electronic Serial Number field. Identifies the electronic serial number of the mobile station (see 2.3.2).

DIGIT – Digit field (see Table 2.7.1.1-1).

AUTHR – Output response of the authentication algorithm.

AUTHU – Output of the authentication algorithm when responding to a Unique Challenge order (see 2.3.12.1.5).

RANDBS – Random number used in the SSD update procedure (see 2.3.12.1.8).

RSVD – Reserved for future use; all bits must be set as indicated.

P – Parity field.

Table 2.7.1.1-1. Digit Code

Digit	Code	Digit	Code
1	0001	7	0111
2	0010	8	1000
3	0011	9	1001
4	0100	0	1010
5	0101	*	1011
6	0110	#	1100
		Null	0000

Notes:

1. The digit 0 is encoded as binary "ten"; not binary "zero."
2. The code 0000 is the null code, indicating no digit present.
3. All other four-bit sequences are reserved, and must not be transmitted.

Examples of encoding called-address information into the called-address words are given below:

1. If the number 2# is entered, the word is:

Information element	Value	Length (bits)
F = 0	NOTE	1
NAWC	NOTE	3
1st DIGIT	0010	4
2nd DIGIT	1100	4
3rd DIGIT	0000	4
4th DIGIT	0000	4
5th DIGIT	0000	4
6th DIGIT	0000	4
7th DIGIT	0000	4
8th DIGIT	0000	4
P		12

II. If the number 13792640 is entered, the word is:

Information element	Value	Length (bits)
F = 0	NOTE	1
NAWC	NOTE	3
1st DIGIT	0001	4
2nd DIGIT	0011	4
3rd DIGIT	0111	4
4th DIGIT	1001	4
5th DIGIT	0010	4
6th DIGIT	0110	4
7th DIGIT	0100	4
8th DIGIT	1010	4
P		12

III. If the number *24273258 is entered, the words are:

Word D - First Word of the Called-Address

Information element	Value	Length (bits)
F = 0	NOTE	1
NAWC	NOTE	3
1st DIGIT	1011	4
2nd DIGIT	0010	4
3rd DIGIT	0100	4
4th DIGIT	0010	4
5th DIGIT	0111	4
6th DIGIT	0011	4
7th DIGIT	0010	4
8th DIGIT	0101	4
P		12

Word E - Second Word of the Called-Address

Information element	Value	Length (bits)
F = 0	NOTE	1
NAWC = 0	NOTE	3
9th DIGIT	1000	4
10th DIGIT	0000	4
11th DIGIT	0000	4
12th DIGIT	0000	4
13th DIGIT	0000	4
14th DIGIT	0000	4
15th DIGIT	0000	4
16th DIGIT	0000	4
P		12

NOTE: These four bits depend on the type of message.

2.7.2 Reverse Analog Voice Channel (RVC)

The reverse voice channel (RVC) is a wideband data stream sent from the mobile station to the base station. This data stream must be generated at a 10 kbps ±1 bps rate. Figure 2.7.2-1 depicts the format of the RVC data stream.

Information element	Length (bits)
DOTTING	101
W.S.	11
Repeat 1 of WORD1	48
dotting	37
W.S.	11
Repeat 2 of WORD 1	48
dotting	37
W.S.	11
...	...
Repeat 5 of WORD 1	48
dotting	37
W.S.	11
Repeat 1 of WORD 2	48
dotting	37
W.S.	11
...	...
Repeat 5 of WORD 2	48

DOTTING = 1010....101

W.S. (WORD SYNC) = 11100010010

Figure 2.7.2-1. RVC Message Stream (Mobile-to-Base)

A 37-bit dotting sequence (1010....101) and an 11-bit word sync sequence (11100010010) are sent to permit base stations to achieve synchronization with the incoming data, except at the first repeat of word 1 of the message where a 101-bit dotting sequence is used. Each word contains 48 bits, including parity, and is repeated five times together with the 37-bit dotting and 11-bit word sync sequences; it is then referred to as a word block. For a multi-word message, the second word block is formed the same as the first word block including the 37-bit dotting and 11-bit word sync sequences. A word is formed by encoding the 36 content bits into a (48, 36) BCH code that has a distance of 5, (48, 36; 5). The left-most bit (i.e., earliest in time) shall be designated the most-significant bit. The 36 most-significant bits of the 48-bit field shall be the content bits. The generator polynomial for the code is the same as for the (40, 28; 5) code used on the forward control channel (see 3.7.1).

2.7.2.1 Reverse Analog Voice Channel (RVC) Messages

Each RVC message can consist of one or two words. Formats are shown for the following RVC message types:

- Order Confirmation Message
- Called-Address Message
- Serial Number Response Message
- Page Response
- Unique Challenge Order Confirmation
- Base Station Challenge Order Message

Order Confirmation Message

Information element	Length (bits)
F = 1	1
NAWC = 00	2
T = 1	1
LOCAL/MSG_TYPE	5
ORDQ	3
ORDER	5
RSVD = 000 ... 000	19
P	12

Called-Address Message:

Word 1 - First Word of the Called-Address

Information element	Length (bits)
F = 1	1
NAWC	2
T = 0	1
1st DIGIT	4
2nd DIGIT	4
3rd DIGIT	4
4th DIGIT	4
5th DIGIT	4
6th DIGIT	4
7th DIGIT	4
8th DIGIT	4
P	12

Word 2 - Second Word of the Called-Address

Information element	Length (bits)
F = 0	1
NAWC = 00	2
T = 0	1
9th DIGIT	4
10th DIGIT	4
11th DIGIT	4
12th DIGIT	4
13th DIGIT	4
14th DIGIT	4
15th DIGIT	4
16th DIGIT	4
P	12

Serial Number Response Message:

Word 1 of Serial Number Response Message

Information element	Length (bits)
F = 1	1
NAWC = 01	2
T = 1	1
LOCAL/MSG_TYPE = 00000	5
ORDQ	3
ORDER	5
RSVD = 000 ... 000	19
P	12

Word 2 of Serial Number Response Message

Information element	Length (bits)
F = 0	1
NAWC = 00	2
T = 1	1
ESN	32
P	12

Page Response

Information element	Length (bits)
F = 1	1
NAWC = 00	2
T = 1	1
MSG_TYPE = 00000	5
ORDQ = 000	3
ORDER = 00000	5
RSVD = 000 ... 000	19
P	12

Unique Challenge Order Confirmation Message

Information element	Length (bits)
F = 1	1
NAWC = 00	2
T = 1	1
LOCAL/MSG_TYPE = 0...0	5
ORDQ	3
ORDER	5
AUTHU	18
RSVD = 0	1
P	12

Base Station Challenge Order Message

Word 1 of Base Station Challenge Order Message

Information element	Length (bits)
F = 1	1
NAWC = 01	2
T = 1	1
LOCAL/MSG_TYPE = 0...0	5
ORDQ	3
ORDER	5
RSVD = 000 ... 000	19
P	12

Word 2 of Base Station Challenge Order Message

Information element	Length (bits)
F = 0	1
NAWC = 00	2
T = 1	1
RANDBS	32
P	12

The interpretation of the data fields is as follows:

F	–	First word field. Set to '1' in first word and '0' in second word.
NAWC	–	Number of additional words coming field.
T	–	T field. Set to '1' to identify the message as an order or order confirmation. Set to '0' to identify the message as a called-address.
DIGIT	–	Digit field (see Table 2.7.1.1-1).
ORDER	–	Order field. Identifies the order type (see Table 3.7.1.1-1).
ORDQ	–	Order qualifier field. Qualifies the order confirmation to a specific action (see Table 3.7.1.1-1).
LOCAL	–	Local Control field. This field is specific to each system. The ORDER field must be set to local control (see Table 3.7.1.1-1) for this field to be interpreted.
MSG_TYPE	–	Message Type field. Qualifies the order (see Table 3.7.1.1-1).
RSVD	–	Reserved for future use; all bits must be set as indicated.
AUTHU	–	Output of the authentication algorithm when responding to a Unique Challenge order (see 2.3.12.1.5).
RANDBS	–	Random number used in the SSD update procedure (see 2.3.12.1.8).
ESN	–	Electronic Serial Number field. Identifies the electronic serial number of the mobile station (see 2.3.2).
P	–	Parity field.

6 REQUIREMENTS FOR MOBILE STATION CDMA OPERATION

This section defines requirements that are specific to CDMA mobile station equipment and operation. See Section 2 and Section 4 for analog mobile station requirements.

6.1 Transmitter

6.1.1 Frequency Parameters

6.1.1.1 Channel Spacing and Designation

Channel spacing and designation for the dual-mode mobile station transmissions shall be as specified in 2.1.1.1. The mobile station shall support CDMA operations on channel numbers 1013 through 1023, 1 through 311, 356 through 644, 689 through 694, and 739 through 777 inclusive, as shown in Table 6.1.1.1-1.

The CDMA frequency assignment in MHz corresponding to the CDMA Channel number shown in Table 6.1.1.1-1 (expressed as N) is calculated as shown in Table 6.1.1.1-2.

Channel numbers for the Primary CDMA Channel and the Secondary CDMA Channel are given in 7.1.1.1.

6.1.1.2 Frequency Tolerance

When operating in the CDMA transmission mode, the mobile station transmit carrier frequency shall be 45.0 MHz ±300 Hz lower than the frequency of the base station transmit signal as measured at the mobile station receiver.

6.1.2 Power Output Characteristics

All power levels are referenced to the mobile station antenna connector unless otherwise specified.

6.1.2.1 Maximum Output Power

The absolute maximum effective radiated power (ERP) with respect to a half-wave dipole for any class mobile station transmitter shall be 8 dBW (6.3 Watts). ERP measured during a transmitted power control group (see 6.1.3.1.7.1) for each mobile station class when commanded to maximum output power shall be within the limits given in Table 6.1.2.1-1. Transmission at maximum power shall not degrade the spurious emission levels as specified in 6.1.4.2. An inoperative antenna assembly shall not degrade spurious emission levels as specified in 6.1.4.2. These ERP requirements shall be met over the ambient temperature range of -30° C to +60° C. For a Class III mobile station, the ERP at maximum output power may drop by 2 dB at 60° C.

Table 6.1.1.1-1. CDMA Channel Numbers and Corresponding Frequencies

System	Valid CDMA Frequency Assignments	Analog Channel Count	CDMA Channel Number	Transmitter Frequency Assignment (MHz) Mobile	Base
A" (1 MHz)	/////////	22	991 1012	824.040 824.670	869.040 869.670
	CDMA	11	1013 1023	824.700 825.000	869.700 870.000
A (10 MHz)	CDMA	311	1 311	825.030 834.330	870.030 879.330
	/////////	22	312 333	834.360 834.990	879.360 879.990
B (10 MHz)	/////////	22	334 355	835.020 835.650	880.020 880.650
	CDMA	289	356 644	835.680 844.320	880.680 889.320
	/////////	22	645 666	844.350 844.980	889.350 889.980
A' (1.5 MHz)	/////////	22	667 688	845.010 845.640	890.010 890.640
	CDMA	6	689 694	845.670 845.820	890.670 890.820
	/////////	22	695 716	845.850 846.480	890.850 891.480
B' (2.5 MHz)	/////////	22	717 738	846.510 847.140	891.510 892.140
	CDMA	39	739 777	847.170 848.310	892.170 893.310
	/////////	22	778 799	848.340 848.970	893.340 893.970

Frequencies in shaded (///////) regions are not valid for CDMA frequency assignments.

Table 6.1.1.1-2. CDMA Channel Number to CDMA Frequency Assignment Correspondence

Transmitter	CDMA Channel Number	CDMA Frequency Assignment, MHz
Mobile Station	$1 \le N \le 777$	0.030 N + 825.000
	$1013 \le N \le 1023$	0.030 (N-1023) + 825.000
Base Station	$1 \le N \le 777$	0.030 N + 870.000
	$1013 \le N \le 1023$	0.030 (N-1023) + 870.000

Table 6.1.2.1-1. Effective Radiated Power at Maximum Output Power

Mobile Station Class	ERP at Maximum Output Shall Exceed	ERP at Maximum Output Shall not Exceed
I	1 dBW (1.25 watts)	8 dBW (6.3 watts)
II	-3 dBW (0.5 watts)	4 dBW (2.5 watts)
III	-7 dBW (0.2 watts)	0 dBW (1.0 watts)

6.1.2.2 Output Power Limits

6.1.2.2.1 Minimum Controlled Output Power

With both closed loop and open loop power control functions set to minimum (see 6.1.2.3), the mean output power of the mobile station shall be less than -50 dBm/1.23 MHz (-111 dBm/Hz) for all frequencies within ±615 kHz of the center frequency.

6.1.2.2.2 Gated Output Power

When operating in variable data rate transmission mode, the mobile station transmits at nominal controlled power levels only during gated-on periods, each defined as a power control group (see 6.1.3.1.7.1). Given an ensemble of power control groups, all with the same mean output power, the time response of the ensemble average shall be within the limits shown in Figure 6.1.2.2.2-1. During gated-off periods, between the transmissions of power control groups, the mobile station shall reduce its mean output power either by at least 20 dB with respect to the mean output power of the most recent power control group, or to the transmitter noise floor, whichever is the greater power. The transmitter noise floor should be less than -60 dBm/1.23 MHz and shall be less than -54 dBm/1.23 MHz.

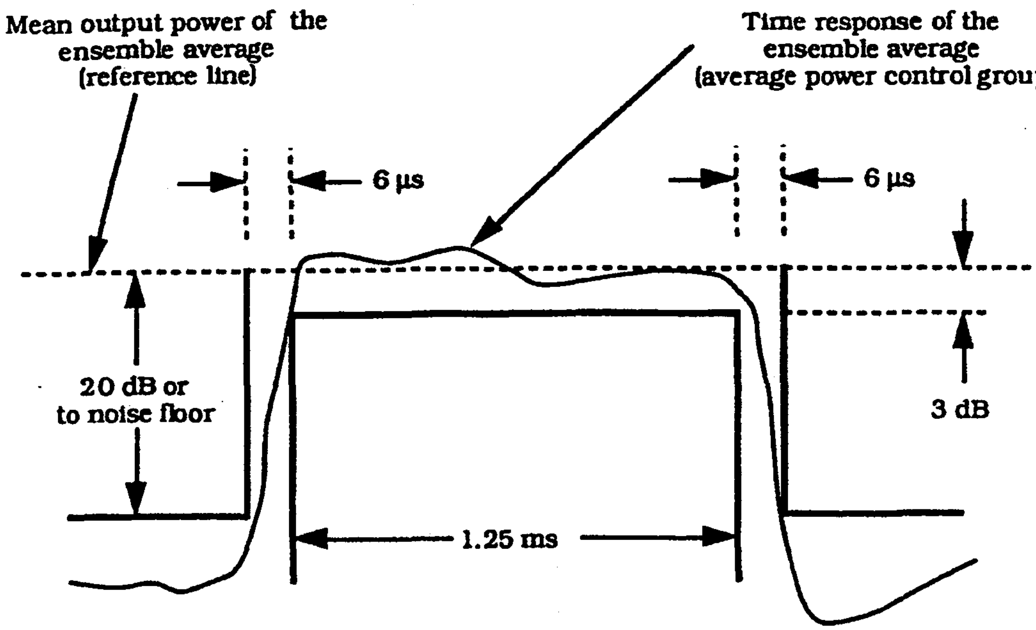


Figure 6.1.2.2.2-1. Transmission Envelope Mask (Average Gated-on Power Control Group)

6.1.2.2.3 Standby Output Power

The mobile station shall disable its transmitter except when transmitting an access probe when in the *System Access State* or when in the *Mobile Station Control on the Traffic Channel State* (see 6.6.3 and 6.6.4). When the transmitter is disabled, the output noise density of the mobile station shall be less than -60 dBm/1.23 MHz for all frequencies within the mobile station's transmit band between 824 and 849 MHz.

6.1.2.3 Controlled Output Power

When operating in the CDMA transmission mode, the mobile station shall provide two independent means for output power adjustment: open loop estimation, solely a mobile station operation, and closed loop correction, involving both the mobile station and the base station.

Accuracy requirements on the controlled range of mean output power (see 6.1.2.4) need not apply for the following three cases: mean output power levels exceeding the minimum ERP at the maximum output power for the corresponding mobile station class (see Table 6.1.2.1-1); mean output power levels less than the minimum controlled output power (see 6.1.2.2.1); or mean input power levels exceeding -25 dBm within the 1.23 MHz CDMA bandwidth.

6.1.2.3.1 Estimated Open Loop Output Power

In the following equations, mean power is referenced to the nominal CDMA Channel bandwidth of 1.23 MHz.

For open loop probing on the Access Channel (with closed loop correction inactive) the mobile station shall transmit the first probe at a mean output power level defined by[1]

$$\text{mean output power (dBm)} = -\text{ mean input power (dBm)} - 73 + \text{NOM\_PWR (dB)} + \text{INIT\_PWR (dB)}.$$

Subsequent probes in an access probe sequence are sent at increased power levels (each probe is incremented by a value equal to PWR_STEP) until a response is obtained or the sequence ends (see 6.6.3.1).

The initial transmission on the Reverse Traffic Channel shall be at a mean output power defined by

$$\text{mean output power (dBm)} = -\text{ mean input power (dBm)} - 73 + \text{NOM\_PWR (dB)} + \text{INIT\_PWR (dB)} + \text{the sum of all access probe corrections (dB)}.$$

Once the first power control bit has been received after initializing Reverse Traffic Channel transmissions, the mean output power shall be defined by

$$\text{mean output power (dBm)} = -\text{ mean input power (dBm)} - 73 + \text{NOM\_PWR (dB)} + \text{INIT\_PWR (dB)} + \text{the sum of all access probe corrections (dB)} + \text{the sum of all closed loop power control corrections (dB)}.$$

The values for NOM_PWR, INIT_PWR, and the step size of a single access probe correction PWR_STEP are system parameters, specified in the *Access Parameters Message* (see 7.7.2.3.2.2) and are obtained by the mobile station prior to transmitting. The range of the NOM_PWR parameter is -8 to 7 dB, with a nominal value of 0 dB. The range of the INIT_PWR parameter is -16 to 15 dB, with a nominal value of 0 dB. The range of the PWR_STEP parameter is 0 to 7 dB. The accuracy of the adjustment to the mean output power due to NOM_PWR, INIT_PWR, or a single access probe correction of PWR_STEP shall be ±0.5 dB or 20%, whichever is greater.

[1]The purpose of having two parameters is to distinguish between their use. If INIT_PWR were 0, then NOM_PWR is the correction that should provide the correct received power at the base station. INIT_PWR is the adjustment that is made to the first Access Channel probe so that it should be received at somewhat less than the required signal power. This conservatism partially compensates for occasional, partially decorrelated path losses between the Forward CDMA Channel and the Reverse CDMA Channel. The constant -73 is equal to $10 \times \log_{10} (10^{-7.3}\ \text{mw}^2)$. For simplicity, the constant is expressed as -73 with no units.

The mobile station shall support a total combined range of initial offset parameters and closed loop corrections as determined by NOM_PWR, INIT_PWR, access probe corrections, and closed loop power control corrections of at least ±32 dB.

Prior to application of access probe corrections, closed loop power control corrections, and with INIT_PWR set to zero, the mobile station's estimated open loop mean output power should be within ±6 dB and shall be within ±9 dB of the value determined by the following relationship:

$$\text{mean output power (dBm)} = -\text{ mean input power (dBm)} - 73 + \text{NOM\_PWR (dB)}.$$

This requirement shall be met over the full range of NOM_PWR (from -8 to +7 dB).

6.1.2.3.2 Closed Loop Output Power

For closed loop correction on the Reverse Traffic Channel (with respect to the open loop estimate), the mobile station shall adjust its mean output power level in response to each valid power control bit (see 7.1.3.1.7) received on the Forward Traffic Channel. A power control bit shall be considered valid if it is received in a 1.25 ms time slot (see 6.1.3.1.7.1) that is the second time slot following a time slot in which the mobile station transmitted. The change in mean output power level per single power control bit shall be 1 dB nominal. The total changed closed loop mean output power shall be the accumulation of the level changes. The mobile station shall lock the accumulation of valid level changes and shall ignore received power control bits related to gated-off periods when the transmitter is disabled.

The change in mean output power per single power control bit shall be within ±0.5 dB of the nominal change, and the change in mean output power level per 10 valid power control bits of the same sign shall be within ±20% of 10 times the nominal change. A '0' power control bit implies an increase in transmit power; a '1' power control bit implies a decrease in transmit power.

The mobile station shall provide a closed loop adjustment range greater than ±24 dB around its open loop estimate.

See 6.6.6.2.7.2 for combining power control bits received from different multipath components or from different base stations during handoff.

6.1.2.4 Power Transition Characteristics

6.1.2.4.1 Open Loop Estimation

Following a step change in mean input power, ΔP_{in}, the mean output power of the mobile station shall transition to its final value in a direction opposite in sign to ΔP_{in}, with magnitude contained between mask limits defined by:

(a) upper limit:

for $0 < t < 24$ ms: $\max\,[1.2 \times |\Delta P_{in}| \times (t/24),\ |\Delta P_{in}| \times (t/24) + 0.5\text{ dB}]$,

for $t \geq 24$ ms: $\max\,[1.2 \times |\Delta P_{in}|,\ |\Delta P_{in}| + 0.5\text{ dB}]$;

(b) lower limit:

for $t > 0$: $\max [0.8 \times |\Delta P_{in}| \times [1 - e^{(1.25 - t)/36}] - 0.5 \text{ dB}, 0]$;

where t is expressed in units of milliseconds, ΔP_{in} is expressed in units of dB, and max [x,y] is the maximum of x and y. These limits shall apply for a step change ΔP_{in} of ±20 dB or less. The change in the magnitude of mean output power shall be a monotonically increasing function of time. If the change in mean output power consists of discrete increments, no single increment shall exceed 0.75 dB. See 6.1.2.3 for the valid range of the mobile station's mean output power.

6.1.2.4.2 Closed Loop Correction

Following the reception of a valid closed loop power control bit, the mean output power of the mobile station shall be within 0.3 dB of the final value in less than 500 μs.

6.1.3 Modulation Characteristics

6.1.3.1 Reverse CDMA Channel Signals

The Reverse CDMA Channel is composed of Access Channels and Reverse Traffic Channels. These channels shall share the same CDMA frequency assignment using direct-sequence CDMA techniques. Figure 6.1.3.1-1 shows an example of all of the signals received by a base station on the Reverse CDMA Channel. Each Traffic Channel is identified by a distinct user long code sequence; each Access Channel is identified by a distinct Access Channel long code sequence. Multiple Reverse CDMA Channels may be used by a base station in a frequency division multiplexed manner.

The Reverse CDMA Channel has the overall structure shown in Figure 6.1.3.1-2. Data transmitted on the Reverse CDMA Channel is grouped into 20 ms frames. All data transmitted on the Reverse CDMA Channel is convolutionally encoded, block interleaved, modulated by the 64-ary orthogonal modulation, and direct-sequence spread prior to transmission.

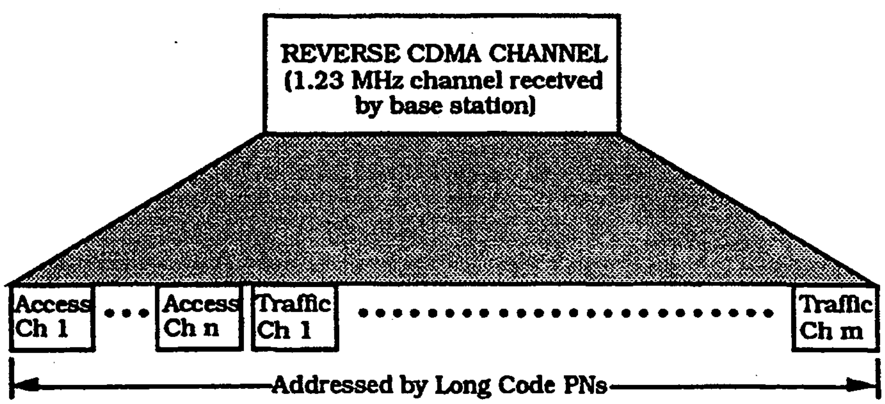


Figure 6.1.3.1-1. Example of Logical Reverse CDMA Channels Received at a Base Station

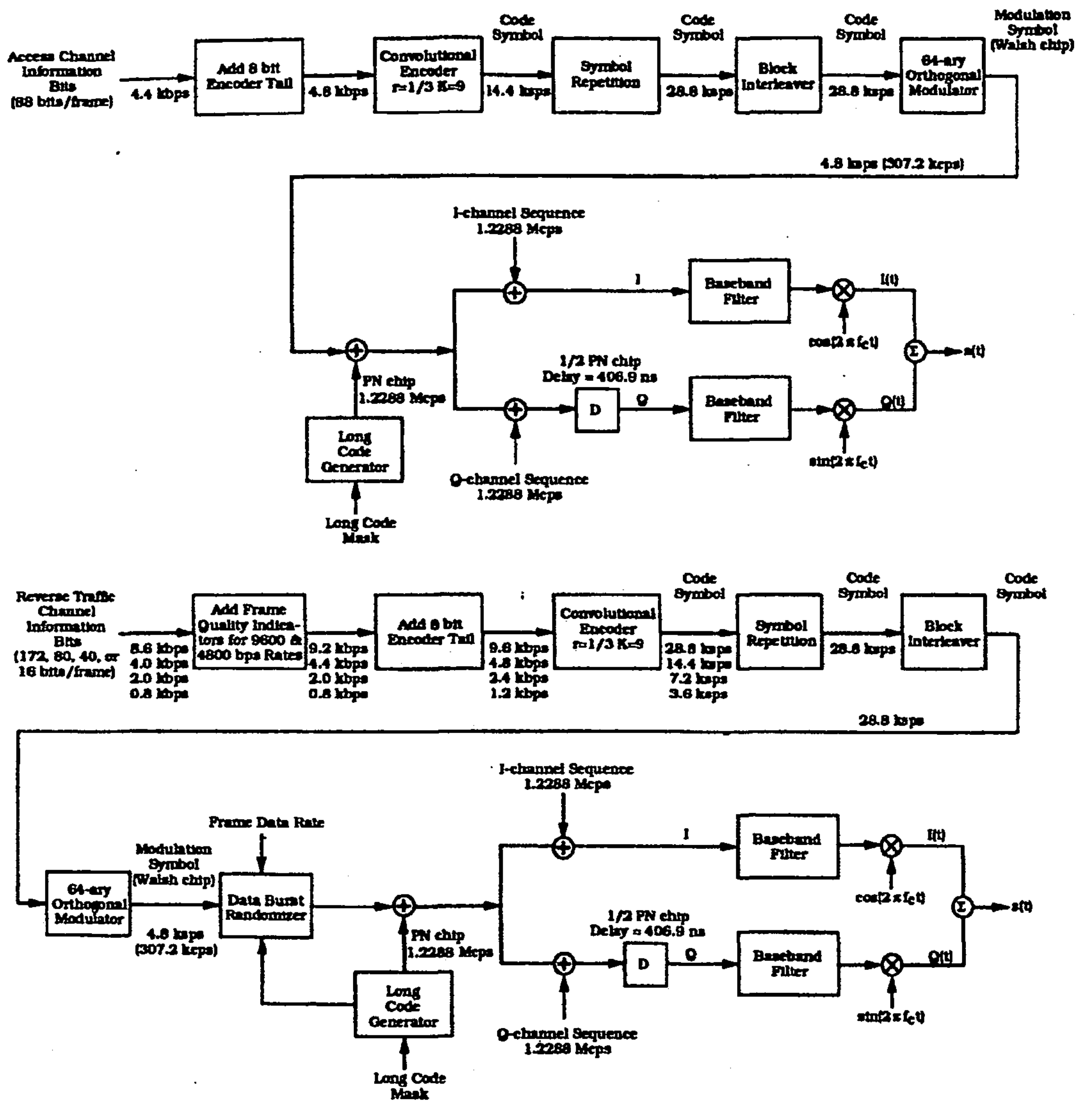


Figure 6.1.3.1-2. Reverse CDMA Channel Structure

After adding frame quality indicators for both the 9600 bps and 4800 bps rates (see 6.1.3.3.2.1) and adding eight Encoder Tail Bits (see 6.1.3.3.2.2), data frames may be transmitted on the Reverse Traffic Channel at data rates of 9600, 4800, 2400, and 1200 bps. The Reverse Traffic Channel may use any of these data rates for transmission. The transmission duty cycle on the Reverse Traffic Channel varies with the transmission data rate. Specifically, the transmission duty cycle for 9600 bps frames is 100 percent, the transmission duty cycle for 4800 bps frames is 50 percent, the transmission duty cycle for 2400 bps frames is 25 percent, and the transmission duty cycle for 1200 bps frames is 12.5 percent as shown in Table 6.1.3.1.1-1. As the duty cycle for transmission varies proportionately with the data rate, the actual burst transmission rate is fixed at 28,800 code symbols per second. Since six code symbols are modulated as one of 64 modulation symbols for transmission, the modulation symbol transmission rate is fixed at 4800 modulation symbols per second. This results in a fixed Walsh chip rate of 307.2 kcps. The rate of the spreading PN sequence is fixed at 1.2288 Mcps, so that each Walsh chip is spread by four PN chips. Table 6.1.3.1.1-1 defines the signal rates and their relationship for the various transmission rates on the Reverse Traffic Channel.

The numerology is identical for the Access Channel except that the transmission rate is fixed at 4800 bps after adding eight Encoder Tail Bits (see 6.1.3.2.2). Each code symbol is repeated once, and the transmission duty cycle is 100 percent. Table 6.1.3.1.1-2 defines the signal rates and their relationship on the Access Channel.

6.1.3.1.1 Modulation Parameters

The modulation parameters for the Reverse Traffic Channel and the Access Channel are shown in Table 6.1.3.1.1-1 and Table 6.1.3.1.1-2, respectively.

Table 6.1.3.1.1-1. Reverse Traffic Channel Modulation Parameters

	Data Rate (bps)				
Parameter	**9600**	**4800**	**2400**	**1200**	**Units**
PN Chip Rate	1.2288	1.2288	1.2288	1.2288	Mcps
Code Rate	1/3	1/3	1/3	1/3	bits/code sym
Transmit Duty Cycle	100.0	50.0	25.0	12.5	%
Code Symbol Rate	28,800	28,800	28,800	28,800	sps
Modulation	6	6	6	6	code sym/mod symbol
Modulation Symbol Rate	4800	4800	4800	4800	sps
Walsh Chip Rate	307.20	307.20	307.20	307.20	kcps
Mod Symbol Duration	208.33	208.33	208.33	208.33	μs
PN Chips/Code Symbol	42.67	42.67	42.67	42.67	PN chip/code symbol
PN Chips/Mod symbol	256	256	256	256	PN chip/mod symbol
PN Chips/Walsh Chip	4	4	4	4	PN chips/Walsh chip

Table 6.1.3.1.1-2. Access Channel Modulation Parameters

	Data Rate (bps)	
Parameter	**4800**	**Units**
PN Chip Rate	1.2288	Mcps
Code Rate	1/3	bits/code sym
Code Symbol Repetition	2	symbols/code sym
Transmit Duty Cycle	100.0	%
Code Symbol Rate	28,800	sps
Modulation	6	code sym/mod symbol
Modulation Symbol Rate	4800	sps
Walsh Chip Rate	307.20	kcps
Mod Symbol Duration	208.33	μs
PN Chips/Code Symbol	42.67	PN chip/code sym
PN Chips/Mod symbol	256	PN chip/mod symbol
PN Chips/Walsh Chip	4	PN chips/Walsh chip

6.1.3.1.2 Data Rates

The Access Channel shall support fixed data rate operation at 4800 bps.

The Reverse Traffic Channel shall support variable data rate operation at 9600, 4800, 2400, and 1200 bps.

6.1.3.1.3 Convolutional Encoding

The mobile station shall convolutionally encode the data transmitted on the Reverse Traffic Channel and the Access Channel prior to interleaving. The convolutional code shall be rate 1/3 and has a constraint length of 9. The generator functions for this code shall be g_0 equals 557 (octal), g_1 equals 663 (octal), and g_2 equals 711 (octal). This is a rate 1/3 code generating three code symbols for each data bit input to the encoder. These code symbols shall be output so that the code symbol (c_0) encoded with generator function g_0 shall be output first, the code symbol (c_1) encoded with generator function g_1 shall be output second, and the code symbol (c_2) encoded with generator function g_2 shall be output last. The state of the convolutional encoder, upon initialization, shall be the all-zero state. The first code symbol output after initialization shall be a code symbol encoded with generator function g_0.

Convolutional encoding involves the modulo-2 addition of selected taps of a serially time-delayed data sequence. The length of the data sequence delay is equal to K-1, where K is the constraint length of the code. Figure 6.1.3.1.3-1 illustrates the encoder for the code specified in this section.

6.1.3.1.4 Code Symbol Repetition

Code symbols output from the convolutional encoder are repeated before being interleaved when the data rate is lower than 9600 bps.

Code symbol repetition on the Reverse Traffic Channel is only used as an expedient method for describing the operation of the block interleaver specified in 6.1.3.1.5 and the data burst randomizer specified in 6.1.3.1.7.2. Implementations other than code symbol repetition that achieve the same result are allowed.

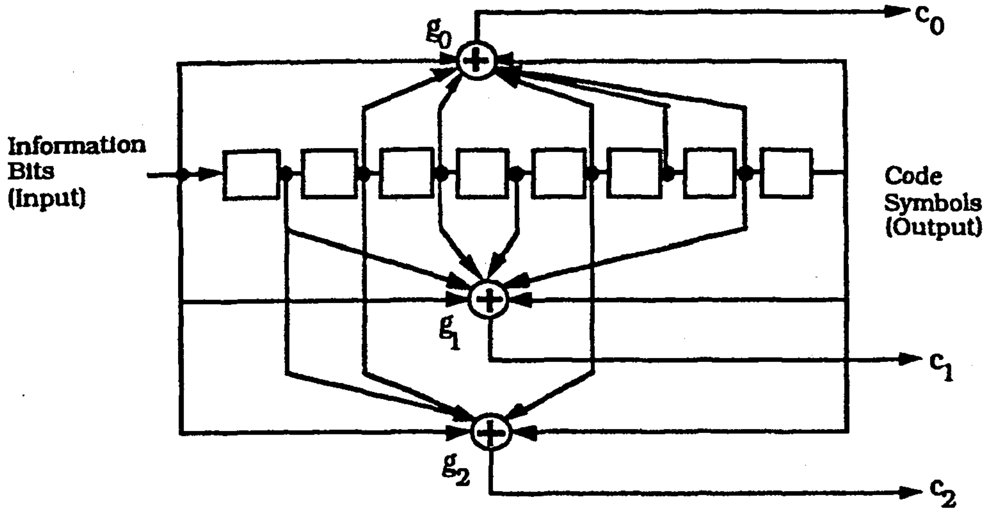


Figure 6.1.3.1.3-1. K = 9, Rate 1/3 Convolutional Encoder

The code symbol repetition rate on the Reverse Traffic Channel varies with data rate. Code symbols shall not be repeated for the 9600 bps data rate. Each code symbol at the 4800 bps data rate shall be repeated 1 time (each symbol occurs 2 consecutive times). Each code symbol at the 2400 bps data rate shall be repeated 3 times (each symbol occurs 4 consecutive times). Each code symbol at the 1200 bps data rate shall be repeated 7 times (each symbol occurs 8 consecutive times). For all of the data rates (9600, 4800, 2400, and 1200 bps), this results in a constant code symbol rate of 28800 code symbols per second. On the Reverse Traffic Channel these repeated code symbols shall not be transmitted multiple times. Rather, the repeated code symbols shall be input to the block interleaver function, and all but one of the code symbol repetitions shall be deleted prior to actual transmission due to the variable transmission duty cycle.

Each code symbol on the Access Channel, which has a fixed data rate of 4800 bps, shall be repeated 1 time (each symbol occurs 2 consecutive times). On the Access Channel both repeated code symbols shall be transmitted.

6.1.3.1.5 Block Interleaving

The mobile station shall interleave all code symbols on the Reverse Traffic Channel and the Access Channel prior to modulation and transmission. A block interleaver spanning 20 ms shall be used. The interleaver shall be an array with 32 rows and 18 columns (i.e., 576 cells). Code symbols (repeated code symbols when at data rates lower than 9600 bps) shall be written into the interleaver by columns filling the complete 32 × 18 matrix. Tables 6.1.3.1.5-1 through 6.1.3.1.5-4 illustrate the ordering of write operations of code symbols (or repeated code symbols) into the interleaver array for transmission data rates of 9600, 4800, 2400, and 1200 bps, respectively.

Reverse Traffic Channel code symbols shall be output from the interleaver by rows. The interleaver rows shall be output in the following order:

At 9600 bps:

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32

At 4800 bps:

1 3 2 4 5 7 6 8 9 11 10 12 13 15 14 16 17 19 18 20 21 23 22 24 25 27 26 28 29 31 30 32

At 2400 bps:

1 5 2 6 3 7 4 8 9 13 10 14 11 15 12 16 17 21 18 22 19 23 20 24 25 29 26 30 27 31 28 32

At 1200 bps:

1 9 2 10 3 11 4 12 5 13 6 14 7 15 8 16 17 25 18 26 19 27 20 28 21 29 22 30 23 31 24 32

Access Channel code symbols shall be output from the interleaver by rows. The interleaver rows shall be output in the following order:[2]

1 17 9 25 5 21 13 29 3 19 11 27 7 23 15 31 2 18 10 26 6 22 14 30 4 20 12 28 8 24 16 32

[2] This is a bit-reversed readout of the row addresses. If there is a binary counter $c_4c_3c_2c_1c_0$, counting from 0 through 31, and n is a 5-bit binary number, $n = a_4a_3a_2a_1a_0$, where $a_4=c_0$, $a_3=c_1$, $a_2=c_2$, $a_1=c_3$, $a_0=c_4$, then the row address is given by n+1.

Table 6.1.3.1.5-1. Reverse Traffic Channel Interleaver Memory (Write Operation) (9600 bps)

1	33	65	97	129	161	193	225	257	289	321	353	385	417	449	481	513	545
2	34	66	98	130	162	194	226	258	290	322	354	386	418	450	482	514	546
3	35	67	99	131	163	195	227	259	291	323	355	387	419	451	483	515	547
4	36	68	100	132	164	196	228	260	292	324	356	388	420	452	484	516	548
5	37	69	101	133	165	197	229	261	293	325	357	389	421	453	485	517	549
6	38	70	102	134	166	198	230	262	294	326	358	390	422	454	486	518	550
7	39	71	103	135	167	199	231	263	295	327	359	391	423	455	487	519	551
8	40	72	104	136	168	200	232	264	296	328	360	392	424	456	488	520	552
9	41	73	105	137	169	201	233	265	297	329	361	393	425	457	489	521	553
10	42	74	106	138	170	202	234	266	298	330	362	394	426	458	490	522	554
11	43	75	107	139	171	203	235	267	299	331	363	395	427	459	491	523	555
12	44	76	108	140	172	204	236	268	300	332	364	396	428	460	492	524	556
13	45	77	109	141	173	205	237	269	301	333	365	397	429	461	493	525	557
14	46	78	110	142	174	206	238	270	302	334	366	398	430	462	494	526	558
15	47	79	111	143	175	207	239	271	303	335	367	399	431	463	495	527	559
16	48	80	112	144	176	208	240	272	304	336	368	400	432	464	496	528	560
17	49	81	113	145	177	209	241	273	305	337	369	401	433	465	497	529	561
18	50	82	114	146	178	210	242	274	306	338	370	402	434	466	498	530	562
19	51	83	115	147	179	211	243	275	307	339	371	403	435	467	499	531	563
20	52	84	116	148	180	212	244	276	308	340	372	404	436	468	500	532	564
21	53	85	117	149	181	213	245	277	309	341	373	405	437	469	501	533	565
22	54	86	118	150	182	214	246	278	310	342	374	406	438	470	502	534	566
23	55	87	119	151	183	215	247	279	311	343	375	407	439	471	503	535	567
24	56	88	120	152	184	216	248	280	312	344	376	408	440	472	504	536	568
25	57	89	121	153	185	217	249	281	313	345	377	409	441	473	505	537	569
26	58	90	122	154	186	218	250	282	314	346	378	410	442	474	506	538	570
27	59	91	123	155	187	219	251	283	315	347	379	411	443	475	507	539	571
28	60	92	124	156	188	220	252	284	316	348	380	412	444	476	508	540	572
29	61	93	125	157	189	221	253	285	317	349	381	413	445	477	509	541	573
30	62	94	126	158	190	222	254	286	318	350	382	414	446	478	510	542	574
31	63	95	127	159	191	223	255	287	319	351	383	415	447	479	511	543	575
32	64	96	128	160	192	224	256	288	320	352	384	416	448	480	512	544	576

Table 6.1.3.1.5-2. Reverse Traffic Channel or Access Channel Interleaver Memory (Write Operation) (4800 bps)

1	17	33	49	65	81	97	113	129	145	161	177	193	209	225	241	257	273
1	17	33	49	65	81	97	113	129	145	161	177	193	209	225	241	257	273
2	18	34	50	66	82	98	114	130	146	162	178	194	210	226	242	258	274
2	18	34	50	66	82	98	114	130	146	162	178	194	210	226	242	258	274
3	19	35	51	67	83	99	115	131	147	163	179	195	211	227	243	259	275
3	19	35	51	67	83	99	115	131	147	163	179	195	211	227	243	259	275
4	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244	260	276
4	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244	260	276
5	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245	261	277
5	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245	261	277
6	22	38	54	70	86	102	118	134	150	166	182	198	214	230	246	262	278
6	22	38	54	70	86	102	118	134	150	166	182	198	214	230	246	262	278
7	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247	263	279
7	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247	263	279
8	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248	264	280
8	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248	264	280
9	25	41	57	73	89	105	121	137	153	169	185	201	217	233	249	265	281
9	25	41	57	73	89	105	121	137	153	169	185	201	217	233	249	265	281
10	26	42	58	74	90	106	122	138	154	170	186	202	218	234	250	266	282
10	26	42	58	74	90	106	122	138	154	170	186	202	218	234	250	266	282
11	27	43	59	75	91	107	123	139	155	171	187	203	219	235	251	267	283
11	27	43	59	75	91	107	123	139	155	171	187	203	219	235	251	267	283
12	28	44	60	76	92	108	124	140	156	172	188	204	220	236	252	268	284
12	28	44	60	76	92	108	124	140	156	172	188	204	220	236	252	268	284
13	29	45	61	77	93	109	125	141	157	173	189	205	221	237	253	269	285
13	29	45	61	77	93	109	125	141	157	173	189	205	221	237	253	269	285
14	30	46	62	78	94	110	126	142	158	174	190	206	222	238	254	270	286
14	30	46	62	78	94	110	126	142	158	174	190	206	222	238	254	270	286
15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255	271	287
15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255	271	287
16	32	48	64	80	96	112	128	144	160	176	192	208	224	240	256	272	288
16	32	48	64	80	96	112	128	144	160	176	192	208	224	240	256	272	288

Table 6.1.3.1.5-3. Reverse Traffic Channel Interleaver Memory (Write Operation) (2400 bps)

1	9	17	25	33	41	49	57	65	73	81	89	97	105	113	121	129	137
1	9	17	25	33	41	49	57	65	73	81	89	97	105	113	121	129	137
1	9	17	25	33	41	49	57	65	73	81	89	97	105	113	121	129	137
1	9	17	25	33	41	49	57	65	73	81	89	97	105	113	121	129	137
2	10	18	26	34	42	50	58	66	74	82	90	98	106	114	122	130	138
2	10	18	26	34	42	50	58	66	74	82	90	98	106	114	122	130	138
2	10	18	26	34	42	50	58	66	74	82	90	98	106	114	122	130	138
2	10	18	26	34	42	50	58	66	74	82	90	98	106	114	122	130	138
3	11	19	27	35	43	51	59	67	75	83	91	99	107	115	123	131	139
3	11	19	27	35	43	51	59	67	75	83	91	99	107	115	123	131	139
3	11	19	27	35	43	51	59	67	75	83	91	99	107	115	123	131	139
3	11	19	27	35	43	51	59	67	75	83	91	99	107	115	123	131	139
4	12	20	28	36	44	52	60	68	76	84	92	100	108	116	124	132	140
4	12	20	28	36	44	52	60	68	76	84	92	100	108	116	124	132	140
4	12	20	28	36	44	52	60	68	76	84	92	100	108	116	124	132	140
4	12	20	28	36	44	52	60	68	76	84	92	100	108	116	124	132	140
5	13	21	29	37	45	53	61	69	77	85	93	101	109	117	125	133	141
5	13	21	29	37	45	53	61	69	77	85	93	101	109	117	125	133	141
5	13	21	29	37	45	53	61	69	77	85	93	101	109	117	125	133	141
5	13	21	29	37	45	53	61	69	77	85	93	101	109	117	125	133	141
6	14	22	30	38	46	54	62	70	78	86	94	102	110	118	126	134	142
6	14	22	30	38	46	54	62	70	78	86	94	102	110	118	126	134	142
6	14	22	30	38	46	54	62	70	78	86	94	102	110	118	126	134	142
6	14	22	30	38	46	54	62	70	78	86	94	102	110	118	126	134	142
7	15	23	31	39	47	55	63	71	79	87	95	103	111	119	127	135	143
7	15	23	31	39	47	55	63	71	79	87	95	103	111	119	127	135	143
7	15	23	31	39	47	55	63	71	79	87	95	103	111	119	127	135	143
7	15	23	31	39	47	55	63	71	79	87	95	103	111	119	127	135	143
8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128	136	144
8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128	136	144
8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128	136	144
8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128	136	144

Table 6.1.3.1.5-4. Reverse Traffic Channel Interleaver Memory (Write Operation) (1200 bps)

1	5	9	13	17	21	25	29	33	37	41	45	49	53	57	61	65	69
1	5	9	13	17	21	25	29	33	37	41	45	49	53	57	61	65	69
1	5	9	13	17	21	25	29	33	37	41	45	49	53	57	61	65	69
1	5	9	13	17	21	25	29	33	37	41	45	49	53	57	61	65	69
1	5	9	13	17	21	25	29	33	37	41	45	49	53	57	61	65	69
1	5	9	13	17	21	25	29	33	37	41	45	49	53	57	61	65	69
1	5	9	13	17	21	25	29	33	37	41	45	49	53	57	61	65	69
1	5	9	13	17	21	25	29	33	37	41	45	49	53	57	61	65	69
2	6	10	14	18	22	26	30	34	38	42	46	50	54	58	62	66	70
2	6	10	14	18	22	26	30	34	38	42	46	50	54	58	62	66	70
2	6	10	14	18	22	26	30	34	38	42	46	50	54	58	62	66	70
2	6	10	14	18	22	26	30	34	38	42	46	50	54	58	62	66	70
2	6	10	14	18	22	26	30	34	38	42	46	50	54	58	62	66	70
2	6	10	14	18	22	26	30	34	38	42	46	50	54	58	62	66	70
2	6	10	14	18	22	26	30	34	38	42	46	50	54	58	62	66	70
2	6	10	14	18	22	26	30	34	38	42	46	50	54	58	62	66	70
3	7	11	15	19	23	27	31	35	39	43	47	51	55	59	63	67	71
3	7	11	15	19	23	27	31	35	39	43	47	51	55	59	63	67	71
3	7	11	15	19	23	27	31	35	39	43	47	51	55	59	63	67	71
3	7	11	15	19	23	27	31	35	39	43	47	51	55	59	63	67	71
3	7	11	15	19	23	27	31	35	39	43	47	51	55	59	63	67	71
3	7	11	15	19	23	27	31	35	39	43	47	51	55	59	63	67	71
3	7	11	15	19	23	27	31	35	39	43	47	51	55	59	63	67	71
3	7	11	15	19	23	27	31	35	39	43	47	51	55	59	63	67	71
4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72
4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72
4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72
4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72
4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72
4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72
4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72
4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72

6.1.3.1.6 Orthogonal Modulation

Modulation for the Reverse CDMA Channel shall be 64-ary orthogonal modulation. One of 64 possible modulation symbols is transmitted for each six code symbols. The modulation symbol shall be one of 64 mutually orthogonal waveforms generated using Walsh functions. These modulation symbols are given in Table 6.1.3.1.6-1 and are numbered 0 through 63. The modulation symbols shall be selected according to the following formula:

$$\text{Modulation symbol index} = c_0 + 2c_1 + 4c_2 + 8c_3 + 16c_4 + 32c_5,$$

where c_5 shall represent the last (or most recent) and c_0 the first (or oldest) binary valued ('0' and '1') code symbol of each group of six code symbols that form a modulation symbol index.

The 64 by 64 matrix shown in Table 6.1.3.1.6-1 can be generated by means of the following recursive procedure:

$$\mathbf{H}_1 = 0, \qquad \mathbf{H}_2 = \begin{matrix} 0 & 0 \\ 0 & 1 \end{matrix},$$

$$\mathbf{H}_4 = \begin{matrix} 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 \\ 0 & 1 & 1 & 0 \end{matrix}, \qquad \mathbf{H}_{2N} = \begin{matrix} \mathbf{H}_N & \mathbf{H}_N \\ \mathbf{H}_N & \overline{\mathbf{H}}_N \end{matrix},$$

where N is a power of 2 and $\overline{\mathbf{H}}_N$ denotes the binary complement of $\mathbf{H}_N$.

The period of time required to transmit a single modulation symbol shall be equal to 1/4800 second (= 208.333... μs). The period of time associated with one-sixty-fourth of the modulation symbol is referred to as a Walsh chip and shall be equal to 1/307200 second (= 3.255... μs).

Within a modulation symbol, Walsh chips shall be transmitted in the order of 0, 1, 2, ..., 63.

Table 6.1.3.1.6-1. 64-ary Orthogonal Symbol Set

Walsh Chip within Symbol

Modulation Symbol Index

	0 1 2 3	4 5 6 7	8 9 10 11	12 13 14 15	16 17 18 19	20 21 22 23	24 25 26 27	28 29 30 31	32 33 34 35	36 37 38 39	40 41 42 43	44 45 46 47	48 49 50 51	52 53 54 55	56 57 58 59	60 61 62 63
0	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
1	0101	0101	0101	0101	0101	0101	0101	0101	0101	0101	0101	0101	0101	0101	0101	0101
2	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011
3	0110	0110	0110	0110	0110	0110	0110	0110	0110	0110	0110	0110	0110	0110	0110	0110
4	0000	1111	0000	1111	0000	1111	0000	1111	0000	1111	0000	1111	0000	1111	0000	1111
5	0101	1010	0101	1010	0101	1010	0101	1010	0101	1010	0101	1010	0101	1010	0101	1010
6	0011	1100	0011	1100	0011	1100	0011	1100	0011	1100	0011	1100	0011	1100	0011	1100
7	0110	1001	0110	1001	0110	1001	0110	1001	0110	1001	0110	1001	0110	1001	0110	1001
8	0000	0000	1111	1111	0000	0000	1111	1111	0000	0000	1111	1111	0000	0000	1111	1111
9	0101	0101	1010	1010	0101	0101	1010	1010	0101	0101	1010	1010	0101	0101	1010	1010
10	0011	0011	1100	1100	0011	0011	1100	1100	0011	0011	1100	1100	0011	0011	1100	1100
11	0110	0110	1001	1001	0110	0110	1001	1001	0110	0110	1001	1001	0110	0110	1001	1001
12	0000	1111	1111	0000	0000	1111	1111	0000	0000	1111	1111	0000	0000	1111	1111	0000
13	0101	1010	1010	0101	0101	1010	1010	0101	0101	1010	1010	0101	0101	1010	1010	0101
14	0011	1100	1100	0011	0011	1100	1100	0011	0011	1100	1100	0011	0011	1100	1100	0011
15	0110	1001	1001	0110	0110	1001	1001	0110	0110	1001	1001	0110	0110	1001	1001	0110
16	0000	0000	0000	0000	1111	1111	1111	1111	0000	0000	0000	0000	1111	1111	1111	1111
17	0101	0101	0101	0101	1010	1010	1010	1010	0101	0101	0101	0101	1010	1010	1010	1010
18	0011	0011	0011	0011	1100	1100	1100	1100	0011	0011	0011	0011	1100	1100	1100	1100
19	0110	0110	0110	0110	1001	1001	1001	1001	0110	0110	0110	0110	1001	1001	1001	1001
20	0000	1111	0000	1111	1111	0000	1111	0000	0000	1111	0000	1111	1111	0000	1111	0000
21	0101	1010	0101	1010	1010	0101	1010	0101	0101	1010	0101	1010	1010	0101	1010	0101
22	0011	1100	0011	1100	1100	0011	1100	0011	0011	1100	0011	1100	1100	0011	1100	0011
23	0110	1001	0110	1001	1001	0110	1001	0110	0110	1001	0110	1001	1001	0110	1001	0110
24	0000	0000	1111	1111	1111	1111	0000	0000	0000	0000	1111	1111	1111	1111	0000	0000
25	0101	0101	1010	1010	1010	1010	0101	0101	0101	0101	1010	1010	1010	1010	0101	0101
26	0011	0011	1100	1100	1100	1100	0011	0011	0011	0011	1100	1100	1100	1100	0011	0011
27	0110	0110	1001	1001	1001	1001	0110	0110	0110	0110	1001	1001	1001	1001	0110	0110
28	0000	1111	1111	0000	1111	0000	0000	1111	0000	1111	1111	0000	1111	0000	0000	1111
29	0101	1010	1010	0101	1010	0101	0101	1010	0101	1010	1010	0101	1010	0101	0101	1010
30	0011	1100	1100	0011	1100	0011	0011	1100	0011	1100	1100	0011	1100	0011	0011	1100
31	0110	1001	1001	0110	1001	0110	0110	1001	0110	1001	1001	0110	1001	0110	0110	1001
32	0000	0000	0000	0000	0000	0000	0000	0000	1111	1111	1111	1111	1111	1111	1111	1111
33	0101	0101	0101	0101	0101	0101	0101	0101	1010	1010	1010	1010	1010	1010	1010	1010
34	0011	0011	0011	0011	0011	0011	0011	0011	1100	1100	1100	1100	1100	1100	1100	1100
35	0110	0110	0110	0110	0110	0110	0110	0110	1001	1001	1001	1001	1001	1001	1001	1001
36	0000	1111	0000	1111	0000	1111	0000	1111	1111	0000	1111	0000	1111	0000	1111	0000
37	0101	1010	0101	1010	0101	1010	0101	1010	1010	0101	1010	0101	1010	0101	1010	0101
38	0011	1100	0011	1100	0011	1100	0011	1100	1100	0011	1100	0011	1100	0011	1100	0011
39	0110	1001	0110	1001	0110	1001	0110	1001	1001	0110	1001	0110	1001	0110	1001	0110
40	0000	0000	1111	1111	0000	0000	1111	1111	1111	1111	0000	0000	1111	1111	0000	0000
41	0101	0101	1010	1010	0101	0101	1010	1010	1010	1010	0101	0101	1010	1010	0101	0101
42	0011	0011	1100	1100	0011	0011	1100	1100	1100	1100	0011	0011	1100	1100	0011	0011
43	0110	0110	1001	1001	0110	0110	1001	1001	1001	1001	0110	0110	1001	1001	0110	0110
44	0000	1111	1111	0000	0000	1111	1111	0000	1111	0000	0000	1111	1111	0000	0000	1111
45	0101	1010	1010	0101	0101	1010	1010	0101	1010	0101	0101	1010	1010	0101	0101	1010
46	0011	1100	1100	0011	0011	1100	1100	0011	1100	0011	0011	1100	1100	0011	0011	1100
47	0110	1001	1001	0110	0110	1001	1001	0110	1001	0110	0110	1001	1001	0110	0110	1001
48	0000	0000	0000	0000	1111	1111	1111	1111	1111	1111	1111	1111	0000	0000	0000	0000
49	0101	0101	0101	0101	1010	1010	1010	1010	1010	1010	1010	1010	0101	0101	0101	0101
50	0011	0011	0011	0011	1100	1100	1100	1100	1100	1100	1100	1100	0011	0011	0011	0011
51	0110	0110	0110	0110	1001	1001	1001	1001	1001	1001	1001	1001	0110	0110	0110	0110
52	0000	1111	0000	1111	1111	0000	1111	0000	1111	0000	1111	0000	0000	1111	0000	1111
53	0101	1010	0101	1010	1010	0101	1010	0101	1010	0101	1010	0101	0101	1010	0101	1010
54	0011	1100	0011	1100	1100	0011	1100	0011	1100	0011	1100	0011	0011	1100	0011	1100
55	0110	1001	0110	1001	1001	0110	1001	0110	1001	0110	1001	0110	0110	1001	0110	1001
56	0000	0000	1111	1111	1111	1111	0000	0000	1111	1111	0000	0000	0000	0000	1111	1111
57	0101	0101	1010	1010	1010	1010	0101	0101	1010	1010	0101	0101	0101	0101	1010	1010
58	0011	0011	1100	1100	1100	1100	0011	0011	1100	1100	0011	0011	0011	0011	1100	1100
59	0110	0110	1001	1001	1001	1001	0110	0110	1001	1001	0110	0110	0110	0110	1001	1001
60	0000	1111	1111	0000	1111	0000	0000	1111	1111	0000	0000	1111	0000	1111	1111	0000
61	0101	1010	1010	0101	1010	0101	0101	1010	1010	0101	0101	1010	0101	1010	1010	0101
62	0011	1100	1100	0011	1100	0011	0011	1100	1100	0011	0011	1100	0011	1100	1100	0011
63	0110	1001	1001	0110	1001	0110	0110	1001	1001	0110	0110	1001	0110	1001	1001	0110

6.1.3.1.7 Variable Data Rate Transmission

6.1.3.1.7.1 Rates and Gating

Prior to transmission, the Reverse Traffic Channel interleaver output stream is gated with a time filter that allows transmission of certain interleaver output symbols and deletion of others. This process is illustrated in Figure 6.1.3.1.7.1-1. As shown in the figure, the duty cycle of the transmission gate varies with the transmit data rate. When the transmit data rate is 9600 bps, the transmission gate allows all interleaver output symbols to be transmitted. When the transmit data rate is 4800 bps, the transmission gate allows one-half of the interleaver output symbols to be transmitted, and so forth. The gating process operates by dividing the 20 ms frame into 16 equal length (i.e., 1.25 ms) periods, called power control groups. Certain power control groups are gated-on (i.e., transmitted), while other groups are gated-off (i.e., not transmitted).

The assignment of gated-on and gated-off groups, referred to as the data burst randomizing function, is specified in 6.1.3.1.7.2. The gated-on power control groups are pseudorandomized in their positions within the frame. The data burst randomizer ensures that every code symbol input to the repetition process is transmitted exactly once. During the gated-off periods, the mobile station shall comply with the requirement in 6.1.2.2.2, thus reducing the interference to other mobile stations operating on the same Reverse CDMA Channel.

When transmitting on the Access Channel, the code symbols are repeated once (each symbol occurs twice) prior to transmission. The data burst randomizer is not used when the mobile station transmits on the Access Channel. Therefore, both copies of the repeated code symbols are transmitted as shown in Figure 6.1.3.1.7.1-2.

6.1.3.1.7.2 Data Burst Randomizing Algorithm

The data burst randomizer generates a masking pattern of '0's and '1's that randomly masks out the redundant data generated by the code repetition. The masking pattern is determined by the data rate of the frame and by a block of 14 bits taken from the long code. These 14 bits shall be the last 14 bits of the long code used for spreading in the previous to the last power control group of the previous frame (see Figure 6.1.3.1.7.1-1). In other words, these are the 14 bits which occur exactly one power control group (1.25 ms) before each Reverse Traffic Channel frame boundary. These 14 bits are denoted as

$$b_0\ b_1\ b_2\ b_3\ b_4\ b_5\ b_6\ b_7\ b_8\ b_9\ b_{10}\ b_{11}\ b_{12}\ b_{13},$$

where b_0 represents the oldest bit, and b_{13} represents the latest bit.[3]

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[3]In order to randomize the position of the data bursts, only 8 bits are strictly necessary. The algorithm described here uses 14 bits to assure that the slots used for data transmission at the quarter rate are a subset of the slots used at the half rate and that the slots used at the one-eighth rate are a subset of the slots used at the quarter rate.

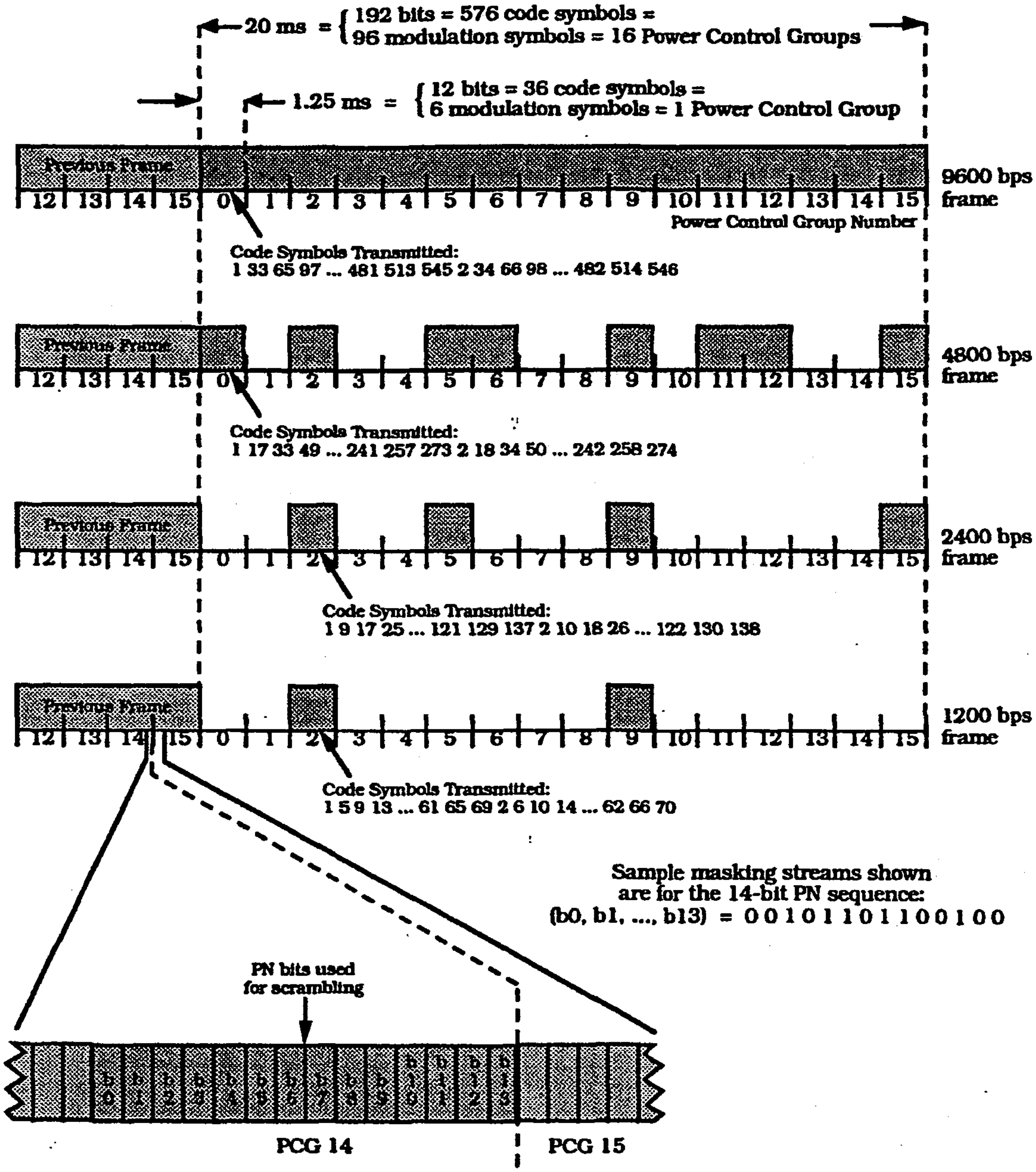

Figure 6.1.3.1.7.1-1. Reverse CDMA Channel Variable Data Rate Transmission Example

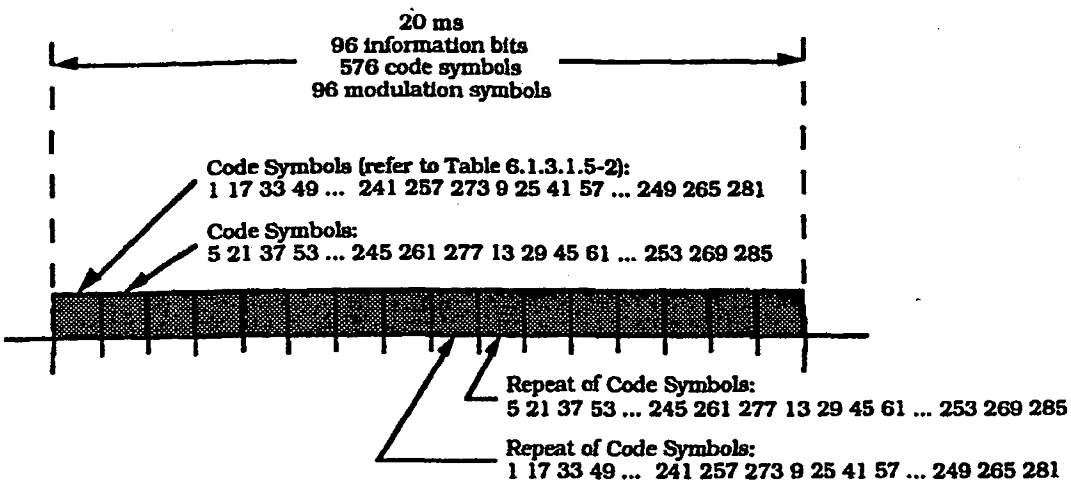

Figure 6.1.3.1.7.1-2. Access Channel Transmission Structure

Each 20 ms Reverse Traffic Channel frame shall be divided into 16 equal length (i.e., 1.25 ms) power control groups numbered from 0 to 15 as shown in Figure 6.1.3.1.7.1-1. The data burst randomizer algorithm shall be as follows:

Data Rate Selected: 9600 bps

Transmission shall occur on power control groups numbered:

0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15.

Data Rate Selected: 4800 bps

Transmission shall occur on power control groups numbered:

b_0, $2 + b_1$, $4 + b_2$, $6 + b_3$, $8 + b_4$, $10 + b_5$, $12 + b_6$, $14 + b_7$.

Data Rate Selected: 2400 bps

Transmission shall occur on power control groups numbered:

b_0 if $b_8 = 0$, or $2 + b_1$ if $b_8 = 1$;

$4 + b_2$ if $b_9 = 0$, or $6 + b_3$ if $b_9 = 1$;

$8 + b_4$ if $b_{10} = 0$, or $10 + b_5$ if $b_{10} = 1$;

$12 + b_6$ if $b_{11} = 0$, or $14 + b_7$ if $b_{11} = 1$.

Data Rate Selected: 1200 bps

Transmission shall occur on power control groups numbered:

b_0 if ($b_8 = 0$ and $b_{12} = 0$), or $2 + b_1$ if ($b_8 = 1$ and $b_{12} = 0$),

or $4 + b_2$ if ($b_9 = 0$ and $b_{12} = 1$), or $6 + b_3$ if ($b_9 = 1$ and $b_{12} = 1$);

$8 + b_4$ if ($b_{10} = 0$ and $b_{13} = 0$), or $10 + b_5$ if ($b_{10} = 1$ and $b_{13} = 0$),

or $12 + b_6$ if ($b_{11} = 0$ and $b_{13} = 1$), or $14 + b_7$ if ($b_{11} = 1$ and $b_{13} = 1$).

6.1.3.1.8 Direct Sequence Spreading

Prior to transmission, the Reverse Traffic Channel and the Access Channel shall be direct sequence spread by the long code. For the Reverse Traffic Channel, this spreading operation involves modulo-2 addition of the data burst randomizer output stream and the long code. For the Access Channel, this spreading operation involves modulo-2 addition of the 64-ary orthogonal modulator output stream and the long code.

This long code shall be periodic with period 2^{42}-1 chips and shall satisfy the linear recursion specified by the following characteristic polynomial:

$$p(x) = x^{42} + x^{35} + x^{33} + x^{31} + x^{27} + x^{26} + x^{25} + x^{22} + x^{21} + x^{19} + x^{18} + x^{17} + x^{16} + x^{10} + x^7 + x^6 + x^5 + x^3 + x^2 + x^1 + 1.$$

Each PN chip of the long code shall be generated by the modulo-2 inner product of a 42-bit mask and the 42-bit state vector of the sequence generator as shown in Figure 6.1.3.1.8-1.

The time alignment of the long code generator shall be as shown in Figure 1.2-1.

The mask used for the long code varies depending on the channel type on which the mobile station is transmitting. See Figure 6.1.3.1.8-2. Specifically, when transmitting on the Access Channel, the mask shall be as follows: M_{41} through M_{33} shall be set to '110001111'; M_{32} through M_{28} shall be set to the Access Channel number chosen (see 6.6.3.1.1.2); M_{27} through M_{25} shall be set to the code channel number for the associated Paging Channel (the range is 1 through 7), M_{24} through M_9 shall be set to the BASE_ID value (see 7.7.2.3.2.1) for the current base station; and M_8 through M_0 shall be set to the PILOT_PN value for the current CDMA Channel (see 7.7.1.3).

When transmitting on the Reverse Traffic Channel, the mobile station shall use one of two long code masks unique to that mobile station: a public long code mask unique to the mobile station's ESN or a private long code mask. The public long code mask shall be as follows: M_{41} through M_{32} shall be set to '1100011000', and M_{31} through M_0 shall be set to a permutation of the mobile station's ESN bits. This permutation is specified as follows:

$$\text{ESN} = (E_{31}, E_{30}, E_{29}, E_{28}, E_{27}, E_{26}, E_{25}, \ldots E_2, E_1, E_0)$$

$$\text{Permuted ESN} = (E_0, E_{31}, E_{22}, E_{13}, E_4, E_{26}, E_{17}, E_8, E_{30}, E_{21}, E_{12}, E_3, E_{25}, E_{16}, E_7, E_{29}, E_{20}, E_{11}, E_2, E_{24}, E_{15}, E_6, E_{28}, E_{19}, E_{10}, E_1, E_{23}, E_{14}, E_5, E_{27}, E_{18}, E_9).^4$$

The private long code mask shall be as specified in Appendix A.

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[4]This permutation prevents high correlation between long codes corresponding to consecutive ESNs.

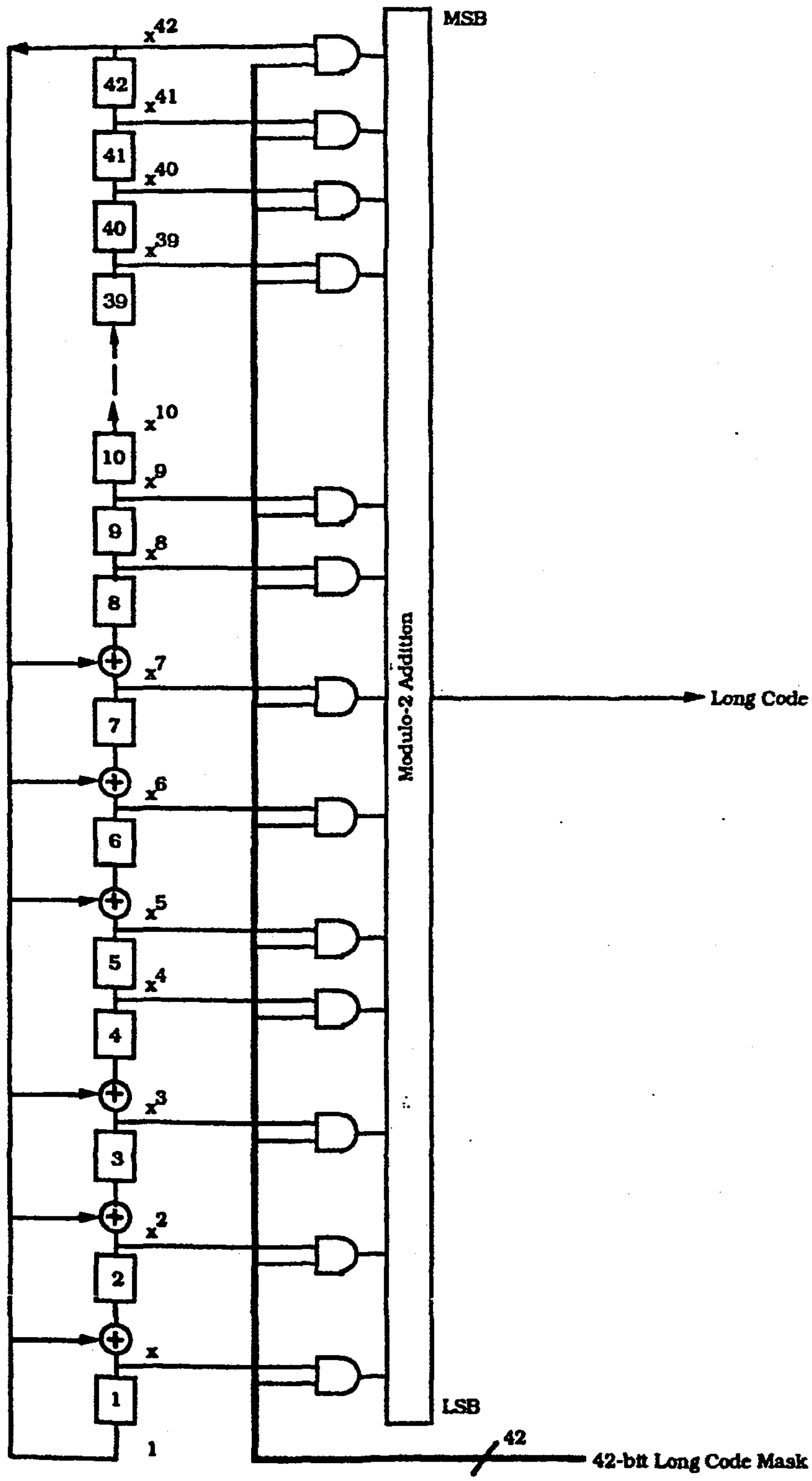


Figure 6.1.3.1.8-1. Long Code Generator

Access Channel Long Code Mask

41 … 33	32 … 28	27 … 25	24 … 9	8 … 0
110001111	ACN	PCN	BASE_ID	PILOT_PN

ACN - Access Channel Number
PCN - Paging Channel Number
BASE_ID - Base station identification
PILOT_PN - PN offset for the Forward CDMA Channel

Public Long Code Mask

41 … 32	31 … 0
1100011000	Permuted ESN

Figure 6.1.3.1.8-2. Long Code Mask Format

6.1.3.1.9 Quadrature Spreading

Following the direct sequence spreading, the Reverse Traffic Channel and Access Channel are spread in quadrature as shown in Figure 6.1.3.1-2. The sequences used for this spreading shall be the zero-offset I and Q pilot PN sequences used on the Forward CDMA Channel (see 7.1.3.2.1). These sequences are periodic with period 2^{15} chips and shall be based on the following characteristic polynomials, respectively:

$$P_I(x) = x^{15} + x^{13} + x^9 + x^8 + x^7 + x^5 + 1$$

(for the in-phase (I) sequence)

and

$$P_Q(x) = x^{15} + x^{12} + x^{11} + x^{10} + x^6 + x^5 + x^4 + x^3 + 1$$

(for the quadrature-phase (Q) sequence).

The maximum length linear feedback shift register sequences, {i(n)} and {q(n)}, based on the above polynomials are of period 2^{15}-1 and can be generated by using the following linear recursions:

$$i(n) = i(n-15) \oplus i(n-10) \oplus i(n-8) \oplus i(n-7) \oplus i(n-6) \oplus i(n-2)$$

(based on $P_I(x)$ as the characteristic polynomial)

and

$$q(n) = q(n-15) \oplus q(n-12) \oplus q(n-11) \oplus q(n-10) \oplus q(n-9) \oplus q(n-5) \oplus q(n-4) \oplus q(n-3)$$

(based on $P_Q(x)$ as the characteristic polynomial).

where i(n) and q(n) are binary-valued ('0' and '1') and the additions are modulo-2. In order to obtain the I and Q pilot PN sequences (of period 2^{15}), a '0' is inserted in {i(n)} and {q(n)} after 14 consecutive '0' outputs (this occurs only once in each period). Therefore, the pilot PN sequences have one run of 15 consecutive '0' outputs instead of 14.

The mobile station shall align the I and Q pilot PN sequences such that the first chip on every even second mark as referenced to the transmit time reference (see 6.1.5.1) is the '1' after the 15 consecutive '0's (see Figure 1.2-1).

The pilot PN sequences repeat every 26.666... ms (= $2^{15}/1228800$ seconds). There are exactly 75 repetitions in every 2 seconds.

The data spread by the Q pilot PN sequence shall be delayed by half a PN chip time (406.901 ns) with respect to the data spread by the I pilot PN sequence.

After baseband filtering (see 6.1.3.1.10), the binary data ('0's and '1's), I and Q shown in Figure 6.1.3.1-2, shall be mapped into phase according to Table 6.1.3.1.9-1.

Table 6.1.3.1.9-1. Reverse CDMA Channel I and Q Mapping

I	Q	Phase
0	0	$\pi/4$
1	0	$3\pi/4$
1	1	$-3\pi/4$
0	1	$-\pi/4$

The resulting signal constellation and phase transition are shown in Figure 6.1.3.1.9-1.

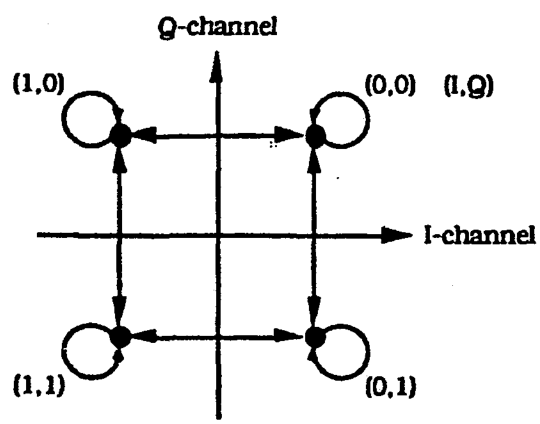


Figure 6.1.3.1.9-1. Reverse CDMA Channel Signal Constellation and Phase Transition

6.1.3.1.10 Baseband Filtering

Following the spreading operation, the I and Q impulses are applied to the inputs of the I and Q baseband filters as shown in Figure 6.1.3.1-2. The baseband filters shall have a frequency response S(f) that satisfies the limits given in Figure 6.1.3.1.10-1. Specifically, the normalized frequency response of the filter shall be contained within $\pm\delta_1$ in the passband $0 \le f \le f_p$ and shall be less than or equal to $-\delta_2$ in the stopband $f \ge f_s$. The numerical values for the parameters are $\delta_1 = 1.5$ dB, $\delta_2 = 40$ dB, $f_p = 590$ kHz, and $f_s = 740$ kHz.

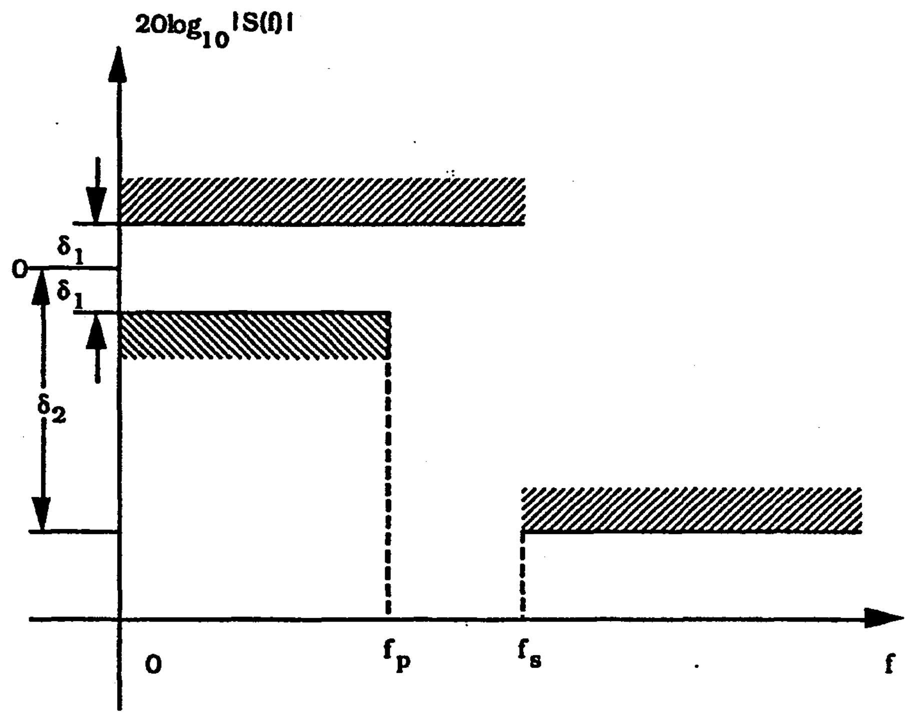


Figure 6.1.3.1.10-1. Baseband Filters Frequency Response Limits

Let s(t) be the impulse response of the baseband filter. Then s(t) shall satisfy the following equation:

$$\text{Mean Squared Error} = \sum_{k=0}^{\infty} [\alpha s(kT_s - \tau) - h(k)]^2 \le 0.03,$$

where the constants α and τ are used to minimize the mean squared error. The constant T_s is equal to 203.451... ns, which equals one quarter of a PN chip. The values of the coefficients h(k), for $k < 48$, are given in Table 6.1.3.1.10-1; $h(k) = 0$ for $k \ge 48$. Note that h(k) equals h(47 - k).

Table 6.1.3.1.10-1. Coefficients h(k)

k	h(k)
0, 47	-0.025288315
1, 46	-0.034167931
2, 45	-0.035752323
3, 44	-0.016733702
4, 43	0.021602514
5, 42	0.064938487
6, 41	0.091002137
7, 40	0.081894974
8, 39	0.037071157
9, 38	-0.021998074
10, 37	-0.060716277
11, 36	-0.051178658
12, 35	0.007874526
13, 34	0.084368728
14, 33	0.126869306
15, 32	0.094528345
16, 31	-0.012839661
17, 30	-0.143477028
18, 29	-0.211829088
19, 28	-0.140513128
20, 27	0.094601918
21, 26	0.441387140
22, 25	0.785875640
23, 24	1.0

6.1.3.2 Access Channel

The Access Channel is used by the mobile station to initiate communication with the base station and to respond to Paging Channel messages. An Access Channel transmission is a coded, interleaved, and modulated spread-spectrum signal. The Access Channel uses a random-access protocol (see 6.6.3.1.1). Access Channels are uniquely identified by their long codes (see 6.1.3.1.8).

6.1.3.2.1 Access Channel Time Alignment and Modulation Rate

The mobile station shall transmit information on the Access Channel at a fixed data rate of 4800 bps. An Access Channel frame shall be 20 ms in duration. An Access Channel frame shall begin only when System Time is an integral multiple of 20 ms (see Figure 1.2-1).

The synchronization, timing, and structure of the Access Channel are specified in 6.6.3.1.1 and 6.7.1.1.

The Reverse CDMA Channel may contain up to 32 Access Channels numbered 0 through 31 per supported Paging Channel. At least one Access Channel exists on the Reverse CDMA Channel for each Paging Channel on the corresponding Forward CDMA Channel. Each Access Channel is associated with a single Paging Channel.

6.1.3.2.2 Access Channel Frame Structure

Each Access Channel frame contains 96 bits (20 ms frame at 4800 bps). Each Access Channel frame shall consist of 88 information bits and eight Encoder Tail Bits (see Figure 6.1.3.2.2-1).

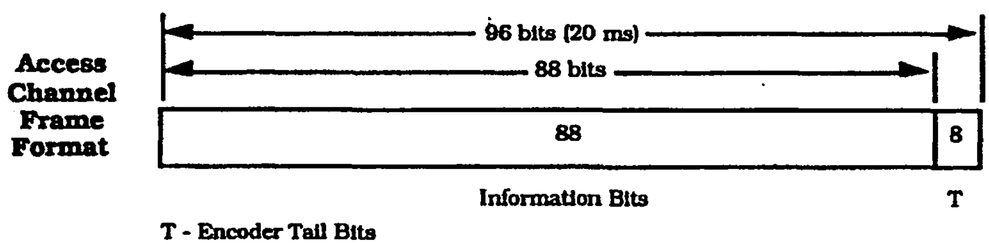


Figure 6.1.3.2.2-1. Access Channel Frame Structure

6.1.3.2.2.1 Access Channel Preamble

The Access Channel preamble shall consist of frames of 96 zeros that are transmitted at the 4800 bps rate. The Access Channel preamble is transmitted to aid the base station in acquiring an Access Channel transmission (see 6.7.1.1).

6.1.3.2.3 Access Channel Convolutional Encoding

The Access Channel data shall be convolutionally encoded prior to transmission as specified in 6.1.3.1.3.

When generating Access Channel data, the encoder shall be initialized to the all zero state at the end of each 20 ms frame.

6.1.3.2.4 Access Channel Code Symbol Repetition

Each code symbol output from the convolutional encoder on the Access Channel shall be repeated once (each code symbol occurs two consecutive times) as specified in 6.1.3.1.4.

6.1.3.2.5 Access Channel Interleaving

The repeated code symbols on the Access Channel shall be interleaved as specified in 6.1.3.1.5.

6.1.3.2.6 Access Channel Modulation

The Access Channel data shall be modulated as specified in 6.1.3.1.6.

6.1.3.2.7 Access Channel Gating

The mobile station shall not gate off any power control group while transmitting on the Access Channel as specified in 6.1.3.1.7.1.

6.1.3.2.8 Access Channel Direct Sequence Spreading

The Access Channel shall be spread by the long code as specified in 6.1.3.1.8.

6.1.3.2.9 Access Channel Quadrature Spreading

The Access Channel shall be quadrature spread by the pilot PN sequences as specified in 6.1.3.1.9.

6.1.3.2.10 Access Channel Baseband Filtering

The Access Channel shall be filtered as specified in 6.1.3.1.10.

6.1.3.3 Reverse Traffic Channel

The Reverse Traffic Channel is used for the transmission of user and signaling information to the base station during a call.

6.1.3.3.1 Reverse Traffic Channel Time Alignment and Modulation Rates

The mobile station shall transmit information on the Reverse Traffic Channel at variable data rates of 9600, 4800, 2400, and 1200 bps. The Reverse Traffic Channel frame shall be 20 ms in duration. The data rate shall be selected on a frame-by-frame (i.e., 20 ms) basis.

A mobile station shall support staggered Traffic Channel frames. The time offset is specified by the FRAME_OFFSET parameter (see the *Channel Assignment Message* in 7.7.2.3.2.8).[5] A zero-offset Reverse Traffic Channel frame shall begin only when System Time is an integral multiple of 20 ms (see Figure 1.2-1). A staggered frame shall begin

[5]The Reverse Traffic Channel time offset is the same as the Forward Traffic Channel time offset.

1.25 × FRAME_OFFSET ms later than the zero-offset Traffic Channel frame. The Reverse Traffic Channel interleaver block shall be aligned with the Reverse Traffic Channel frame.

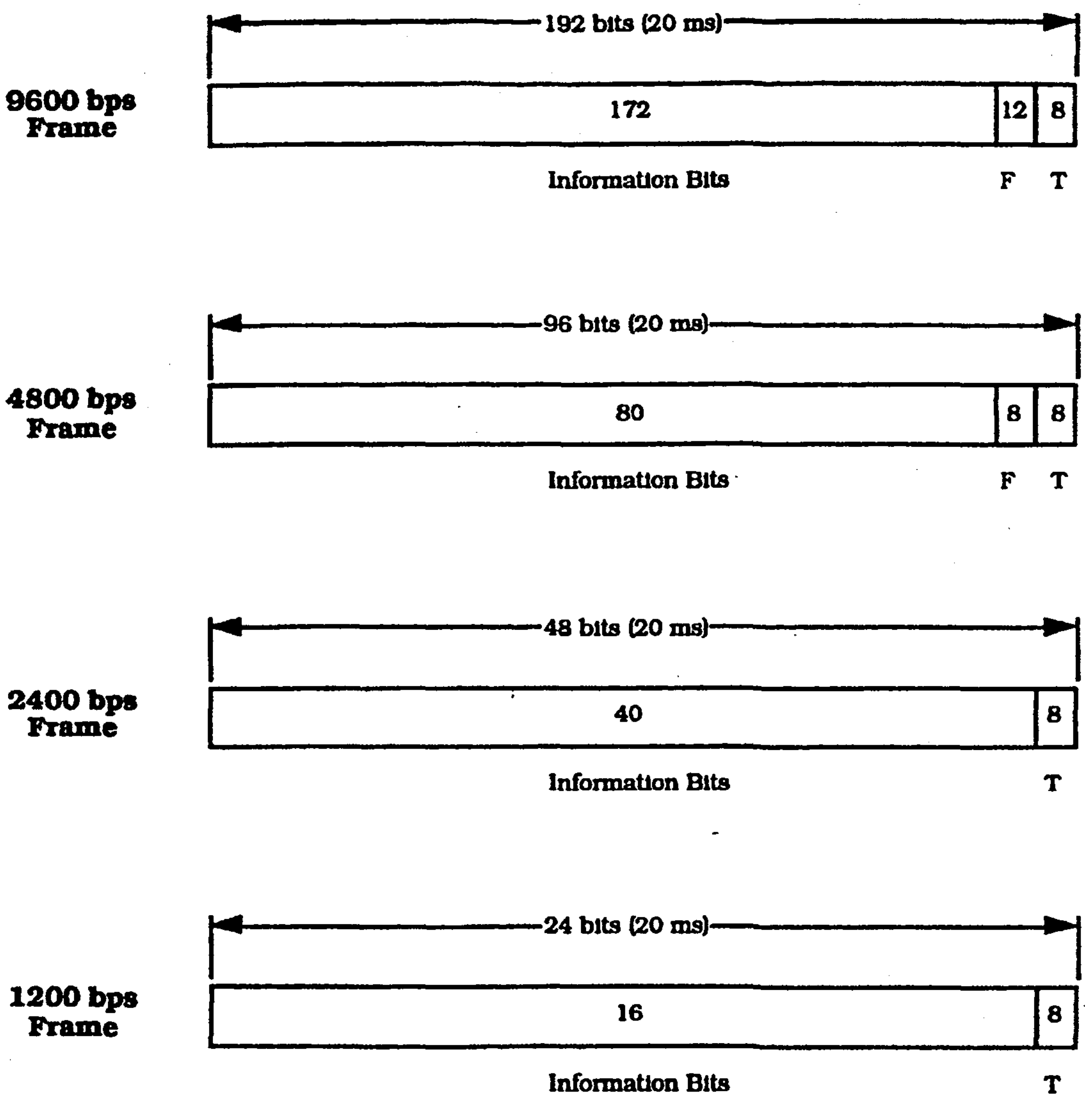
6.1.3.3.2 Reverse Traffic Channel Frame Structure

Reverse Traffic Channel frames sent at the 9600 bps transmission rate shall consist of 192 bits. These 192 bits shall be composed of 172 information bits followed by 12 frame quality indicator (CRC) bits and eight Encoder Tail Bits as shown in Figure 6.1.3.3.2-1.

Reverse Traffic Channel frames sent at the 4800 bps transmission rate shall consist of 96 bits. These 96 bits shall be composed of 80 information bits followed by eight frame quality indicator (CRC) bits and eight Encoder Tail Bits as shown in Figure 6.1.3.3.2-1.

Reverse Traffic Channel frames sent at the 2400 bps transmission rate shall consist of 48 bits. These 48 bits shall be composed of 40 information bits followed by eight Encoder Tail Bits as shown in Figure 6.1.3.3.2-1.

Reverse Traffic Channel frames sent at the 1200 bps transmission rate shall consist of 24 bits. These 24 bits shall be composed of 16 information bits followed by eight Encoder Tail Bits as shown in Figure 6.1.3.3.2-1.



<u>Notation</u>

F - Frame Quality Indicator (CRC)
T - Encoder Tail Bits

Figure 6.1.3.3.2-1. Reverse Traffic Channel Frame Structure

6.1.3.3.2.1 Reverse Traffic Channel Frame Quality Indicator

Each 9600 bps and 4800 bps frame shall include a frame quality indicator. This frame quality indicator is a CRC.[6] No frame quality indicator is used for the 2400 bps and 1200 bps transmission rates.

For both the 9600 bps and 4800 bps rates, the frame quality indicator (CRC) shall be calculated on all bits within the frame, except the frame quality indicator itself and the Encoder Tail Bits. The 9600 bps transmission rate shall use a 12-bit frame quality indicator. The generator polynomial for this frame quality indicator shall be as follows:

$$g(x) = x^{12} + x^{11} + x^{10} + x^9 + x^8 + x^4 + x + 1.$$

The 4800 bps transmission rate shall use an 8-bit frame quality indicator. The generator polynomial for this frame quality indicator shall be as follows:

$$g(x) = x^8 + x^7 + x^4 + x^3 + x + 1.$$

The frame quality indicators shall be computed according to the following procedure using the logic shown in Figures 6.1.3.3.2.1-1 and 6.1.3.3.2.1-2:

- Initially, all shift register elements shall be set to logical one and the switches shall be set in the up position.
- The register shall be clocked 172 times (for 192-bit frame) or 80 times (for 96-bit frame) with the information bits as input.
- The switches shall be set in the down position, and the register shall be clocked an additional 12 times (for 192-bit frame) or 8 times (for 96-bit frame). The 12 or 8 additional output bits shall be the frame quality indicator bits.
- The bits shall be transmitted in the order calculated.

6.1.3.3.2.2 Reverse Traffic Channel Encoder Tail Bits

The last eight bits of each Reverse Traffic Channel frame are called the Encoder Tail Bits. These eight bits shall be set to '0'.

---

[6]The frame quality indicator supports two functions at the receiver. The first function is to determine whether the frame is in error. The second function is to assist in the determination of the data rate of the received frame. Other parameters may be needed for rate determination in addition to the frame quality indicator, such as symbol error rate evaluated at the four data rates.

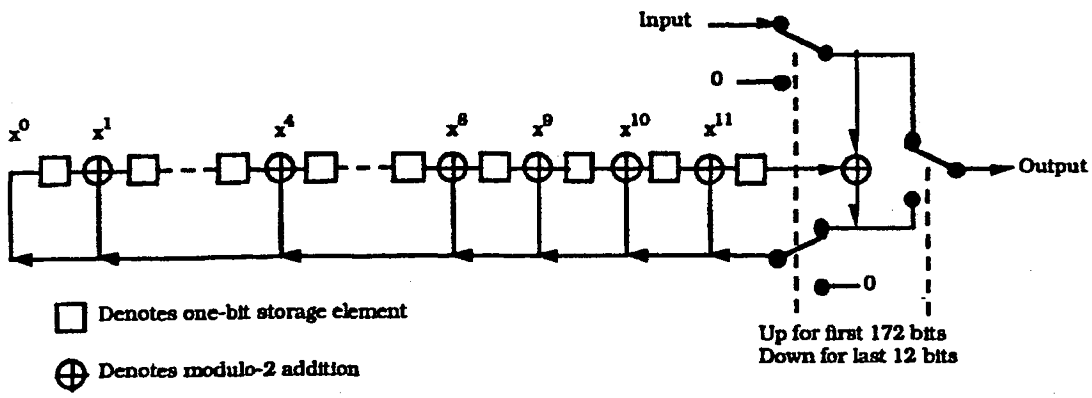


Figure 6.1.3.3.2.1-1. Reverse Traffic Channel Frame Quality Indicator Calculation at the 9600 bps Rate

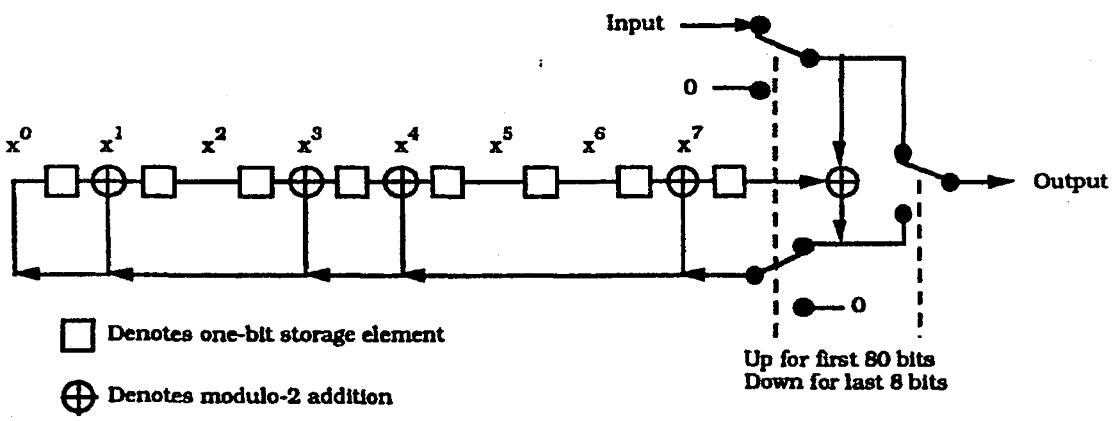


Figure 6.1.3.3.2.1-2. Reverse Traffic Channel Frame Quality Indicator Calculation at the 4800 bps Rate

6.1.3.3.2.3 Traffic Channel Preamble

The Traffic Channel preamble shall consist of frames of 192 zeros that are transmitted at the 9600 bps rate. The Traffic Channel preamble shall not include the frame quality indicator.

The Traffic Channel preamble is transmitted to aid the base station in performing initial acquisition of the Reverse Traffic Channel. The Traffic Channel preamble transmission occurs after the mobile station's transmitter has been enabled during the *Traffic Channel Initialization Substate* of the *Mobile Station Control on the Traffic Channel State* and before receipt of the first valid message on the Forward Traffic Channel (see 6.6.4.2).

6.1.3.3.2.4 Null Traffic Channel Data

Null Traffic Channel data shall consist of frames of 16 ones followed by 8 zeros (the Encoder Tail Bits) sent at the 1200 bps rate.

The mobile station transmits null Traffic Channel data when no service option is active. Null Traffic Channel data serves as a "keep-alive" operation so that the base station can maintain connectivity with the mobile station.

6.1.3.3.3 Reverse Traffic Channel Convolutional Encoding

The Reverse Traffic Channel data shall be convolutionally encoded prior to transmission as specified in 6.1.3.1.3.

When generating Reverse Traffic Channel data, the encoder shall be initialized to the all zero state at the end of each 20 ms frame.

6.1.3.3.4 Reverse Traffic Channel Code Symbol Repetition

Reverse Traffic Channel code symbol repetition shall be as specified in 6.1.3.1.4.

6.1.3.3.5 Reverse Traffic Channel Interleaving

The code symbols (or repeated code symbols when a data rate lower than 9600 bps is used) on the Reverse Traffic Channel shall be interleaved as specified in 6.1.3.1.5.

6.1.3.3.6 Reverse Traffic Channel Modulation

The Reverse Traffic Channel data shall be modulated as specified in 6.1.3.1.6.

6.1.3.3.7 Reverse Traffic Channel Gating

The mobile station shall perform the data burst randomizing function as specified in 6.1.3.1.7 while transmitting on the Reverse Traffic Channel.

6.1.3.3.8 Reverse Traffic Channel Direct Sequence Spreading

The Reverse Traffic Channel shall be spread by the long code as specified in 6.1.3.1.8.

6.1.3.3.9 Reverse Traffic Channel Quadrature Spreading

The Reverse Traffic Channel shall be quadrature spread by the pilot PN sequences as specified in 6.1.3.1.9.

6.1.3.3.10 Reverse Traffic Channel Baseband Filtering

The Reverse Traffic Channel shall be filtered as specified in 6.1.3.1.10.

6.1.3.3.11 Multiplex Option Information

Multiplex Option 1 is also referred to as the default multiplex option.[7] It provides for the transmission of primary traffic and signaling or secondary traffic. Signaling traffic may be transmitted via blank-and-burst with the signaling traffic using all of the frame or via dim-and-burst with the primary traffic and signaling traffic sharing the frame. Multiplex Option 1 also supports the transmission of secondary traffic. When primary traffic is active, secondary traffic is transmitted via dim-and-burst with the primary traffic and secondary traffic sharing the frame. When primary traffic is not active, secondary traffic is transmitted via blank-and-burst with the secondary traffic using all of the frame. The information bit structures for primary and signaling traffic are specified in 6.1.3.3.11.1; the information bit structures for secondary traffic are specified in 6.1.3.3.11.2. Table 6.1.3.3.11-1 shows the information bit structures supported by Multiplex Option 1.

The mobile station shall support Multiplex Option 1. The mobile station shall support the transmission of primary traffic and signaling traffic using the information bit structures specified in 6.1.3.3.11.1. The mobile station may support secondary traffic, and if so, the mobile station shall also use the information bit structures specified in 6.1.3.3.11.2. Procedures for support of secondary traffic data are for further study.

Other multiplex options are for further study.

[7]The multiplex option is the same on both the Forward Traffic Channel and the Reverse Traffic Channel.

Table 6.1.3.3.11-1. Reverse Traffic Channel Information Bits for Multiplex Option 1

	Format Bits			Primary Traffic	Signaling Traffic	Secondary Traffic
Transmit Rate (bits/sec)	Mixed Mode (MM)	Traffic Type (TT)	Traffic Mode (TM)	bits/ frame	bits/ frame	bits/ frame
9600	'0'	–	–	171	0	0
	'1'	'0'	'00'	80	88	0
	'1'	'0'	'01'	40	128	0
	'1'	'0'	'10'	16	152	0
	'1'	'0'	'11'	0	168	0
*	'1'	'1'	'00'	80	0	88
*	'1'	'1'	'01'	40	0	128
*	'1'	'1'	'10'	16	0	152
*	'1'	'1'	'11'	0	0	168
4800	–	–	–	80	0	0
2400	–	–	–	40	0	0
1200	–	–	–	16	0	0

Note: Secondary traffic structures, marked with *, are optional.

6.1.3.3.11.1 Primary and Signaling Traffic with Multiplex Option 1

The mobile station shall support the information bit structures described in Table 6.1.3.3.11-1 and Figure 6.1.3.3.11.1-1.

9600 bps Primary Traffic Only (172 bits)

1	171
MM =0	Primary Traffic

Dim and Burst with Rate 1/2 Primary and Signaling Traffic (172 bits)

1	1	2	80	88
MM =1	TT =0	TM =00	Primary Traffic	Signaling Traffic

Dim and Burst with Rate 1/4 Primary and Signaling Traffic (172 bits)

1	1	2	40	128
MM =1	TT =0	TM =01	Primary Traffic	Signaling Traffic

Dim and Burst with Rate 1/8 Primary and Signaling Traffic (172 bits)

1	1	2	16	152
MM =1	TT =0	TM =10	Primary Traffic	Signaling Traffic

Blank and Burst with Signaling Traffic Only (172 bits)

1	1	2	168
MM =1	TT =0	TM =11	Signaling Traffic

Notation

MM - Mixed Mode Bit
- 0 - Primary Traffic Only
- 1 - Primary Traffic and/or Signaling Traffic or Secondary Traffic

TT - Traffic Type Bit
- 0 - Signaling Traffic
- 1 - Secondary Traffic

TM - Traffic Mode Bits
- 00 - 80 Primary Traffic Bits and either 88 Signaling Traffic or 88 Secondary Traffic Bits
- 01 - 40 Primary Traffic Bits and either 128 Signaling Traffic Bits or 128 Secondary Traffic Bits
- 10 - 16 Primary Traffic Bits and either 152 Signaling Traffic Bits or 152 Secondary Traffic Bits
- 11 - 168 Signaling Traffic Bits or 168 Secondary Traffic Bits

Figure 6.1.3.3.11.1-1. Information Bits for Primary Traffic and Signaling Traffic (Part 1 of 2)

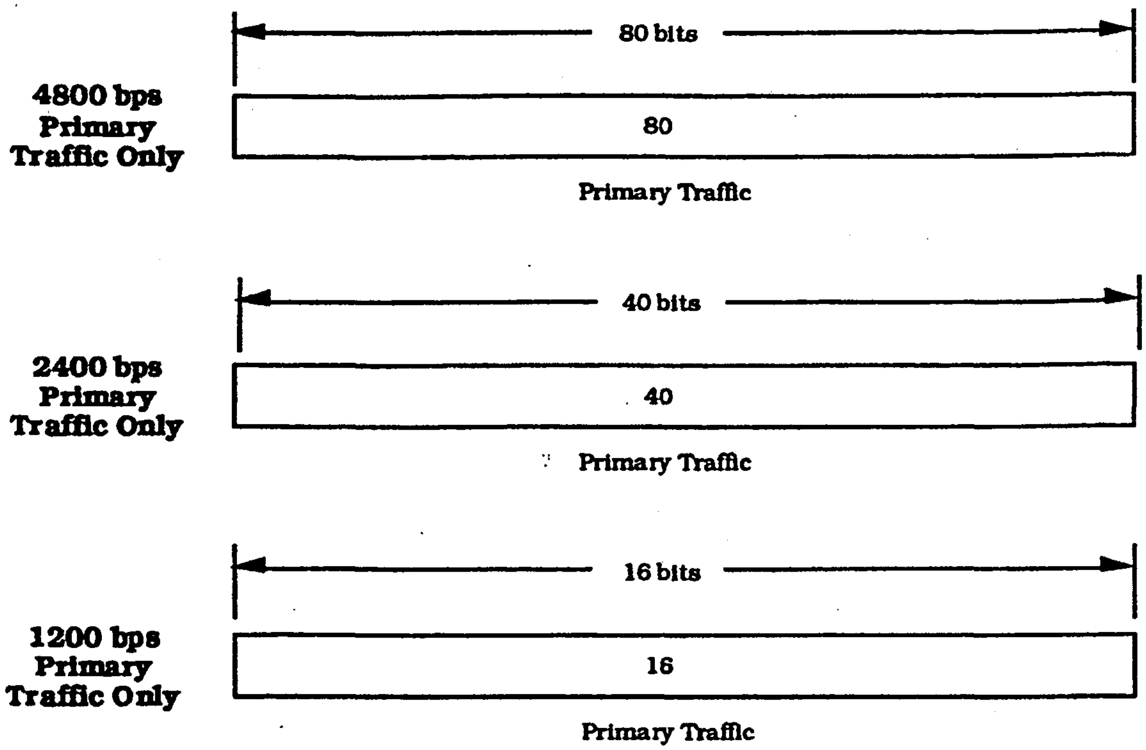
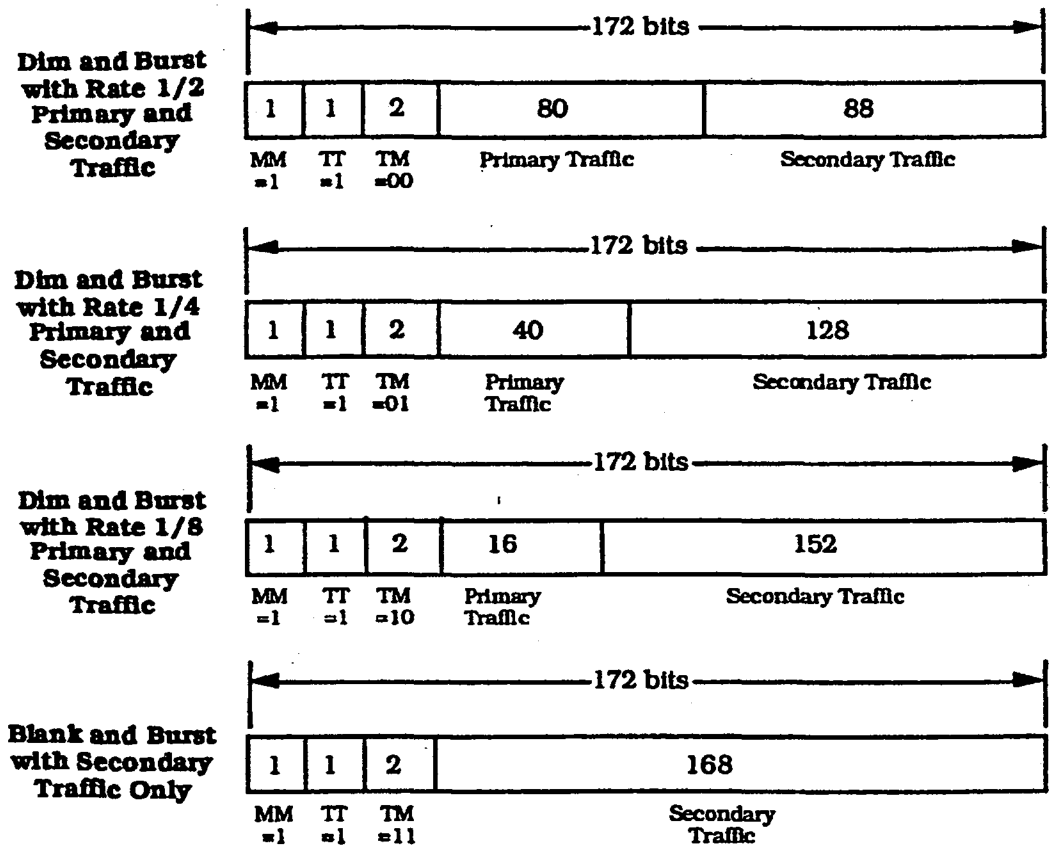


Figure 6.1.3.3.11.1-1. Information Bits for Primary Traffic and Signaling Traffic (Part 2 of 2)

6.1.3.3.11.2 Secondary Traffic with Multiplex Option 1

If the mobile station supports secondary traffic, the mobile station shall use the information bit structures described in Table 6.1.3.3.11-1 and Figure 6.1.3.3.11.2-1.



Notation

MM - Mixed Mode Bit
- 0 - Primary Traffic Only
- 1 - Primary Traffic and/or Signaling Traffic or Secondary Traffic

TT - Traffic Type Bit
- 0 - Signaling Traffic
- 1 - Secondary Traffic

TM - Traffic Mode Bits
- 00 - 80 Primary Traffic Bits and either 88 Signaling Traffic or 88 Secondary Traffic Bits
- 01 - 40 Primary Traffic Bits and either 128 Signaling Traffic Bits or 128 Secondary Traffic Bits
- 10 - 16 Primary Traffic Bits and either 152 Signaling Traffic Bits or 152 Secondary Traffic Bits
- 11 - 168 Signaling Traffic Bits or 168 Secondary Traffic Bits

Figure 6.1.3.3.11.2-1. Information Bits for Secondary Traffic

6.1.3.3.11.3 Use of Various Information Bit Formats for Multiplex Option 1

When neither a primary traffic service option nor a secondary traffic service option is active, the mobile station shall transmit signaling traffic using only blank-and-burst frames. When not transmitting signaling traffic, the mobile station shall transmit only null Traffic Channel data frames.

When a primary traffic service option is active and a secondary traffic service option is not active, the mobile station shall use the information formats specified in 6.1.3.3.11.1. The mobile station shall not transmit null Traffic Channel data. The mobile station should use the dim-and-burst information formats specified in 6.1.3.3.11.1 for signaling traffic.

When a primary traffic service option is not active and a secondary traffic service option is active, the mobile station shall use the information formats specified in 6.1.3.3.11.2 to transmit secondary traffic. The mobile station shall use the blank-and-burst format specified in 6.1.3.3.11.1 for signaling traffic. The mobile station shall transmit null Traffic Channel data when neither secondary traffic nor signaling traffic is to be sent.

When both a primary traffic service option and a secondary traffic service option are active, the mobile station shall use the information formats specified in 6.1.3.3.11.1 and 6.1.3.3.11.2. The mobile station shall not transmit null Traffic Channel data. The mobile station should use the dim-and-burst information formats specified in 6.1.3.3.11.1 for signaling traffic.

6.1.3.3.11.4 Control of Service Options for Multiplex Option 1

Multiplex Option 1 controls the number of bits that the service option supplies for a frame (see IS-96 "Speech Service Option Standard for Wideband Spread Spectrum Digital Cellular System").

The mobile station shall use the following rules when a primary traffic service option is active: If signaling traffic is to be transmitted in a frame, Multiplex Option 1 shall either restrict the primary traffic service option to generate zero bits (for a blank-and-burst frame) or to generate less than 171 bits (for a dim-and-burst frame). If secondary traffic is to be transmitted in a frame, Multiplex Option 1 may restrict the primary traffic service option to generate less than 171 bits but shall allow the primary traffic service option to generate at least 16 bits. In all other cases, Multiplex Option 1 shall allow the primary traffic service option to generate either 16, 40, 80, or 171 bits for a frame.

6.1.4 Limitations on Emissions

6.1.4.1 Bandwidth Occupied

Modulation products in a bandwidth of 30 kHz centered ±900 kHz from the channel center frequency should be at least 45 dB and shall be at least 42 dB below the mean output power level.

6.1.4.2 Conducted Spurious Emissions

6.1.4.2.1 Suppression Inside Cellular Band

When transmitting on any CDMA Channel, spurious emission levels in the mobile station transmit band between 824 and 849 MHz shall be less than the limits specified in Table 6.1.4.2.1-1.

In addition, spurious emissions in each 1.23 MHz band located anywhere in the mobile station receive band between 869 and 894 MHz shall be less than -80 dBm. These requirements shall apply to measurements made at the mobile station antenna connector.

Table 6.1.4.2.1-1. Spurious Emission Limits When Transmitting

For Frequency Offset Δf, with |Δf|	Greater than 885.0 kHz	Greater than 1.98 MHz
Spurious emission levels shall not exceed (a), or both (b) and (c), whichever is the greater power.	(a) -42 dBc/30 kHz	(a) -54 dBc/30 kHz
	(b) -60 dBm/30 kHz (c) -54 dBm/1.23 MHz	(b) -60 dBm/30 kHz (c) -54 dBm/1.23 MHz
Spurious emission levels should not exceed (a), or both (b) and (c), whichever is the greater power.	(a) -45 dBc/30 kHz	(a) -60 dBc/30 kHz
	(b) -66 dBm/30 kHz (c) -60 dBm/1.23 MHz	(b) -66 dBm/30 kHz (c) -60 dBm/1.23 MHz

Note: All frequencies in the measurement bandwidth shall satisfy the restrictions on |Δf| where Δf = center frequency - measurement frequency

6.1.4.2.2 Suppression Outside Cellular Band

Current FCC rules shall apply.

6.1.4.3 Radiated Spurious Emissions

Radiated spurious emissions (from sources other than the antenna connector) shall meet levels corresponding to the conducted spurious requirements listed in 6.1.4.2.

6.1.5 Synchronization and Timing

6.1.5.1 Time Reference

Figure 1.2-1 illustrates the nominal relationship between the mobile station and base station transmit and receive time references. The mobile station shall establish a time reference which is used to derive timing for the transmit chip, symbol, frame slot, and system timing. The mobile station time reference shall be, in steady state conditions, within ±1 μs of the time of occurrence, as measured at the mobile station antenna connector, of the earliest arriving multipath component being used for demodulation. If another multipath component (belonging to the same Pilot Channel or to a different Pilot Channel) becomes the earliest arriving multipath component to be used, the mobile station time reference shall track to the new component. If the difference between the mobile station time reference and the time of occurrence of the earliest arriving multipath component being used for demodulation, as measured at the mobile station antenna connector, is less than ±1 μs, the mobile station may track its time reference to the earliest arriving multipath component being used for demodulation.

If a mobile station time reference correction is needed, it shall be corrected no faster than 1/4 chip (203.451 ns) in any 200 ms period and no slower than 3/8 PN chip (305.18 ns) per second.

When receiving the Forward Traffic Channel, the mobile station time reference shall be used as the transmit time of the Reverse Traffic Channel. When receiving the Paging Channel, the mobile station time reference shall be used as the transmit time of the Access Channel.

6.1.6 Transmitter Performance Requirements

System performance is predicated on transmitters meeting the requirements set forth in IS-98 "Recommended Minimum Performance Standards for Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations."

6.2 Receiver

6.2.1 Frequency Parameters

6.2.1.1 Channel Spacing and Designation

Channel spacing and designation for the mobile station reception shall be as specified in 2.1.1.1. Valid channels for CDMA operations shall be as specified in 6.1.1.1.

6.2.2 Demodulation Characteristics

6.2.2.1 Processing

The mobile station demodulation process shall perform complementary operations to the base station modulation process on the Forward CDMA Channel (see 7.1.3).

The mobile station shall provide a minimum of four processing elements that can be directed independently from each other. At least three elements shall be capable of tracking and demodulating multipath components of the Forward CDMA Channel. At least one element shall be a "searcher" element capable of scanning and estimating the signal strength at each pilot PN sequence offset.

6.2.2.2 Forward Traffic Channel Frame Categorization for Multiplex Option 1

For multiplex option 1, the mobile station shall classify received Forward Traffic Channel frames into the following 14 categories (see 7.1.3.5.11):

1. 9600 bps frame, primary traffic only
2. 9600 bps frame, dim-and-burst with Rate 1/2 primary and signaling traffic
3. 9600 bps frame, dim-and-burst with Rate 1/4 primary and signaling traffic

4. 9600 bps frame, dim-and-burst with Rate 1/8 primary and signaling traffic
5. 9600 bps frame, blank-and-burst with signaling traffic only
6. 4800 bps frame, primary traffic only
7. 2400 bps frame, primary traffic only
8. 1200 bps frame, primary traffic or null data only
9. 9600 bps frame, primary traffic only, with bit errors[8]
10. Frame with insufficient frame quality[9]
11. 9600 bps frame, dim-and-burst with Rate 1/2 primary and secondary traffic
12. 9600 bps frame, dim-and-burst with Rate 1/4 primary and secondary traffic
13. 9600 bps frame, dim-and-burst with Rate 1/8 primary and secondary traffic
14. 9600 bps frame, blank-and-burst with secondary traffic only

Frames in categories 9 and 10 are bad frames; all frames otherwise categorized are considered good frames.

If primary traffic is active and secondary traffic is not active, then the mobile station shall categorize the received frames into one of categories 1 through 10. If primary traffic is not active and secondary traffic is active, then the mobile station shall categorize the received frames into one of categories 5, 8, 10 and 14. If neither primary traffic nor secondary traffic is active, then the mobile station shall categorize the received frames into one of categories 5, 8, and 10. Mobile stations that do not implement secondary traffic services are not required to implement categories 11 through 14.

6.2.2.3 Forward Traffic Channel Time Alignment

The Forward Traffic Channel frame time alignment is specified in 7.1.3.5.1. A mobile station shall support staggered Forward Traffic Channel frames.

6.2.3 Limitations on Emissions

6.2.3.1 Conducted Spurious Emissions

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[8]Certain service options, which can be connected to the multiplex sublayer, can satisfactorily handle some bit errors. This category is used when the frame quality indicator (CRC) fails but other parameters indicate a 9600 bps frame has been received.

[9]This category is used when the mobile station is unable to decide upon the data rate of the received frame or when the mobile station detects a frame in error which does not belong to category 9.

6.2.3.1.1 Suppression Inside Cellular Band

Total spurious emissions in each 1.23 MHz band located anywhere in the mobile station receive band between 869 and 894 MHz shall be less than -80 dBm. Total spurious emissions in each 1.23 MHz band located anywhere in the mobile station's transmit band between 824 and 849 MHz shall not exceed -60 dBm. These requirements shall apply to measurements made at the mobile station antenna connector, with the transmitter disabled.

6.2.3.1.2 Suppression Outside Cellular Band

Current FCC rules shall apply.

6.2.3.2 Radiated Spurious Emissions

Current FCC rules shall apply.

6.2.4 Receiver Performance Requirements

System performance is predicated on receivers meeting the requirements set forth in IS-98 "Recommended Minimum Performance Standards for Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations."

6.3 Security and Identification

6.3.1 Mobile Station Identification Number

See 2.3.1.

For CDMA operation, the same MIN may be entered into multiple mobile stations. Individual systems may or may not allow these capabilities. The management of these capabilities is a function of the base station and system operator.

6.3.2 Electronic Serial Number

See 2.3.2.

6.3.3 Station Class Mark

See 2.3.3.

6.3.4 Registration Memory

See 2.3.4 for registration memory when operating in the analog mode.

The mobile station shall have memory to store one element in the zone-based registration list $\text{ZONE\_LIST}_{s\text{-}p}$ (see 6.6.5.1.5). This stored element shall include both REG_ZONE and the corresponding (SID, NID) pair. The data retention time under power-off conditions shall be at least 48 hours. If, after 48 hours, the data integrity cannot be guaranteed, then the entry in $\text{ZONE\_LIST}_{s\text{-}p}$ shall be deleted upon power-on.

The mobile station shall have memory to store one element in the system/network registration list $\text{SID\_NID\_LIST}_{s\text{-}p}$ (see 6.6.5.1.5). The data retention time under power-off conditions shall be at least 48 hours. If, after 48 hours, the data integrity cannot be guaranteed, then the entry in $\mathrm{SID\_NID\_LIST}_{s\text{-}p}$ shall be deleted upon power-on.

The mobile station shall have memory to store the distance-based registration variables $\mathrm{BASE\_LAT\_REG}_{s\text{-}p}$, $\mathrm{BASE\_LONG\_REG}_{s\text{-}p}$, and $\mathrm{REG\_DIST\_REG}_{s\text{-}p}$ (see 6.6.5.1.4). The data retention time under power-off conditions shall be at least 48 hours. If, after 48 hours, the data integrity cannot be guaranteed, then $\mathrm{REG\_DIST\_REG}_{s\text{-}p}$ shall be set to zero upon power-on.

6.3.5 Access Overload Class

See 2.3.5.

6.3.6 Reserved

6.3.7 Reserved

6.3.8 Home System and Network Identification

In addition to the $\mathrm{HOME\_SID}_p$ parameter that the mobile station stores for the MIN that is associated with the mobile station (see 2.3.8), the mobile station shall provide memory to store at least one home (SID_p, NID_p) pair. The mobile station shall also provide memory to store the 1-bit parameters $\mathrm{MOB\_TERM\_HOME}_p$, $\mathrm{MOB\_TERM\_FOR\_SID}_p$, and $\mathrm{MOB\_TERM\text{-}\_FOR\_NID}_p$ (see 6.6.5.3).

6.3.9 Local Control Option

See 2.3.9.

6.3.10 Preferred Operation Selection

6.3.10.1 Preferred System

See 2.3.10.1.

6.3.10.2 Preferred CDMA or Analog

See 2.3.10.2.

6.3.11 Discontinuous Reception

The mobile station shall provide memory to store the preferred slot cycle index, $\mathrm{SLOT\_CYCLE\_INDEX}_p$ (see 6.6.2.1.1.3).

6.3.12 Authentication, Encryption of Signaling Information/User Data and Voice Privacy

6.3.12.1 Authentication

Authentication is the process by which information is exchanged between a mobile station and base station for the purpose of confirming the identity of the mobile station. A successful outcome of the authentication process occurs only when it can be demonstrated that the mobile station and base station possess identical sets of shared secret data.

The authentication algorithms are described in "Common Cryptographic Algorithms." The interface (input and output parameters) for the algorithms are described in "Interface Specification for Common Cryptographic Algorithms." Table 6.3.12.1-1 summarizes the setting of the input parameters of the Auth_Signature procedure for each of its uses in this standard.

Table 6.3.12.1-1. Auth_Signature Input Parameters

Procedure	RAND_CHALLENGE	ESN	AUTH_-DATA	SSD_-AUTH	SAVE_-REGISTERS
Registration (6.3.12.1.4)	$RAND_S$	ESN_P	MIN1	SSD_A	FALSE
Unique Challenge (6.3.12.1.5)	256 × RANDU + (8 LSBs of MIN2)	ESN_P	MIN1	SSD_A	FALSE
Originations (6.3.12.1.6)	$RAND_S$	ESN_P	Digits	SSD_A	TRUE
Terminations (6.3.12.1.7)	$RAND_S$	ESN_P	MIN1	SSD_A	TRUE
Base Station Challenge (6.3.12.1.9)	RANDBS	ESN_P	MIN1	SSD_A_-NEW	FALSE

6.3.12.1.1 Shared Secret Data (SSD)

SSD is a 128-bit quantity that is stored in semi-permanent memory in the mobile station, as specified in 2.3.12.1.1.

SSD_A is used to support the authentication procedures and SSD_B is used to support voice privacy and message encryption. SSD is generated according to the procedure specified in 2.3.12.1.8 or 6.3.12.1.9.

6.3.12.1.2 Random Challenge Memory (RAND)

See 2.3.12.1.2.

6.3.12.1.3 Call History Parameter ($COUNT_{S-P}$)

See 2.3.12.1.3.

6.3.12.1.4 Authentication of Mobile Station Registrations

The following authentication procedures shall be performed when the AUTH field of the *Access Parameters Message* is set to '01' (standard authentication mode), and the mobile station attempts to register (by sending a *Registration Message* on the Access Channel).

The mobile station shall set the input parameters of the Auth_Signature procedure (see "Interface Specification for Common Cryptographic Algorithms," section 2.3) as illustrated in Figure 6.3.12.1.4-1.

The mobile station shall set the SAVE_REGISTERS input parameter to FALSE.

The mobile station shall then execute the Auth_Signature procedure. The 18-bit output AUTH_SIGNATURE shall be used to fill the AUTHR field of the *Registration Message*. The RANDC (eight most significant bits of RAND) and COUNT fields of the message shall be filled with the current values stored in the mobile station.

The base station compares the received value of RANDC to the most significant eight bits of its internally stored value of RAND.

The base station may also compare the received value of COUNT with its internally stored value associated with the received MIN/ESN.

The base station computes the value of AUTHR in the same manner as the mobile station, but using its internally stored value of SSD_A. The base station compares its computed value of AUTHR to the value received from the mobile station.

If any of the comparisons fail, the base station may deem the registration attempt unsuccessful, initiate the Unique Challenge-Response Procedure (see 6.3.12.1.5) or commence the process of updating SSD (see 6.3.12.1.9).

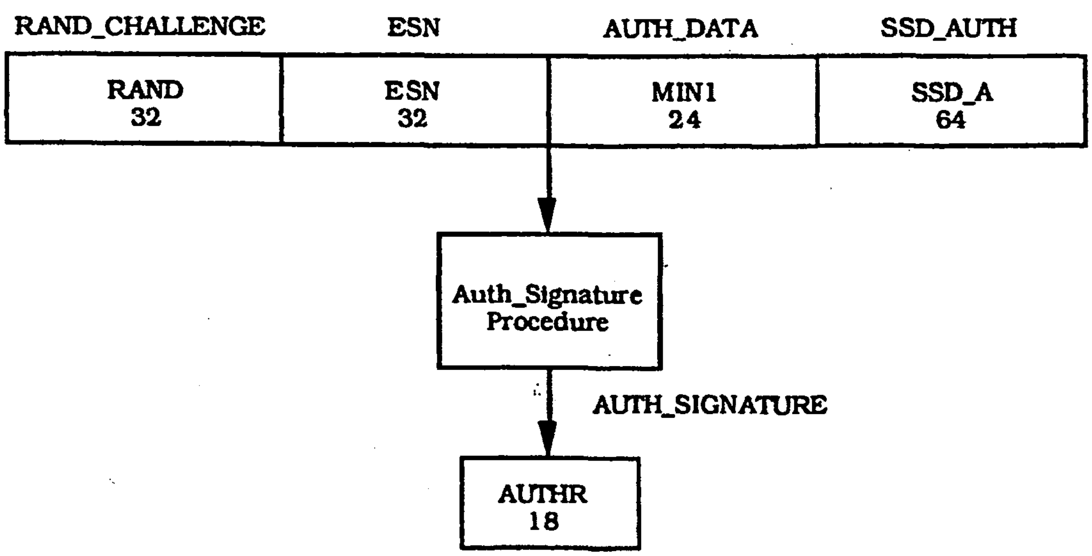

Figure 6.3.12.1.4-1. Computation of AUTHR for Authentication of Mobile Station Registrations

6.3.12.1.5 Unique Challenge-Response Procedure

The Unique Challenge-Response Procedure is initiated by the base station and can be carried out either on the Paging and Access Channels, or on the Forward and Reverse Traffic Channels. The procedure is as follows:

The base station generates the 24-bit quantity RANDU and sends it to the mobile station in the *Authentication Challenge Message* on either the Paging Channel or the Forward Traffic Channel. Upon receipt of the *Authentication Challenge Message*, the mobile station shall set the input parameters of the Auth_Signature procedure (see "Interface Specification for Common Cryptographic Algorithms," section 2.3) as illustrated in Figure 6.3.12.1.5-1. The 24 most significant bits of the RAND_CHALLENGE input parameter shall be filled with RANDU, and the 8 least significant bits of RAND_CHALLENGE shall be filled with the 8 least significant bits of MIN2.

The mobile station shall set the SAVE_REGISTERS input parameter to FALSE.

The mobile station shall then execute the Auth_Signature procedure. The 18-bit output AUTH_SIGNATURE shall be used to fill the AUTHU field of the *Authentication Challenge Response Message*, which shall be sent to the base station.

The base station computes the value of AUTHU in the same manner as the mobile station, but using its internally stored value of SSD_A. The base station compares its computed value of AUTHU to the value received from the mobile station. If the comparison fails, the base station may deny further access attempts by the mobile station, drop the call in progress, or initiate the process of updating SSD (see 6.3.12.1.9).

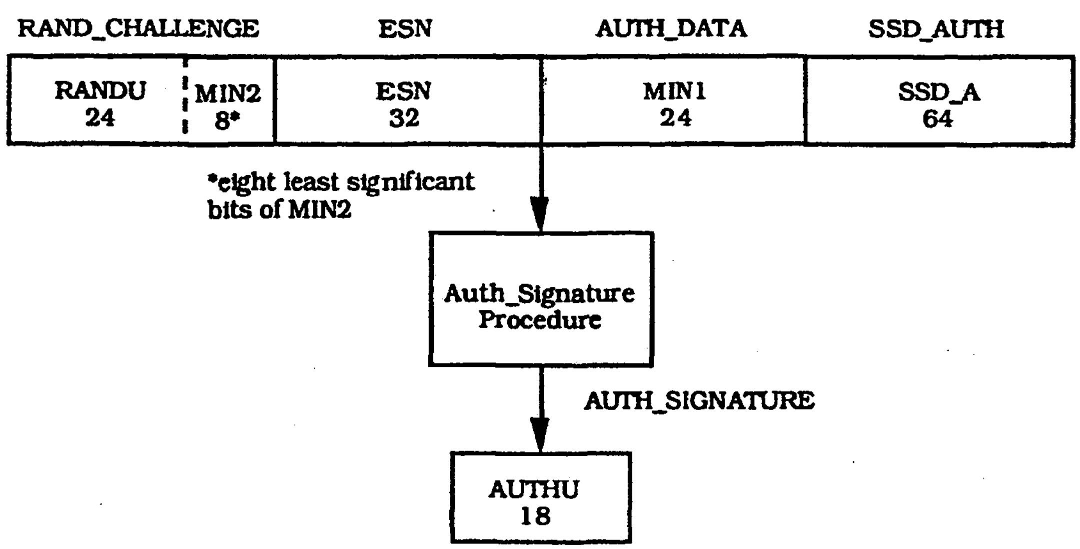

Figure 6.3.12.1.5-1. Computation of AUTHU for the Unique Challenge-Response Procedure

6.3.12.1.6 Authentication of Mobile Station Originations

When the AUTH field of the *Access Parameters Message* sent on the Paging Channel is set to '01' (standard authentication mode), and the mobile station attempts to originate a call (by sending an *Origination Message* on the Access Channel), the following authentication procedures shall be performed:

The mobile station shall set the input parameters of the Auth_Signature procedure (see "Interface Specification for Common Cryptographic Algorithms," section 2.3) as illustrated in Figure 6.3.12.1.6-1. The AUTH_DATA input parameter shall contain the last six digits contained in the CHARi fields of the *Origination Message*, encoded according to Table 6.7.1.3.2.4-4.

If fewer than six digits are included in the *Origination Message*, the most significant bits of MIN1 shall be used to replace the missing digits. The exact procedure is that MIN1 is used to initially fill the AUTH_DATA input parameter and then the last dialed digits entered by the subscriber are used to replace all or part of this initial value. If a full 6 digits are dialed, the first digit of the 6 that was dialed is used as the most significant 4 bits of AUTH_DATA, the second digit is the next less-significant 4 bits of AUTH_DATA, and so forth. If less than 6 digits are dialed, then the least significant 4 bits of AUTH_DATA are the last dialed digit, the second-last dialed digit becomes the next more-significant 4 bits of AUTH_DATA, and so on up to the first of the dialed digits.

The mobile station shall set the SAVE_REGISTERS input parameter to TRUE.

The mobile station shall then execute the Auth_Signature Procedure. The 18-bit output AUTH_SIGNATURE shall be used to fill the AUTHR field of the *Origination Message*. The RANDC (eight most significant bits of RAND) and COUNT fields of the message shall be filled with the current values stored in the mobile station.

The base station compares the received value of RANDC to the most significant eight bits of its internally stored value of RAND.

The base station may also compare the received value of COUNT with its internally stored value associated with the received MIN/ESN.

The base station computes the value of AUTHR in the same manner as the mobile station, but using its internally stored value of SSD_A. The base station compares its computed value of AUTHR to the value received from the mobile station.

If the comparisons executed at the base station are successful, the base station may initiate the appropriate channel assignment procedures. After channel assignment, the base station may issue a *Parameter Update Order* on the Forward Traffic Channel, updating the value of $COUNT_{s-p}$ in the mobile station.

If any of the comparisons fail, the base station may deny service, initiate the Unique Challenge-Response Procedure (see 6.3.12.1.5) or commence the process of updating SSD (see 6.3.12.1.9).

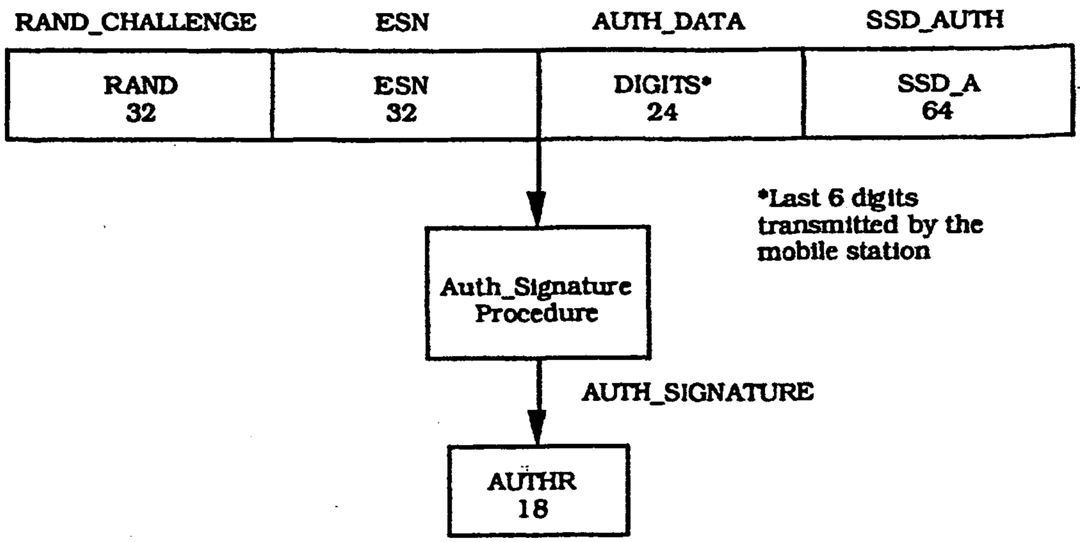

Figure 6.3.12.1.6-1. Computation of AUTHR for Authentication of Mobile Station Originations

6.3.12.1.7 Authentication of Mobile Station Terminations

When the AUTH field of the *Access Parameters Message* sent on the Paging Channel is set to '01' (standard authentication mode), and the mobile station responds to a page (by sending a *Page Response Message* on the Access Channel), the following authentication procedures shall be performed:

The mobile station shall set the input parameters of the Auth_Signature procedure (see "Interface Specification for Common Cryptographic Algorithms," section 2.3) as illustrated in Figure 6.3.12.1.7-1.

The mobile station shall set the SAVE_REGISTERS input parameter to TRUE.

The mobile station shall then execute the Auth_Signature procedure. The 18-bit output AUTH_SIGNATURE shall be used to fill the AUTHR field of the *Page Response Message*. The RANDC (eight most significant bits of RAND) and COUNT fields of the message shall be filled with the current values stored in the mobile station.

The base station compares the received value of RANDC to the eight most significant bits of its internally stored value of RAND.

The base station may also compare the received value of COUNT with its internally stored value associated with the received MIN/ESN.

The base station computes the value of AUTHR in the same manner as the mobile station, but using its internally stored value of SSD_A. The base station compares its computed value of AUTHR to the value received from the mobile station.

If the comparisons executed at the base station are successful, the base station may initiate the appropriate channel assignment procedures. After channel assignment, the base station may issue a *Parameter Update Order* on the Forward Traffic Channel, updating the value of $COUNT_{s\text{-}p}$ in the mobile station.

If any of the comparisons fail, the base station may deny service, initiate the Unique Challenge Response Procedure (see 6.3.12.1.5) or commence the process of updating SSD (see 6.3.12.1.9).

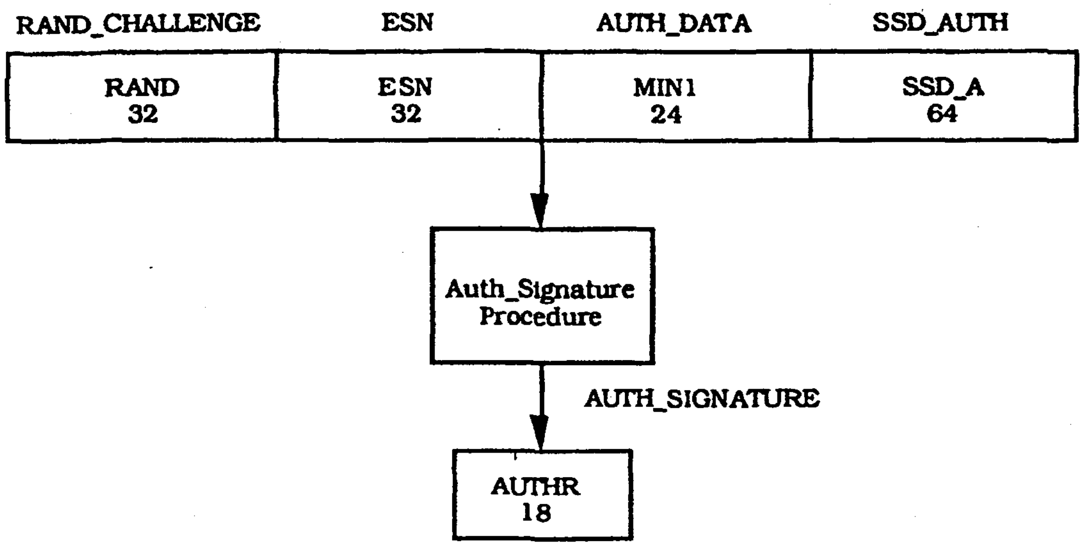

Figure 6.3.12.1.7-1. Computation of AUTHR for Authentication of Mobile Station Terminations

6.3.12.1.8 Authentication of Mobile Station Data Bursts

Reserved.

6.3.12.1.9 Updating the Shared Secret Data (SSD)

SSD is updated using the SSD_Generation procedure (see "Interface Specification for Common Cryptographic Algorithms," section 2.2.1), initialized with mobile station specific information, random data and the mobile station's A-key. The A-key is 64 bits long. It is assigned to the mobile station and is stored in the mobile station's permanent security and identification memory. The A-key is known only to the mobile station and to its associated Home Location Register/Authentication Center (HLR/AC) (see EIA/TIA/IS-41). See TSB 50 "User Interface for Authentication Key Entry," for details of A-key entry into the mobile station.

The SSD update procedure is performed as follows (see Figure 6.3.12.1.9-1):

The base station sends an *SSD Update Message* on either the Paging Channel or the Forward Traffic Channel. The RANDSSD field of the *SSD Update Message* contains the same value used for the HLR/AC computation of SSD.

Upon receipt of the *SSD Update Message* the mobile station shall set the input parameters of the SSD_Generation procedure (see "Interface Specification for Common Cryptographic Algorithms," section 2.2.1) as illustrated in Figure 6.3.12.1.9-2. The mobile station shall then execute the SSD_Generation procedure. The mobile station shall set SSD_A_NEW and SSD_B_NEW to the outputs of the SSD_Generation procedure.

The mobile station shall then select a 32-bit random number, RANDBS, and shall send it to the base station in a *Base Station Challenge Order* on the Access Channel or Reverse Traffic Channel.

Both the mobile station and the base station shall then set the input parameters of the Auth_Signature procedure (see "Interface Specification for Common Cryptographic Algorithms," section 2.3) as illustrated in Figure 6.3.12.1.9-3 and shall execute the Auth_Signature procedure.

The mobile station and base station shall set the SAVE_REGISTERS input parameter to FALSE.

The mobile station and base station shall execute the Auth_Signature procedure. AUTHBS is set to the 18-bit result AUTH_SIGNATURE. The base station sends its computed value of AUTHBS to the mobile station in a *Base Station Challenge Confirmation Order* on the Paging Channel or the Forward Traffic Channel.

Upon receipt of the *Base Station Challenge Confirmation Order* the mobile station shall compare the received value of AUTHBS to its internally computed value. (If the mobile station receives a *Base Station Challenge Confirmation Order* without having previously received an *SSD Update Message*, the mobile station shall respond with an *SSD Update Rejection Order*.)

If the comparison is successful, the mobile station shall execute the SSD_Update procedure (see "Interface Specification for Common Cryptographic Algorithms," section 2.2.2) to set SSD_A and SSD_B to SSD_A_NEW and SSD_B_NEW, respectively. The mobile station shall then send an *SSD Update Confirmation Order* to the base station, indicating successful completion of the SSD update.

If the comparison is not successful, the mobile station shall discard SSD_A_NEW and SSD_B_NEW. The mobile station shall then send an *SSD Update Rejection Order* to the base station, indicating unsuccessful completion of the SSD update.

Upon receipt of the *SSD Update Confirmation Order*, the base station sets SSD_A and SSD_B to the values received from the HLR/AC (see EIA/TIA/IS-41).

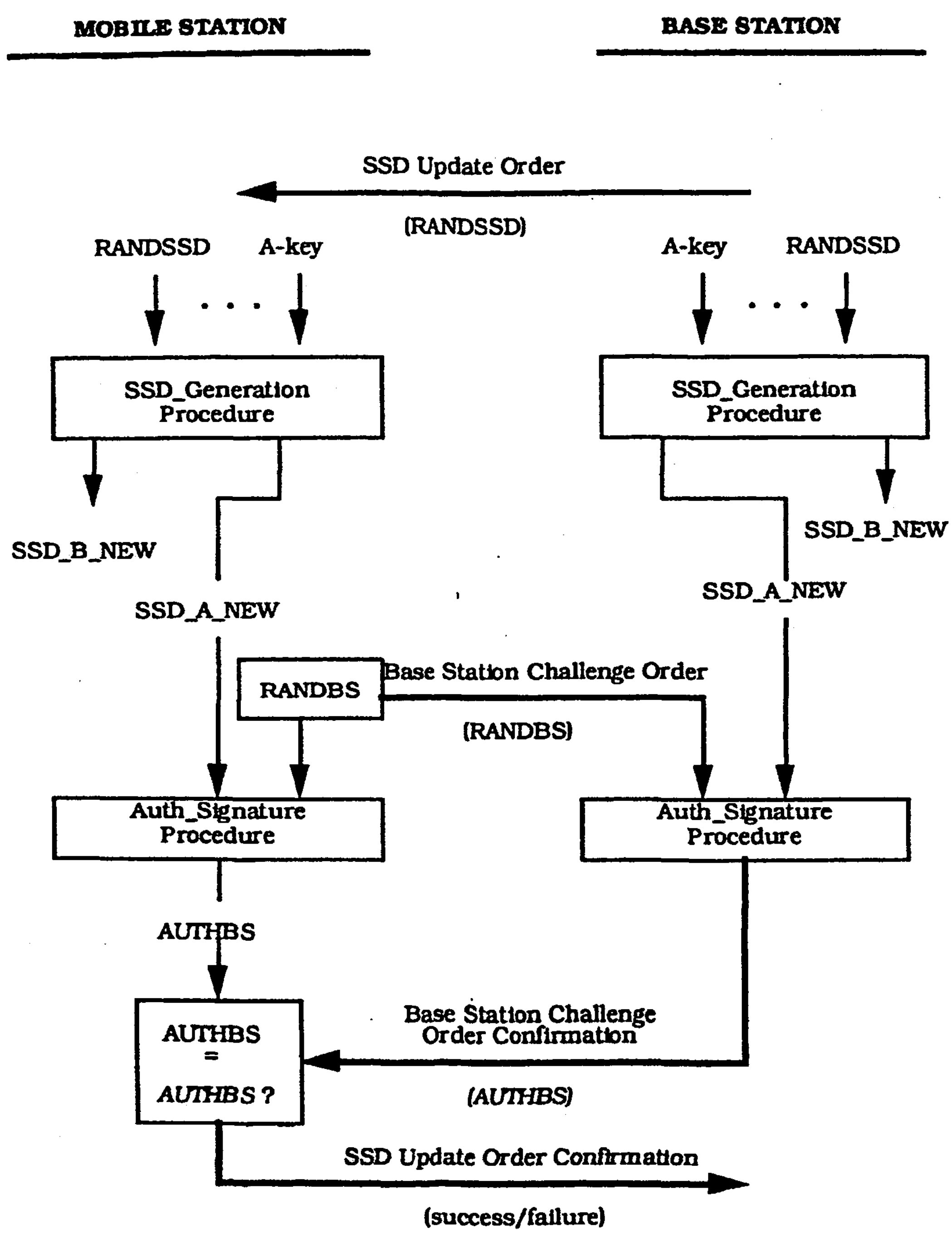

Figure 6.3.12.1.9-1. SSD Update Message Flow

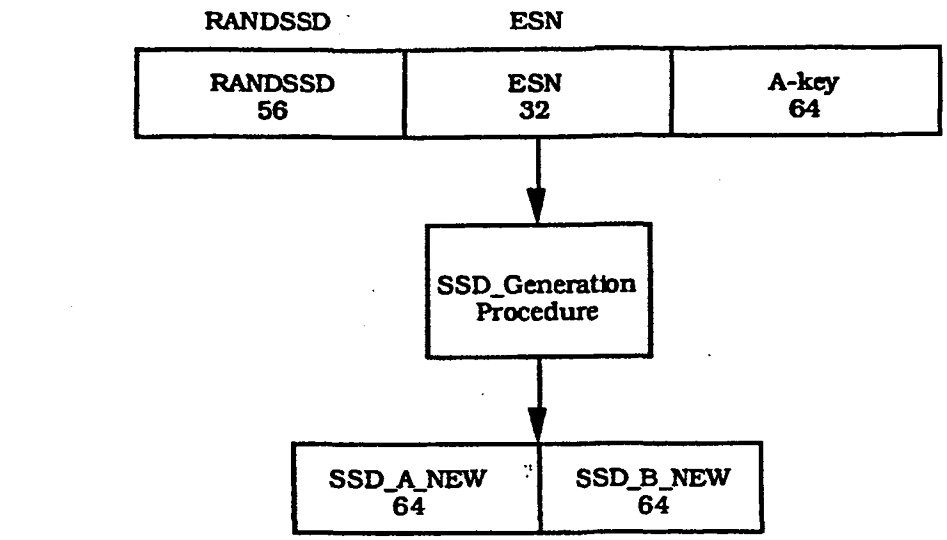

Figure 6.3.12.1.9-2. Computation of Shared Secret Data (SSD)

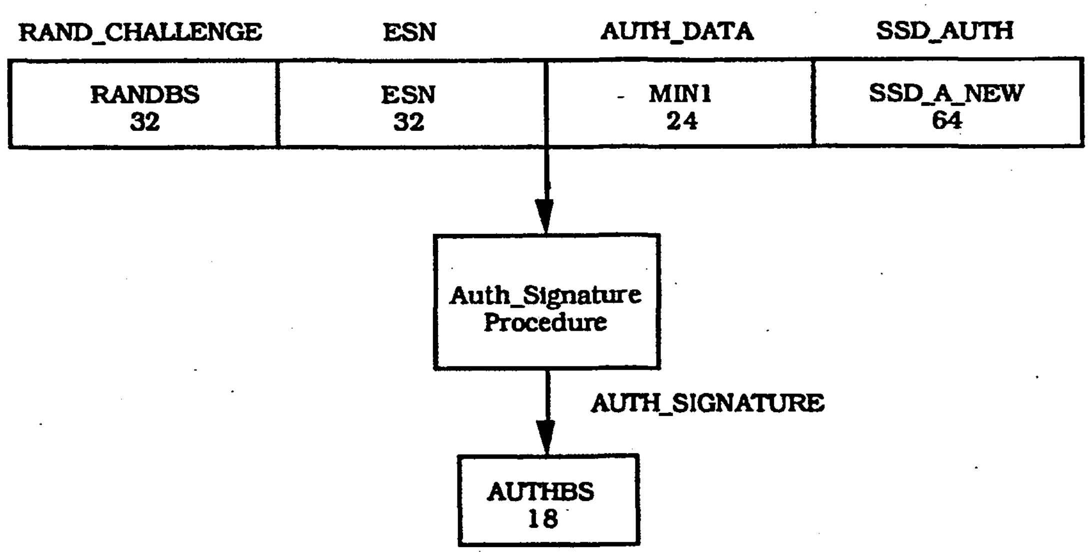

Figure 6.3.12.1.9-3. Computation of AUTHBS

6.3.12.2 Signaling Message Encryption

In an effort to enhance the authentication process and to protect sensitive subscriber information (such as PINs), a method is provided to encrypt certain fields of selected Traffic Channel signaling messages. See Appendix A for the list of messages and fields to be encrypted.

The message encryption algorithm is described in "Common Cryptographic Algorithms." The availability of encryption algorithm information is governed under the U. S. International Traffic and Arms Regulation (ITAR) and the Export Administration Regulations. TIA acts as the focal point and facilitator for making such information available.

Messages shall not be encrypted if authentication is not performed (AUTH field equal to '00' in the *Access Parameters Message*). See "Interface Specification for Common Cryptographic Algorithms" for details of the initialization and use of the encryption procedure.

Signaling message encryption is controlled for each call individually. The initial encryption mode for the call is established by the value of the ENCRYPT_MODE field in the *Channel Assignment Message*. If ENCRYPT_MODE is set to '00', message encryption is off. To turn encryption on after channel assignment, the base station sends one of the following Forward Traffic channel messages to the mobile station:

- *Handoff Direction Message* with the ENCRYPT_MODE field set to '01'
- *Analog Handoff Direction Message* with the MEM field set to '1'
- *Message Encryption Mode Order* with the ENCRYPT_MODE field set to '01'

To turn signaling message encryption off, the base station sends one of the following Forward Traffic Channel messages to the mobile station

- *Handoff Direction Message* with the ENCRYPT_MODE field set to '00'.
- *Analog Handoff Direction Message* with the MEM field set to '0'.
- *Message Encryption Mode Order* with the ENCRYPT_MODE field set to '00'.

Every Reverse Traffic Channel message contains an ENCRYPTION field which identifies the message encryption mode active at the time the message was created (see 6.7.2.3.1.2).

6.3.12.3 Voice Privacy

Voice privacy is provided in the CDMA system by means of the private long code mask used for PN spreading (see 6.1.3.1.8).

The generation and application of the private long code mask is specified in Appendix A.

Voice privacy is provided on the Traffic Channels only. All calls are initiated using the public long code mask for PN spreading (see 6.1.3.1.8). The mobile station user may request voice privacy during call setup using the *Origination Message* or *Page Response Message*, and during Traffic Channel operation using the *Long Code Transition Request Order*.

The transition to private long code mask shall not be performed if authentication is not performed (AUTH field set to '00' in the *Access Parameters Message* or mobile station unable to perform authentication).

To initiate a transition to the private or public long code mask, either the base station or the mobile station sends a *Long Code Transition Request Order* on the Traffic Channel. The mobile station actions in response to receipt of this order are specified in 6.6.4, and the base station actions in response to receipt of this order are specified in 7.6.4.

The base station can also cause a transition to the private or public long code mask by sending the *Handoff Direction Message* with the PRIVATE_LCM bit set appropriately.

6.3.13 Lock and Maintenance Required Orders

The mobile station shall have memory to store the lock reason code ($LCKRSN\_P_{s-p}$) received in the *Lock Until Power-Cycled Order*. The data retention time under power-off conditions shall be at least 48 hours.

The mobile station shall have memory to store the maintenance reason code ($MAINTRSN_{s-p}$) received in the *Maintenance Required Order*. The data retention time under power-off conditions shall be at least 48 hours.

There are no requirements on the use of the lock and maintenance reason codes, and interpretation and use are implementation dependent.

6.3.14 Mobile Station Revision Identification

The mobile station shall provide memory to store the following parameters sent in the *Status Message* (*Terminal Information* information record):

- Protocol revision number ($MOB\_P\_REV_p$)
- Manufacturer's model number (MOB_MODEL_p)
- Firmware revision number ($MOB\_FIRM\_REV_p$)

6.4 Supervision

This section details the supervision mechanisms in CDMA. The time and numerical constant values (e.g., T_{30m} and N_{2m}) are given in Appendix D.

6.4.1 Pilot Channel

The mobile station shall monitor the Pilot Channel at all times except when not receiving in the slotted mode. The mobile station shall measure the strength of the Pilot Channel as specified in 6.6.6.2.2.

6.4.2 Sync Channel

The mobile station shall check the CRC of all received Sync Channel messages (see 7.7.1.2.2). The mobile station shall consider any message with a CRC that checks to be valid. The mobile station shall ignore any message which is not valid.

6.4.3 Paging Channel

The mobile station shall check the CRC of all received Paging Channel messages (see 7.7.2.2.2). The mobile station shall consider any message with a CRC that checks to be valid. The mobile station shall ignore any message which is not valid.

If the mobile station is operating in the non-slotted mode in the *Mobile Station Idle State*, it shall monitor the Paging Channel at all times. The mobile station shall reset a timer for T_{30m} seconds whenever a valid message is received on the Paging Channel, whether addressed to the mobile station or not. If the timer expires, the mobile station shall declare a loss of the Paging Channel.

If the mobile station is operating in the slotted mode in the *Mobile Station Idle State*, the mobile station shall set a timer for T_{30m} seconds at the start of each of its assigned slots. If the timer expires before the mobile station receives a valid message, whether addressed to the mobile station or not, the mobile station shall declare a loss of the Paging Channel.

When in the *System Access State*, the mobile station shall monitor the Paging Channel at all times. The mobile station shall reset a timer for T_{40m} seconds whenever a valid message is received on the Paging Channel, whether addressed to the mobile station or not. If the timer expires, the mobile station shall declare a loss of the Paging Channel.

6.4.4 Forward Traffic Channel

The mobile station shall check the CRC of all received Forward Traffic messages (see 7.7.3.2.2). The mobile station shall consider any message with a CRC that checks to be valid. The mobile station shall ignore any message which is not valid.

When in the *Mobile Station Control on the Traffic Channel State*, the mobile station shall monitor the Forward Traffic Channel at all times. If the mobile station receives N_{2m} consecutive bad frames on the Forward Traffic Channel (see 6.2.2.2), it shall disable its transmitter. Thereafter, if the mobile station receives N_{3m} consecutive good frames, the mobile station should re-enable its transmitter.

The mobile station shall establish a Forward Traffic Channel fade timer. The timer shall be enabled when the mobile station first enables its transmitter when in the *Traffic Channel Initialization Substate* of the *Mobile Station Control on the Traffic Channel State*. The fade timer shall be reset for T_{5m} seconds whenever N_{3m} consecutive good frames are received on the Forward Traffic Channel. If the timer expires, the mobile station shall disable its transmitter and declare a loss of the Forward Traffic Channel. The mobile station also resets this timer when it re-enables its transmitter when performing a CDMA to CDMA hard handoff (see 6.6.6.2.8).

6.4.5 Accumulated Statistics

6.4.5.1 Accumulated Access Channel Statistics

The mobile station shall maintain the counters shown in Table 6.4.5.1-1. Each counter shall be 16 bits long. The mobile station shall initialize each counter described herein to zero upon power-on; the mobile station shall not re-initialize any counter described herein at any other time except upon command from the base station. Each counter shall be maintained modulo 2^{16}.

The mobile station shall increment the ACC_1 counter for each Access Channel request message it generates. The mobile station shall increment the ACC_2 counter for each Access Channel response messages it generates. The mobile station shall increment the ACC_i counter during the i minus one transmission of an access probe in the access attempt, for i equals three to seven. The mobile station shall increment ACC_8 if the access attempt is unsuccessful due to the transmission of MAX_REQ_SEQ or MAX_RSP_SEQ probe sequences.

Table 6.4.5.1-1. Accumulated Access Channel Statistics

Counter Identifier	Length (bits)	Description
ACC_1	16	Number of Access Channel request messages generated by layer 3
ACC_2	16	Number of Access Channel response messages generated by layer 3
ACC_3	16	Number of times that an access probe was transmitted at least twice
ACC_4	16	Number of times that an access probe was transmitted at least three times
ACC_5	16	Number of times that an access probe was transmitted at least four times
ACC_6	16	Number of times that an access probe was transmitted at least five times
ACC_7	16	Number of times that an access probe was transmitted at least six times
ACC_8	16	Number of unsuccessful access attempts

6.4.5.2 Accumulated Reverse Traffic Channel Statistics

The mobile station shall maintain the counters shown in Table 6.4.5.2-1 when supporting Multiplex Option 1. Each used counter shall be 24 bits long. The mobile station shall initialize each used counter described herein to zero upon power-on; the mobile station shall not re-initialize any counter described herein at any other time except upon command from the base station. Each used counter shall be maintained modulo 2^{24}.

Each time a Multiplex Option 1 Reverse Traffic Channel frame is transmitted, the mobile station shall increment the counter corresponding to the type of frame.

Table 6.4.5.2-1. Accumulated Reverse Traffic Channel Statistics

Counter Identifier	Length (bits)	Type of Frame
MUX1_REV_1	24	9600 bps frame, primary traffic only
MUX1_REV_2	24	9600 bps frame, dim-and-burst with Rate 1/2 primary and signaling traffic
MUX1_REV_3	24	9600 bps frame, dim-and-burst with Rate 1/4 primary and signaling traffic
MUX1_REV_4	24	9600 bps frame, dim-and-burst with Rate 1/8 primary and signaling traffic
MUX1_REV_5	24	9600 bps frame, blank-and-burst with signaling traffic only
MUX1_REV_6	24	4800 bps frame, primary traffic only
MUX1_REV_7	24	2400 bps frame, primary traffic only
MUX1_REV_8	24	1200 bps frame, primary traffic or null Traffic Channel data only
MUX1_REV_9	0	Reserved
MUX1_REV_10	0	Reserved
MUX1_REV_11	24	9600 bps frame, dim-and-burst with Rate 1/2 primary and secondary traffic
MUX1_REV_12	24	9600 bps frame, dim-and-burst with Rate 1/4 primary and secondary traffic
MUX1_REV_13	24	9600 bps frame, dim-and-burst with Rate 1/8 primary and secondary traffic
MUX1_REV_14	24	9600 bps frame, blank-and-burst with secondary traffic only

6.4.5.3 Accumulated Paging Channel Statistics

The mobile station shall maintain the counters shown in Table 6.4.5.3-1. The counters shall have the length as specified in Table 6.4.5.3-1. The mobile station shall initialize each counter described herein to zero upon power-on; the mobile station shall not re-initialize any counter described herein at any other time except upon command from the base station. Each counter shall be maintained modulo 2^{Length}, where Length is specified in Table 6.4.5.3-1.

The mobile station shall increment the counter PAG_1 for each Paging Channel message CRC that it tests. The mobile station shall increment the counter PAG_2 for each invalid Paging Channel message. The mobile station shall increment the counter PAG_3 for each record or message that it receives addressed to the mobile station. The PAG_3 counter shall not be incremented for messages detected as duplicates or for acknowledgements.[10] The mobile station shall increment the counter PAG_4 for each Paging Channel half frame (see 7.7.2.1.2) that it receives. The mobile station shall increment the counter PAG_5 for each Paging Channel half frame that contains any part of a valid message. The mobile station shall increment the counter PAG_6 each time that it declares a loss of the Paging Channel (see 6.4.3). The mobile station shall increment the counter PAG_7 for each idle handoff it performs.

Table 6.4.5.3-1. Accumulated Paging Channel Statistics

Counter Identifier	Length (bits)	Description
PAG_1	24	Number of Paging Channel messages the mobile station attempted to receive
PAG_2	24	Number of Paging Channel messages the mobile station received that CRC does not check
PAG_3	16	Number of Paging Channel messages or records the mobile station received that were addressed to it
PAG_4	24	Number of Paging Channel half frames received by the mobile station
PAG_5	24	Number of Paging Channel half frames that contain any part of a message with a CRC that checks
PAG_6	16	Number of times that the mobile station declared a loss of the Paging Channel
PAG_7	16	Number of mobile station idle handoffs

6.4.5.4 Accumulated Forward Traffic Channel Statistics

The mobile station shall maintain the counters shown in Table 6.4.5.4-1 when supporting Multiplex Option 1. Each counter shall be 24 bits long. The mobile station shall initialize each counter described herein to zero upon power-on; the mobile station shall not re-initialize any counter described herein at any other time except upon command from the base station. Each counter shall be maintained modulo 2^{24}.

Each time a mobile station categorizes a received Multiplex Option 1 Forward Traffic Channel frame (see 6.2.2.2), the mobile station shall increment the counter corresponding to the type of frame. The accumulation shall start when the mobile station enables its transmitter while in the *Traffic Channel Initialization Substate* of the *Mobile Station Control*

[10] PAG_3 counts those messages processed by layer 3.

on the Traffic Channel State (see 6.6.4.2). The accumulation shall stop when the mobile station exits the *Mobile Station Control on the Traffic Channel State*.

Table 6.4.5.4-1. Accumulated Forward Traffic Channel Statistics

Counter Identifier	Length (bits)	Type of Frame
MUX1_FOR_1	24	9600 bps frame, primary traffic only
MUX1_FOR_2	24	9600 bps frame, dim-and-burst with Rate 1/2 primary and signaling traffic
MUX1_FOR_3	24	9600 bps frame, dim-and-burst with Rate 1/4 primary and signaling traffic
MUX1_FOR_4	24	9600 bps frame, dim-and-burst with Rate 1/8 primary and signaling traffic
MUX1_FOR_5	24	9600 bps frame, blank-and-burst with signaling traffic only
MUX1_FOR_6	24	4800 bps frame, primary traffic only
MUX1_FOR_7	24	2400 bps frame, primary traffic only
MUX1_FOR_8	24	1200 bps frame, primary traffic or null Traffic Channel data only
MUX1_FOR_9	24	9600 bps frame with bit errors
MUX1_FOR_10	24	Frame quality insufficient to decide upon rate
MUX1_FOR_11	24	9600 bps frame, dim-and-burst with Rate 1/2 primary and secondary traffic
MUX1_FOR_12	24	9600 bps frame, dim-and-burst with Rate 1/4 primary and secondary traffic
MUX1_FOR_13	24	9600 bps frame, dim-and-burst with Rate 1/8 primary and secondary traffic
MUX1_FOR_14	24	9600 bps frame, blank-and-burst with secondary traffic only

6.4.5.5 Accumulated Layer Two Statistics

The mobile station shall maintain the counters shown in Table 6.4.5.5-1. Each counter shall be 16 bits long. The mobile station shall initialize each counter described herein to zero upon power-on; the mobile station shall not re-initialize any counter described herein at any other time except upon command from the base station. Each counter shall be maintained modulo 2^{16}.

When the mobile station transmits a Reverse Traffic Channel message requiring an acknowledgement for the ith time, for i equals one to three it shall increment the counter LAYER2_RTCi.

The mobile station shall increment the counter LAYER2_RTC4 each time it aborts using the Traffic Channel because the timeout expired after the N_{1m} transmission of a message requiring an acknowledgement.

The mobile station shall increment the counter LAYER2_RTC5 for each transmission of a message not requiring an acknowledgement on the Reverse Traffic Channel. This count shall include all transmissions, including those that were repeated multiple times or those carrying an identical layer 3 content.

Table 6.4.5.5-1. Accumulated Layer 2 Statistics

Counter Identifier	Length (bits)	Description
LAYER2_RTC1	16	Number of messages requiring acknowledgement that were transmitted at least once on the Reverse Traffic Channel
LAYER2_RTC2	16	Number of messages requiring acknowledgement that were transmitted at least twice on the Reverse Traffic Channel
LAYER2_RTC3	16	Number of messages requiring acknowledgement that were transmitted at least three times on the Reverse Traffic Channel
LAYER2_RTC4	16	Number of times that the mobile station aborted a call as a result of the timeout expiring after the N_{1m} transmission of a message requiring acknowledgement
LAYER2_RTC5	16	Number of times a message not requiring an acknowledgement was sent on the Reverse Traffic Channel

6.4.5.6 Other Monitored Quantities and Statistics

The mobile station shall store the value described in Table 6.4.5.6-1.

Table 6.4.5.6-1. Other Monitored Quantities and Statistics

Quantity Identifier	Length (bits)	Description
OTHER_SYS_TIME	36	The SYS_TIME field from the most recently received *Sync Channel Message*

6.5 Malfunction Detection

To ensure that a mobile station transmits a spread spectrum signal which does not adversely affect system capacity, the mobile station shall respond to the *Lock Until Power-Cycled Order* and *Maintenance Required Order* from the base station as specified in 6.6.2.4, 6.6.3.2 through 6.6.3.7, and 6.6.4.3 through 6.6.4.5. It is the responsibility of the base station to detect a mobile station transmission malfunction and to send the appropriate message.

6.5.1 Malfunction Timer

The mobile station shall have a malfunction timer which meets the requirements of 2.5.1.

6.6 Call Processing

This section describes mobile station call processing. It contains frequent references to the messages that flow between the mobile station and base station. While reading this section, it may be helpful to refer to the message formats (see 6.7 and 7.7), and to the message flow examples (see Appendix B).

The mobile station may ignore fields at the end of messages which do not exist in the protocol revision supported by the mobile station.

The values for the time and numerical constants used in this section (e.g., T_{20m}, N_{4m}) are specified in Appendix D.

As illustrated in Figure 6.6-1, mobile station call processing consists of the following states:

- *Mobile Station Initialization State* - In this state, the mobile station selects and acquires a system.
- *Mobile Station Idle State* - In this state, the mobile station monitors messages on the Paging Channel.
- *System Access State* - In this state, the mobile station sends messages to the base station on the Access Channel.
- *Mobile Station Control on the Traffic Channel State* - In this state, the mobile station communicates with the base station using the Forward and Reverse Traffic Channels.

After power is applied to the mobile station, it shall enter the *System Determination Substate* of the *Mobile Station Initialization State* with a power-up indication.

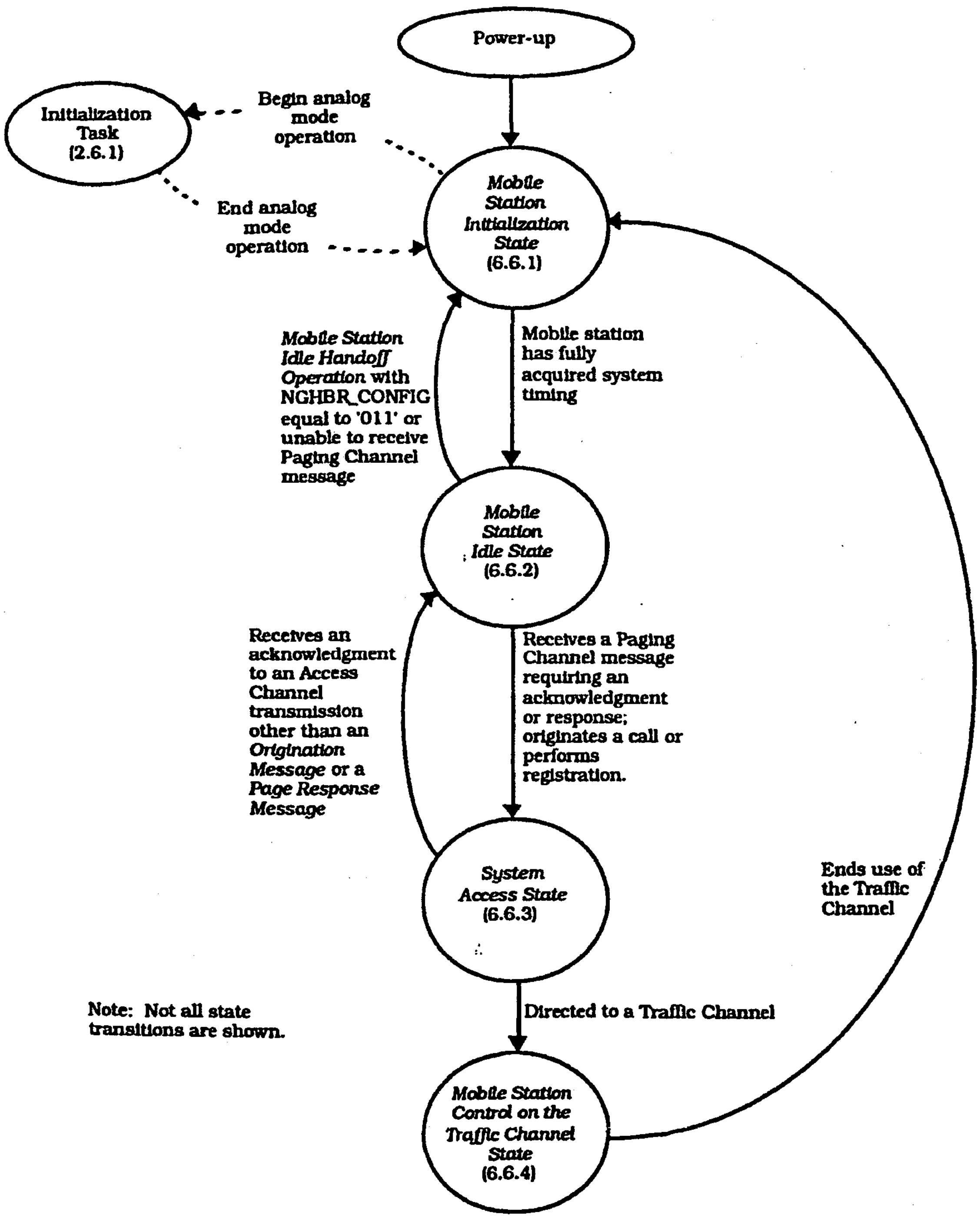

Figure 6.6-1. Mobile Station Call Processing States

6.6.1 Mobile Station Initialization State

In this state, the mobile station first selects a system to use. If the selected system is a CDMA system, the mobile station proceeds to acquire and then synchronize to the CDMA system. If the selected system is an analog system, the mobile station begins analog mode operation (see 2.6.1).

As illustrated in Figure 6.6.1-1, the *Mobile Station Initialization State* consists of the following substates:

- *System Determination Substate* - In this substate, the mobile station selects which system to use.
- *Pilot Channel Acquisition Substate* - In this substate, the mobile station acquires the Pilot Channel of a CDMA system.
- *Sync Channel Acquisition Substate* - In this substate, the mobile station obtains system configuration and timing information for a CDMA system.
- *Timing Change Substate* - In this substate, the mobile station synchronizes its timing to that of a CDMA system.

While in the *Mobile Station Initialization State*, the mobile station shall update all active registration timers as specified in 6.6.5.5.1.2.

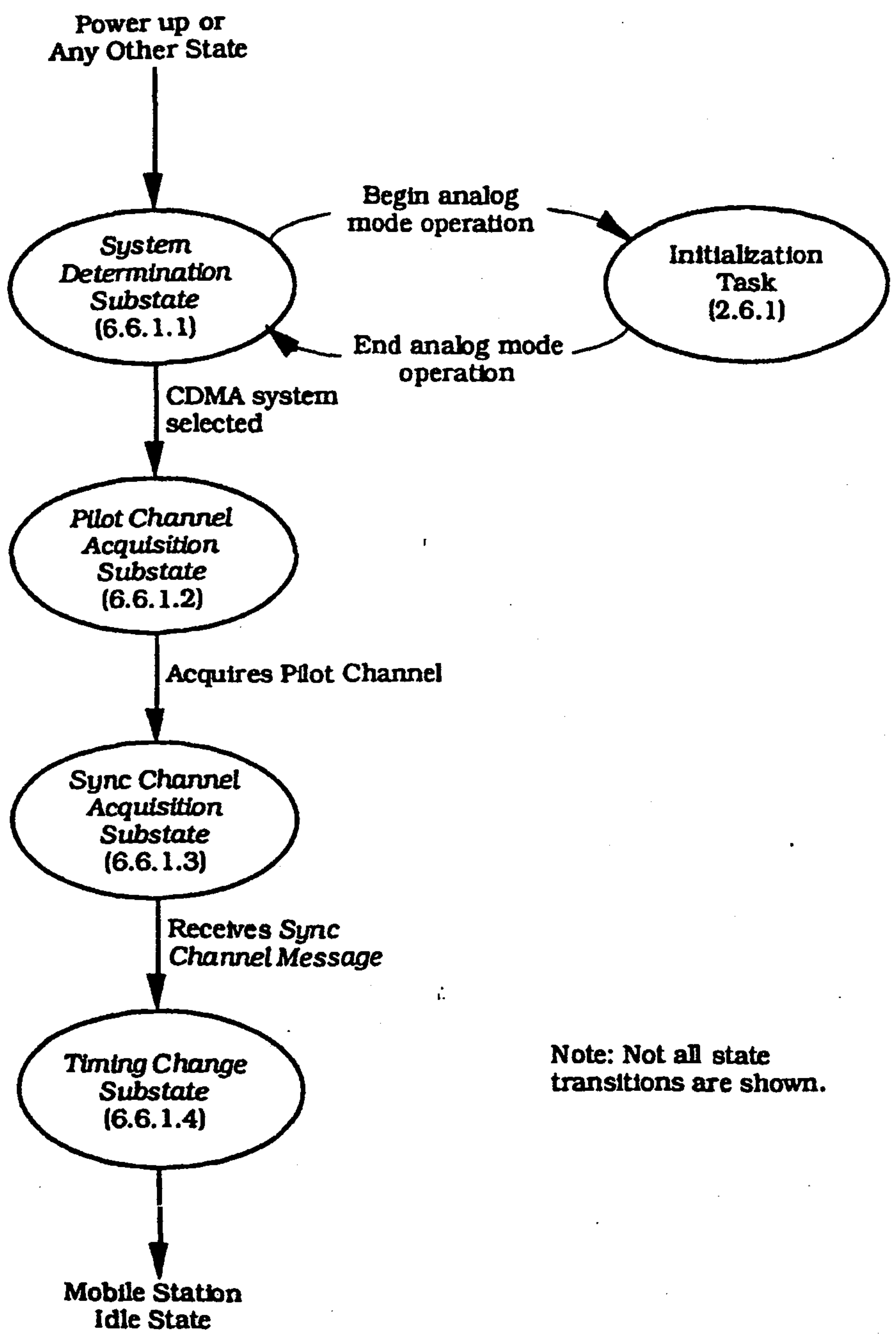

Figure 6.6.1-1. Mobile Station Initialization State

6.6.1.1 System Determination Substate

In this substate, the mobile station selects the system to use. The precise process for system selection is left to the mobile station manufacturer. It is typically influenced by a set of expressed user preferences, such as the following:

- System A (or B) only
- System A (or B) preferred
- CDMA (or analog) system only
- CDMA (or analog) system preferred

Upon entering the *System Determination Substate*, the mobile station shall initialize registration parameters as specified in 6.6.5.5.1.1. If the mobile station enters the *System Determination Substate* with a power-up indication, the mobile station shall set the First-Idle ID status to enabled (see 2.6.3.11), and the $RAND_S$ variable to 0 (see 2.3.12.1.2).

In the *System Determination Substate*, the mobile station shall perform the following:

- The mobile station shall determine which system to use.
- If the mobile station is to use System A, it shall set $SERVSYS_S$ to SYS_A. If the mobile station is to use System B, it shall set $SERVSYS_S$ to SYS_B.
- If the mobile station is to use an analog system, it shall enter the Initialization Task (see 2.6.1).
- If the mobile station is to use a CDMA system, it shall set $CDMACH_S$ either to the Primary or Secondary CDMA Channel number (see 7.1.1.1) for the selected serving system ($SERVSYS_S$). The mobile station shall enter the *Pilot Channel Acquisition Substate*.
- If the mobile station fails to acquire a CDMA system on the first CDMA Channel it tries, the mobile station should attempt to acquire on the alternate CDMA Channel (Primary or Secondary) before performing the system selection process again.

6.6.1.2 Pilot Channel Acquisition Substate

In this substate, the mobile station acquires the Pilot Channel of the selected CDMA system.

Upon entering the *Pilot Channel Acquisition Substate*, the mobile station shall tune to the CDMA Channel number equal to $CDMACH_S$, shall set its code channel for the Pilot Channel (see 7.1.3.1.8), and shall search for the Pilot Channel. If the mobile station acquires the Pilot Channel within T_{20m} seconds, the mobile station shall enter the *Sync Channel Acquisition Substate*.

If the mobile station does not acquire the Pilot Channel within T_{20m} seconds, the mobile station shall enter the *System Determination Substate*.

6.6.1.3 Sync Channel Acquisition Substate

In this substate, the mobile station receives and processes the *Sync Channel Message* to obtain system configuration and timing information.

Upon entering the *Sync Channel Acquisition Substate*, the mobile station shall set its code channel for the Sync Channel (see 7.1.3.1.8).

If the mobile station does not receive a valid *Sync Channel Message* (see 6.4.2) within T_{21m} seconds, the mobile station shall enter the *System Determination Substate*.

If the mobile station receives a valid *Sync Channel Message* within T_{21m} seconds but the protocol revision level supported by mobile station (MOB_P_REV$_p$) is less than the minimum protocol revision level supported by the base station (MIN_P_REV$_r$), the mobile station shall enter the *System Determination Substate*.

If the mobile station receives a valid *Sync Channel Message* within T_{21m} seconds and the protocol revision level supported by the mobile station (MOB_P_REV$_p$) is greater than or equal to the minimum protocol revision level supported by the base station (MIN_P_REV$_r$), the mobile station shall store the following information from the message:

- Protocol revision level (P_REV$_s$ = P_REV$_r$)
- Minimum protocol revision level (MIN_P_REV$_s$ = MIN_P_REV$_r$)
- System identification (SID$_s$ = SID$_r$)
- Network identification (NID$_s$ = NID$_r$)
- Pilot PN sequence offset (PILOT_PN$_s$ = PILOT_PN$_r$)
- Long code state (LC_STATE$_s$ = LC_STATE$_r$)
- System Time (SYS_TIME$_s$ = SYS_TIME$_r$)
- Paging Channel data rate (PRAT$_s$ = PRAT$_r$)

The mobile station may store the following information from the message:

- Number of leap seconds that have occurred since the start of System Time (LP_SEC$_s$ = LP_SEC$_r$)
- Offset of local time from System Time (LTM_OFF$_s$ = LTM_OFF$_r$)
- Daylight savings time indicator (DAYLT$_s$ = DAYLT$_r$)

The mobile station shall enter the *Timing Change Substate*.

6.6.1.4 Timing Change Substate

Figure 6.6.1.4-1 illustrates the mobile station timing changes that occur in this substate. The mobile station synchronizes its long code timing and system timing to those of the CDMA system, using the PILOT_PN$_s$, LC_STATE$_s$, and SYS_TIME$_s$ values obtained from the received *Sync Channel Message*. SYS_TIME$_s$ is equal to the System Time (see 1.2) corresponding to 320 ms past the end of the last 80 ms superframe (see Figure 7.1.3.2.1-1) of the received *Sync Channel Message* minus the pilot PN sequence offset. LC_STATE$_s$ is equal to the system long code state (see 6.1.3.1.8) corresponding to SYS_TIME$_s$.

In the *Timing Change Substate*, the mobile station shall synchronize its long code timing to the CDMA system long code timing derived from LC_STATE_S, and synchronize its system timing to the CDMA system timing derived from SYS_TIME_S.

The mobile station shall:

- Set $PAGECH_S$ to the Primary Paging Channel (see 7.1.3.4);
- Set $PAGE\_CHAN_S$ to '1';
- Set the stored message sequence numbers $CONFIG\_MSG\_SEQ_S$, $SYS\_PAR\_MSG\_SEQ_S$, $ACC\_MSG\_SEQ_S$, $NGHBR\_LST\_MSG\_SEQ_S$, and $CHAN\_LST\_MSG\_SEQ_S$ variables to NULL (see 6.6.2.2); and
- Perform registration initialization as specified in 6.6.5.5.1.3.

The mobile station shall enter the Mobile Station Idle State.

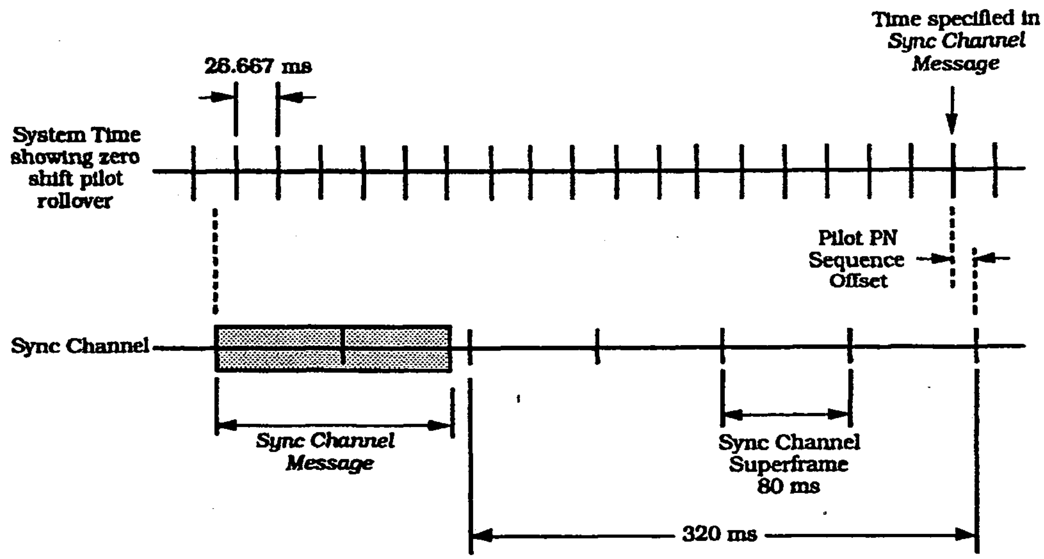

Figure 6.6.1.4-1. Mobile Station Internal Timing

6.6.2 Mobile Station Idle State

In this state, the mobile station monitors the Paging Channel. The mobile station can receive messages, receive an incoming call (mobile station terminated call), initiate a call (mobile station originated call), initiate a registration, or initiate a message transmission.

Upon entering the *Mobile Station Idle State*, the mobile station shall set its code channel to $PAGECH_S$, set the Paging Channel data rate as determined by $PRAT_S$ and shall perform Paging Channel supervision as specified in 6.4.3.

At any time, the mobile station may exit the *Mobile Station Idle State* and enter the *System Determination Substate* of the *Mobile Station Initialization State*.

While in the *Mobile Station Idle State*, the mobile station shall perform the following procedures:

- The mobile station shall perform Paging Channel monitoring procedures as specified in 6.6.2.1.1.
- The mobile station shall perform message acknowledgement procedures as specified in 6.6.2.1.2.
- The mobile station shall perform registration procedures as specified in 6.6.2.1.3.
- The mobile station shall perform idle handoff procedures as specified in 6.6.2.1.4.
- The mobile station shall perform the *Response to Overhead Information Operation* as specified in 6.6.2.2 whenever the mobile station receives a system overhead message (*System Parameters Message*, *CDMA Channel List Message*, *Neighbor List Message*, or *Access Parameters Message*).
- The mobile station shall perform the *Mobile Station Page Match Operation* as specified in 6.6.2.3 whenever it receives a *Page Message* or *Slotted Page Message*.
- The mobile station shall perform the *Mobile Station Order and Message Processing Operation* as specified in 6.6.2.4 whenever a message or order directed to the mobile station is received other than a *Page Message* or *Slotted Page Message*.
- The mobile station shall perform the *Mobile Station Origination Operation* as specified in 6.6.2.5 if directed by the user to initiate a call.
- If the mobile station supports message transmission, it shall perform the *Mobile Station Message Transmission Operation* as specified in 6.6.2.6 if directed by the user to transmit a message.
- The mobile station shall perform the *Mobile Station Power-Down Operation* as specified in 6.6.2.7 if directed by the user to power down.

6.6.2.1 Idle Procedures

6.6.2.1.1 Paging Channel Monitoring Procedures

6.6.2.1.1.1 General Overview

The Paging Channel is divided into 80 ms slots called Paging Channel slots. Paging and control messages for a mobile station operating in the non-slotted mode can be received in any of the Paging Channel slots. Therefore, the non-slotted mode of operation requires the mobile station to monitor all slots.

The Paging Channel protocol also provides for scheduling the transmission of messages for a specific mobile station in certain assigned slots. Support of this feature is optional and may be enabled by each mobile station. A mobile station that monitors the Paging Channel only during certain assigned slots is referred to as operating in the slotted mode. During the slots in which the Paging Channel is not being monitored, the mobile station can stop or reduce its processing for power conservation. A mobile station may not operate in the slotted mode in any state except the *Mobile Station Idle State*.

A mobile station operating in the slotted mode generally monitors the Paging Channel for one or two slots per slot cycle. The mobile station can specify its preferred slot cycle using the SLOT_CYCLE_INDEX field in the *Registration Message*, *Origination Message*, or *Page Response Message*. The mobile station can also specify its preferred slot cycle using the SLOT_CYCLE_INDEX field of the *Terminal Information* record of the *Status Message* when in the *Mobile Station Control on the Traffic Channel State*. The length of the slot cycle, T, in units of 1.28 seconds,[11] is given by

$$T = 2^i,$$

where i is the selected slot cycle index (see 6.6.2.1.1.3).

There are $16 \times T$ slots in a slot cycle.

SLOT_NUM is the Paging Channel slot number, modulo the maximum length slot cycle (2048 slots). That is, the value of SLOT_NUM is

$$\text{SLOT\_NUM} = \lfloor t/4 \rfloor \bmod 2048,$$

where t is the System Time in frames. For each mobile station, the starting times of its slot cycles are offset from the slot in which SLOT_NUM equals zero by a fixed, randomly selected number of slots as specified in 6.6.2.1.1.3.

Figure 6.6.2.1.1.1-1 shows an example for a slot cycle length of 1.28 seconds, in which the computed value of PGSLOT (see 6.6.2.1.1.3) is equal to 6, so that one of the mobile station's slot cycles begins when SLOT_NUM equals 6. The mobile station begins monitoring the Paging Channel at the start of the slot in which SLOT_NUM equals 6. The next slot in which the mobile station must begin monitoring the Paging Channel is 16 slots later, i.e., the slot in which SLOT_NUM is 22.

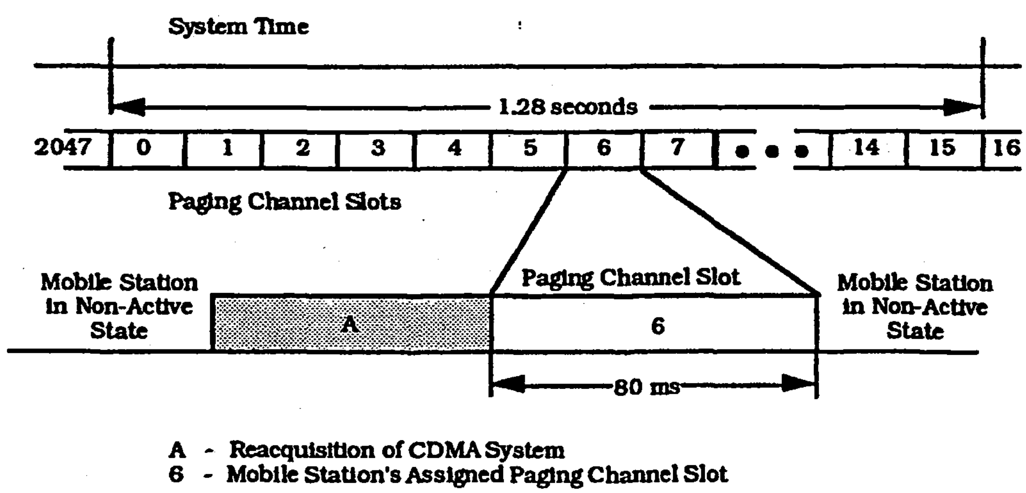

Figure 6.6.2.1.1.1-1. Mobile Station Idle Slotted Mode Structure Example (see text)

[11]The minimum length slot cycle consists of 16 slots of 80 ms each, hence 1.28 seconds.

Slotted Page Messages contain a field called MORE_PAGES which, when set to '0' during a mobile station's assigned slot, indicates that the remainder of the slot will contain no more messages addressed to that mobile station. This allows a mobile station operating in the slotted mode to stop monitoring the Paging Channel as soon as possible.

If no *Slotted Page Message* containing the MORE_PAGES field equal to '0' is received in the assigned slot, the mobile station continues to monitor the Paging Channel for one additional slot. This allows the base station to carry over a message begun in the assigned slot into the following slot if necessary.

6.6.2.1.1.2 Non-Slotted Mode Requirements

A mobile station operating in the non-slotted mode shall monitor the Paging Channel at all times. If the mobile station declares loss of the Paging Channel (see 6.4.3), the mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*.

When a mobile station monitors the Paging Channel in any state other than the *Mobile Station Idle State*, it shall operate in the non-slotted mode.

6.6.2.1.1.3 Slotted Mode Requirements

The mobile station shall not operate in the slotted mode unless bit 5 of the station class mark is set to '0' (see 2.3.3).

During operation in the slotted mode, the mobile station shall ensure that its stored configuration parameter values are current (see 6.6.2.2). The mobile station shall not operate in the slotted mode if its configuration parameters are not current.

If the mobile station declares a loss of the Paging Channel (see 6.4.3), the mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*.

6.6.2.1.1.3.1 Monitoring Assigned Slots

For each of its assigned slots, the mobile station shall begin monitoring the Paging Channel in time to receive the first bit of the assigned slot. The mobile station shall continue to monitor the Paging Channel until one of the following conditions is satisfied:

- The mobile station receives a *Slotted Page Message* with the MORE_PAGES field set to '0'; or
- The mobile station monitors the assigned slot and the slot following the assigned slot, and the mobile station receives at least one valid message (see 6.4.3).

To determine its assigned slots, the mobile station shall use the hash function specified in 6.6.7.1 to select a number, PGSLOT, in the range 0 to 2047 (spanning the maximum slot cycle length, which is 163.84 seconds). The mobile station's assigned slots shall be those slots in which

$$(\lfloor t/4 \rfloor - \mathrm{PGSLOT}) \bmod (16 \times T) = 0,$$

where t is the System Time in frames and T is the slot cycle length in units of 1.28 seconds given by

$$T = 2^i,$$

where i is the slot cycle index.

6.6.2.1.1.3.2 Determination of the Slot Cycle Index

If the SID and NID of the current base station (SID_s and NID_s, as stored from the *System Parameters Message*) do not match any entry of $SID\_NID\_LIST_s$, the mobile station shall use a slot cycle index no greater than the smaller of $MAX\_SLOT\_CYCLE\_INDEX_s$ and 1; otherwise, the mobile station shall use a slot cycle index no greater than $SLOT\_CYCLE\_INDEX_s$ (see 6.6.2.2.1.6).

If the mobile station is directed by the user to modify the preferred slot cycle index ($SLOT\_CYCLE\_INDEX_p$), the mobile station shall perform parameter-change registration (see 6.6.5.1.6).

6.6.2.1.2 Acknowledgement Procedures

Acknowledgement procedures facilitate the reliable exchange of messages between the base station and the mobile station. The mobile station uses the fields ACK_TYPE (acknowledgement address type), ACK_SEQ (acknowledgement sequence number), MSG_SEQ (message sequence number), ACK_REQ (acknowledgement required), and VALID_ACK (valid acknowledgement) to support this mechanism. These fields are referred to as layer 2 fields, and the acknowledgement procedures are referred to as layer 2 procedures. All other message fields and the processing thereof are referred to as pertaining to layer 3. (See Appendix C for further discussion of layering.)

Acknowledgements of messages received on the Paging Channel shall be sent on the Access Channel (see 6.6.3).

When sending a message that includes an acknowledgement, the mobile station shall set the VALID_ACK field to '1' and shall set the ACK_TYPE and ACK_SEQ fields equal to the ADDR_TYPE and MSG_SEQ fields, respectively, of the message being acknowledged. For acknowledgement of a *Page Message* or *Slotted Page Message*, the mobile station shall set the ACK_SEQ field equal to the MSG_SEQ field of the record containing the mobile station's MIN, and shall set the ACK_TYPE field to '000'.

When sending a message that does not include an acknowledgement, the mobile station shall set the VALID_ACK field to '0' and shall set the ACK_TYPE and ACK_SEQ fields equal to the ADDR_TYPE and MSG_SEQ fields, respectively, of the last message received that required acknowledgement. If no such message has been received, the mobile station shall set the ACK_TYPE field to '000' and shall set the ACK_SEQ field to '111'.

Unless otherwise specified in the requirements for processing a specific message, the mobile station shall transmit an acknowledgement in response to any message received that is addressed to the mobile station and that has the ACK_REQ field set to '1'. The mobile station shall transmit a *Page Response Message* including an acknowledgement in response to each record of a *Page Message* or *Slotted Page Message* addressed to the mobile station's

MIN.[12] If a specific message is required in response to any other message requiring acknowledgement, the acknowledgement shall be included with the response. If no specific message is required to be transmitted in response to a received message requiring acknowledgement, the mobile station shall include the acknowledgement in a *Mobile Station Acknowledgement Order* (see 6.7.3).

If no message requiring acknowledgement has been received, the mobile station shall not include an acknowledgement in any transmitted message until a message is received that requires acknowledgement. After a message including an acknowledgement has been sent, the mobile station shall not include an acknowledgement in any subsequent transmitted message until another message is received that requires acknowledgement.

The mobile station shall detect duplicate received messages by the following rules.

The mobile station shall consider two messages (or order records) containing the mobile station's address in the ADDRESS field (all directed messages except *Page Messages* and *Slotted Page Messages*) to be duplicates if all of the following are true:

- The messages (records) were received on the same Paging Channel; and
- The messages (records) contain the same values in both the MSG_SEQ and ACK_REQ fields;[13] and
- The messages (records) were received within T_{4m} seconds (see Appendix D) of each other (see Figure 6.6.2.1.2-1); and
- The messages (records) contain identical ADDR_TYPE and ADDRESS fields.

The mobile station shall consider two page records (as contained in *Page Messages* and *Slotted Page Messages*) to be duplicates if all of the following are true:

- The records were received on the same Paging Channel; and
- The records contain the same values in the MSG_SEQ field; and
- The records were received in messages received within T_{4m} seconds of each other (see Figure 6.6.2.1.2-1), or in the same message; and
- Both records are addressed to the same MIN.

The mobile station shall discard, without further processing, any message or page record that is a duplicate of one previously received.

Paging Channels shall be considered different if any of the following is true:

- The Paging Channels are transmitted by different base stations, or
- The Paging Channels are transmitted on different code channels (see 7.1.3.1.8), or
- The Paging Channels are transmitted on different CDMA Channels (see 7.1.1.1).

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[12]These messages do not have an ACK_REQ field.

[13]Separate sequence numbers are used for messages requiring acknowledgement and messages not requiring acknowledgement on the Paging Channel.

The mobile station shall consider messages to be different if they are not duplicates according to the rules given above. The mobile station shall process all messages that are considered to be different.

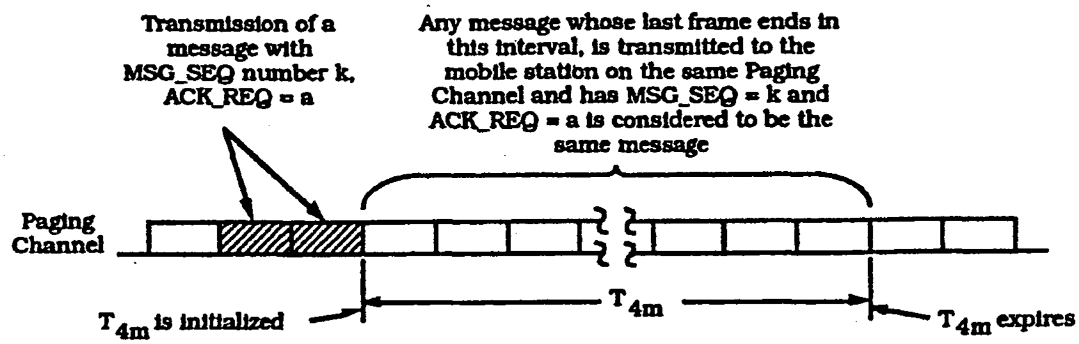

Figure 6.6.2.1.2-1. Time Interval for Duplicate Message Detection

6.6.2.1.3 Registration

While in the *Mobile Station Idle State*, the mobile station shall maintain all active registration timers (see 6.6.5.4), and shall perform the registration procedures specified in 6.6.5.5.2.1.

6.6.2.1.4 Idle Handoff

6.6.2.1.4.1 Pilot Search

An idle handoff occurs when a mobile station has moved from the coverage area of one base station into the coverage area of another base station during the *Mobile Station Idle State*. The mobile station determines that an idle handoff should occur when it detects a sufficiently strong Pilot Channel signal other than that of the current base station's Pilot Channel signal.

Pilot Channels are identified by their offsets relative to the zero offset pilot PN sequence (see 7.1.3.2.1). Pilot offsets are grouped into sets describing their status with regard to pilot searching.

The following sets of pilot offsets are defined for a mobile station in the *Mobile Station Idle State*. Each pilot offset is a member of only one set.

- Active Set: The pilot offset of the Forward CDMA Channel whose Paging Channel is being monitored.
- Neighbor Set: The offsets of the Pilot Channels that are likely candidates for idle handoff. The members of the Neighbor Set are specified in the *Neighbor List Message*.
- Remaining Set: The set of all possible pilot offsets in the current system (integer multiples of $PILOT\_INC_s$) on the current CDMA frequency assignment, excluding the pilots in the Neighbor Set and the Active Set.

The mobile station shall support a Neighbor Set size of at least N_{8m} pilots (see Appendix D).

In the *Mobile Station Idle State*, the mobile station shall continuously search for the strongest Pilot Channel signal on the current CDMA frequency assignment ($CDMACH_S$) whenever it monitors the Paging Channel. Search performance criteria are defined in IS-98 "Recommended Minimum Performance Standards for Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations."

This search should be governed by the following:

- Active Set: The search window size for the pilot in the Active Set should be the number of PN chips specified in Table 6.6.6.2.1-1 corresponding to $SRCH\_WIN\_A_S$. The mobile station should center the search window for the pilot of the Active Set around the earliest arriving usable multipath component of the pilot. If the mobile station receives a value greater than or equal to 13 for $SRCH\_WIN\_A_r$, it may store and use the value 13 in $SRCH\_WIN\_A_S$.

- Neighbor Set: The search window size for each pilot in the Neighbor Set should be the number of PN chips specified in Table 6.6.6.2.1-1 corresponding to $SRCH\_WIN\_N_S$. The mobile station should center the search window for each pilot in the Neighbor Set around the pilot's PN sequence offset using timing defined by the mobile station's time reference (see 6.1.5.1).

- Remaining Set: The search window size for each pilot in the Remaining Set should be the number of PN chips specified in Table 6.6.6.2.1-1 corresponding to $SRCH\_WIN\_R_S$. The mobile station should center the search window for each pilot in the Remaining Set around the pilot's PN sequence offset using timing defined by the mobile station's time reference (see 6.1.5.1). The mobile station should only search for Remaining Set pilots whose pilot PN sequence offset indices are equal to integer multiples of $PILOT\_INC_S$.

If the mobile station determines that one of the Neighbor Set or Remaining Set Pilot Channel signals is sufficiently stronger than the Pilot Channel of the Active Set, the mobile station should perform an idle handoff as specified in 6.6.2.1.4.2.

6.6.2.1.4.2 Idle Handoff Procedures

While performing an idle handoff, the mobile station shall operate in the non-slotted mode until the mobile station has received at least one valid message on the new Paging Channel. Following the reception of this message the mobile station may resume slotted mode operation in accordance with 6.6.2.1.1.3. After performing an idle handoff, the mobile station shall discard all unprocessed messages received on the old Paging Channel.

If the new base station is listed in the *Neighbor List Message* from the old base station (see 6.6.2.2.3), the mobile station shall use the 3-bit NGHBR_CONFIG field to determine the actions required to transition to the new base station. If the new base station is not listed in the *Neighbor List Message*, the mobile station shall perform the handoff operation using the same procedure as for a pilot in the list with the NGHBR_CONFIG field set to '011'.

If the NGHBR_CONFIG field is '000', the mobile station shall set $ACC\_MSG\_SEQ_S$ to NULL (see 6.6.2.2) and shall set $PILOT\_PN_S$ to the pilot offset index of the base station transmitting the new Paging Channel. If the mobile station has not stored configuration parameters for the new Paging Channel, or if the stored information is not current (see 6.6.2.2), the mobile station shall set $CONFIG\_MSG\_SEQ_S$, $SYS\_PAR\_MSG\_SEQ_S$, $NGHBR\_LST\_MSG\_SEQ_S$, and $CHAN\_LST\_MSG\_SEQ_S$ to NULL. The mobile station shall begin monitoring the Paging Channel of the new base station, using the same Code Channel and CDMA Channel.

If the NGHBR_CONFIG field is '001', the mobile station shall set $ACC\_MSG\_SEQ_S$ to NULL and shall set $PILOT\_PN_S$ to the pilot offset index of the base station transmitting the new Paging Channel. If the mobile station has not stored configuration parameters for the Primary Paging Channel of the new base station, or if the stored information is not current (see 6.6.2.2), the mobile station shall set $CONFIG\_MSG\_SEQ_S$, $SYS\_PAR\_MSG\_SEQ_S$, $NGHBR\_LST\_MSG\_SEQ_S$, and $CHAN\_LST\_MSG\_SEQ_S$ to NULL. Set $PAGE\_CHAN_S$ to '1'. The mobile station shall begin monitoring the Primary Paging Channel of the new base station, using the same CDMA Channel.

If the NGHBR_CONFIG field is '010', the mobile station shall set $ACC\_MSG\_SEQ_S$ to NULL and shall set $PILOT\_PN_S$ to the pilot offset index of the base station transmitting the new Paging Channel. If the mobile station has not stored configuration parameters for the Primary Paging Channel of the new base station, or if the stored information is not current (see 6.6.2.2), the mobile station shall set $CONFIG\_MSG\_SEQ_S$, $SYS\_PAR\_MSG\_SEQ_S$, $NGHBR\_LST\_MSG\_SEQ_S$ and $CHAN\_LST\_MSG\_SEQ_S$ to NULL. Set $PAGE\_CHAN_S$ to '1'. The mobile station shall tune to the first CDMA Channel given in the *CDMA Channel List Message* for the old base station and begin monitoring the Primary Paging Channel of the new base station.

If the NGHBR_CONFIG field is '011', the mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*.

6.6.2.2 Response to Overhead Information Operation

The overhead messages on the Paging Channel are:

- *System Parameters Message*
- *Access Parameters Message*
- *Neighbor List Message*
- *CDMA Channel List Message*

The *Response to Overhead Information Operation* is performed whenever the mobile station receives an overhead message. The mobile station updates internally stored information from the received message's data fields.

Configuration parameters and access parameters are received in the configuration messages and the *Access Parameters Message*. The configuration messages are:

- *System Parameters Message*
- *Neighbor List Message*
- *CDMA Channel List Message*

Associated with the set of configuration messages sent on each Paging Channel is a configuration message sequence number (CONFIG_MSG_SEQ). When the contents of one or more of the configuration messages change, the configuration message sequence number is incremented. For each of the configuration messages received, the mobile station stores the configuration message sequence number contained in the configuration message ($SYS\_PAR\_MSG\_SEQ_s$, $NGHBR\_LIST\_MSG\_SEQ_s$, $CHAN\_LIST\_MSG\_SEQ_s$). The mobile station also stores the most recently received configuration message sequence number ($CONFIG\_MSG\_SEQ_s$) contained in any message (see 6.6.2.2.1, 6.6.2.2.3, 6.6.2.2.4 and 6.6.2.3). The mobile station examines the stored values of the configuration message sequence numbers to determine whether the configuration parameters stored by the mobile station are current.

The configuration message sequence number is also included in the *Page Message* and the *Slotted Page Message*. This allows the mobile station to determine whether the stored configuration parameters are current without waiting for a configuration message.

Access Parameters Messages are independently sequence-numbered by the ACC_MSG_SEQ field. The mobile station stores the most recently received *Access Parameters Message* sequence number ($ACC\_MSG\_SEQ_s$).

Paging Channels shall be considered different if they are transmitted by different base stations, if they are transmitted on different code channels, or if they are transmitted on different CDMA Channels. Configuration and access parameters from one Paging Channel shall not be used while monitoring a different Paging Channel. The mobile station shall ignore any overhead message whose $PILOT\_PN_r$ field is not equal to the pilot offset index ($PILOT\_PN_s$) of the base station whose Paging Channel is being monitored.

The mobile station may store the configuration parameters from Paging Channels it has recently monitored. When a mobile station starts monitoring a Paging Channel that it has recently monitored, the mobile station can determine whether the stored parameters are current by examining the $CONFIG\_MSG\_SEQ_s$ in a configuration message, a *Slotted Page Message*, or a *Page Message*.

The mobile station shall define a special value, NULL, to be stored in place of sequence numbers for messages that have not been received or are marked as not current. The special value NULL shall be unequal to any valid message sequence number.

The mobile station shall consider the stored configuration parameters to be current only if all the following conditions are true:

- All three stored configuration message sequence numbers ($SYS\_PAR\_MSG\_SEQ_s$, $NGHBR\_LIST\_MSG\_SEQ_s$, $CHAN\_LIST\_MSG\_SEQ_s$) are equal to $CONFIG\_MSG\_SEQ_s$; and
- $CONFIG\_MSG\_SEQ_s$ is not equal to NULL; and
- No more than T_{31m} seconds (see Appendix D) have elapsed since the mobile station last received a valid message on the Paging Channel for which the parameters were stored.

If the stored parameters are current, the mobile station shall process the parameters as described in 6.6.2.2.1, 6.6.2.2.3, and 6.6.2.2.4.

6.6.2.2.1 System Parameters Message

Whenever a *System Parameters Message* is received on the Paging Channel, the configuration message sequence number, CONFIG_MSG_SEQ$_r$, shall be compared to that stored in SYS_PAR_MSG_SEQ$_s$. If the comparison results in a match, the mobile station may ignore the message. If the comparison results in a mismatch, then the mobile station shall process the remaining fields in the message as described in 6.6.2.2.1.1, 6.6.2.2.1.2, 6.6.2.2.1.3, 6.6.2.2.1.4, 6.6.2.2.1.5, and 6.6.2.2.1.6.

6.6.2.2.1.1 Stored Parameters

The mobile station shall store the following parameters:

- Configuration message sequence number (CONFIG_MSG_SEQ$_s$ = CONFIG_MSG_SEQ$_r$, SYS_PAR_MSG_SEQ$_s$ = CONFIG_MSG_SEQ$_r$)
- System identification (SID$_s$ = SID$_r$)
- Network identification (NID$_s$ = NID$_r$)
- Registration zone (REG_ZONE$_s$ = REG_ZONE$_r$)
- Number of registration zones to be retained (TOTAL_ZONES$_s$ = TOTAL_ZONES$_r$)
- Zone timer length (ZONE_TIMER$_s$ = ZONE_TIMER$_r$)
- Multiple SID storage indicator (MULT_SIDS$_s$ = MULT_SIDS$_r$)
- Multiple NID storage indicator (MULT_NIDS$_s$ = MULT_NIDS$_r$)
- Base station identification (BASE_ID$_s$ = BASE_ID$_r$)
- Base station class (BASE_CLASS$_s$ = BASE_CLASS$_r$)
- Maximum slot cycle index (MAX_SLOT_CYCLE_INDEX$_s$ = MAX_SLOT_CYCLE_INDEX$_r$)
- Home registration indicator (HOME_REG$_s$ = HOME_REG$_r$)
- SID roamer registration indicator (FOR_SID_REG$_s$ = FOR_SID_REG$_r$)
- NID roamer registration indicator (FOR_NID_REG$_s$ = FOR_NID_REG$_r$)
- Power-up registration indicator (POWER_UP_REG$_s$ = POWER_UP_REG$_r$)
- Power-down registration indicator (POWER_DOWN_REG$_s$ = POWER_DOWN_REG$_r$)
- Parameter-change registration indicator (PARAMETER_REG$_s$ = PARAMETER_REG$_r$)
- Registration period (REG_PRD$_s$ = REG_PRD$_r$)
- Base station latitude (BASE_LAT$_s$ = BASE_LAT$_r$)
- Base station longitude (BASE_LONG$_s$ = BASE_LONG$_r$)
- Registration distance (REG_DIST$_s$ = REG_DIST$_r$)
- Search window size for the Active Set and Candidate Set (SRCH_WIN_A$_s$ = SRCH_WIN_A$_r$)
- Search window size for the Neighbor Set (SRCH_WIN_N$_s$ = SRCH_WIN_N$_r$)

- Search window size for the Remaining Set ($SRCH\_WIN\_R_s = SRCH\_WIN\_R_r$)
- Maximum age for retention of Neighbor Set members ($NGHBR\_MAX\_AGE_s = NGHBR\_MAX\_AGE_r$)
- Power control reporting threshold ($PWR\_REP\_THRESH_s = PWR\_REP\_THRESH_r$)
- Power control reporting frame count ($PWR\_REP\_FRAMES_s = PWR\_REP\_FRAMES_r$)
- Power report mode indicator ($PWR\_REP\_MODE_s = PWR\_REP\_MODE_r$)
- Power report delay ($PWR\_REP\_DELAY_s = PWR\_REP\_DELAY_r$)
- Pilot detection threshold ($T\_ADD_s = T\_ADD_r$)
- Pilot drop threshold ($T\_DROP_s = T\_DROP_r$)
- Active Set versus Candidate Set comparison threshold ($T\_COMP_s = T\_COMP_r$)
- Drop timer value ($T\_TDROP_s = T\_TDROP_r$)

6.6.2.2.1.2 Paging Channel Assignment Change

If the number of Paging Channels specified in the *System Parameters Message* ($PAGE\_CHAN_r$) is different from $PAGE\_CHAN_s$, the mobile station shall use the hash algorithm specified in 6.6.7.1 to select a new Paging Channel number in the range 1 to $PAGE\_CHAN_r$. The mobile station shall store the new Paging Channel number as $PAGECH_s$. The mobile station shall then set $PAGE\_CHAN_s$ to $PAGE\_CHAN_r$. The mobile station shall set $ACC\_MSG\_SEQ_s$ to NULL. If the mobile station has not stored configuration parameters for the new Paging Channel, or if the stored parameters are not current (see 6.6.2.2), the mobile station shall set $CONFIG\_MSG\_SEQ_s$, $SYS\_PAR\_MSG\_SEQ_s$, $NGHBR\_LST\_MSG\_SEQ_s$, and $CHAN\_LST\_MSG\_SEQ_s$ to NULL. The mobile station shall then begin monitoring the new Paging Channel as specified in 6.6.2.1.1.

6.6.2.2.1.3 RESCAN Parameter

If the $RESCAN_r$ field in the *System Parameters Message* equals '1', the mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*.

6.6.2.2.1.4 Roaming Status

The mobile station shall determine the roaming status for the mobile station (see 6.6.5.3). The mobile station should indicate to the user whether the mobile station is roaming.

6.6.2.2.1.5 Registration

The mobile station shall update stored variables and perform other registration procedures as specified in 6.6.5.5.2.2.

6.6.2.2.1.6 Slot Cycle Index

The mobile station shall set $SLOT\_CYCLE\_INDEX_s$ to the smaller of: the preferred slot cycle index $SLOT\_CYCLE\_INDEX_p$ and the maximum slot cycle index $MAX\_SLOT\_CYCLE\_INDEX_s$. If the mobile station is operating in the slotted mode, it shall set its slot cycle length as described in 6.6.2.1.1.3.

6.6.2.2.2 Access Parameters Message

Whenever an *Access Parameters Message* is received on the Paging Channel, the sequence number, $ACC\_MSG\_SEQ_r$, shall be compared to $ACC\_MSG\_SEQ_s$. If the comparison results in a match, the mobile station may ignore the message. If the comparison results in a mismatch, then the mobile station shall process the remaining fields in the message as follows.

The mobile station shall store the following parameters:

- *Access Parameters Message* sequence number ($ACC\_MSG\_SEQ_s = ACC\_MSG\_SEQ_r$)
- Number of Access Channels ($ACC\_CHAN_s = ACC\_CHAN_r$)
- Nominal transmit power offset ($NOM\_PWR_s = NOM\_PWR_r$)
- Initial power offset for access ($INIT\_PWR_s = INIT\_PWR_r$)
- Power increment ($PWR\_STEP_s = PWR\_STEP_r$)
- Number of access probes ($NUM\_STEP_s = NUM\_STEP_r$)
- Maximum Access Channel message capsule size ($MAX\_CAP\_SZ_s = MAX\_CAP\_SZ_r$)
- Access Channel preamble length ($PAM\_SZ_s = PAM\_SZ_r$)
- Persistence modifier for Access Channel attempts for registrations which are not responses to the *Registration Request Order* ($REG\_PSIST_s = REG\_PSIST_r$)
- Persistence modifier for Access Channel attempts for message transmissions ($MSG\_PSIST_s = MSG\_PSIST_r$)
- Time randomization for Access Channel probes ($PROBE\_PN\_RAN_s = PROBE\_PN\_RAN_r$)
- Acknowledgement timeout ($ACC\_TMO_s = ACC\_TMO_r$)
- Access Channel probe backoff range ($PROBE\_BKOFF_s = PROBE\_BKOFF_r$)
- Access Channel probe sequence backoff range ($BKOFF_s = BKOFF_r$)
- Maximum number of probe sequences for an Access Channel request ($MAX\_REQ\_SEQ_s = MAX\_REQ\_SEQ_r$)
- Maximum number of probe sequences for an Access Channel response ($MAX\_RSP\_SEQ_s = MAX\_RSP\_SEQ_r$)
- Authentication mode ($AUTH_s = AUTH_r$)
- Random challenge value ($RAND_s = RAND_r$)

The mobile station shall record the persistence parameter number that corresponds to the mobile station's overload class as follows:

- Persistence value for access overload class ($PSIST_s = PSIST_r$)

6.6.2.2.3 Neighbor List Message

Whenever a valid *Neighbor List Message* is received on the current Paging Channel ($PAGECH_s$), the configuration message sequence number, $CONFIG\_MSG\_SEQ_r$, shall be compared to that stored in $NGHBR\_LST\_MSG\_SEQ_s$. If the comparison results in a match, the mobile station may ignore the message. If the comparison results in a mismatch, then the mobile station shall process the remaining fields in the message as follows.

The mobile station shall store the following parameters:

- Configuration message sequence number ($CONFIG\_MSG\_SEQ_s = CONFIG\_MSG\_SEQ_r$, $NGHBR\_LST\_MSG\_SEQ_s = CONFIG\_MSG\_SEQ_r$)
- Pilot PN sequence offset increment ($PILOT\_INC_s = PILOT\_INC_r$)

For each of the neighboring base stations contained in the *Neighbor List Message*, the mobile station shall store the following:

- Neighbor configuration ($NGHBR\_CONFIG_s = NGHBR\_CONFIG_r$)
- Neighbor pilot PN sequence offset ($NGHBR\_PN_s = NGHBR\_PN_r$)

The mobile station shall update the idle handoff Neighbor Set (see 6.6.2.1.4) so that it consists only of pilot offsets listed in the *Neighbor List Message*. If the *Neighbor List Message* contains more pilot offsets than the mobile station can store, the mobile station shall store the pilot offsets beginning at the start of the *Neighbor List Message*, up to the limits of the mobile station's Neighbor Set storage capacity.

6.6.2.2.4 CDMA Channel List Message

Whenever a *CDMA Channel List Message* is received on the Paging Channel, the configuration message sequence number, $CONFIG\_MSG\_SEQ_r$, shall be compared to that stored in $CHAN\_LST\_MSG\_SEQ_s$. If the comparison results in a match, the mobile station may ignore the message. If the comparison results in a mismatch, then the mobile station shall process the remaining fields in the message as follows.

The mobile station shall store the following parameters:

- Configuration message sequence number ($CONFIG\_MSG\_SEQ_s = CONFIG\_MSG\_SEQ_r$, $CHAN\_LST\_MSG\_SEQ_s = CONFIG\_MSG\_SEQ_r$)

The mobile station shall use the hash algorithm specified in 6.6.7.1 and the number of channels listed in the *CDMA Channel List Message* to determine the CDMA Channel (frequency assignment) for its Paging Channel. If the CDMA frequency assignment has changed (the computed CDMA Channel is different from $CDMACH_s$), the mobile station shall perform the following actions:

- Set $CDMACH_s$ to the new CDMA Channel.
- Set $PAGECH_s$ to the Primary Paging Channel.

- Set $CONFIG\_MSG\_SEQ_s$, $SYS\_PAR\_MSG\_SEQ_s$, $NGHBR\_LST\_MSG\_SEQ_s$, $CHAN\_LST\_MSG\_SEQ_s$, and $ACC\_MSG\_SEQ_s$ to NULL.

- Tune to the new CDMA Channel.

6.6.2.3 Mobile Station Page Match Operation

The page messages on the Paging Channel are:

- *Page Message*

- *Slotted Page Message*

The *Mobile Station Page Match Operation* is performed whenever the mobile station receives a page message. The mobile station searches each message to determine whether it contains the mobile station's MIN. If so, the mobile station transmits a *Page Response Message* to the page message on the Access Channel.

The mobile station shall compare the configuration message sequence number, $CONFIG\_MSG\_SEQ_r$, to $CONFIG\_MSG\_SEQ_s$. If the comparison results in a mismatch, then the mobile station shall set $CONFIG\_MSG\_SEQ_s$ to $CONFIG\_MSG\_SEQ_r$. The mobile station shall also compare the *Access Parameters Message* sequence number, $ACC\_MSG\_SEQ_r$, with that stored in $ACC\_MSG\_SEQ_s$. If the comparison results in a mismatch, then the mobile station shall set $ACC\_MSG\_SEQ_s$ to NULL (see 6.6.2.2).

The mobile station shall compare its MIN with the MIN in each record of the page message (see 7.7.2.3.2.5 and 7.7.2.3.2.6). If both MIN1 and MIN2 are present in a record and both MIN1 and MIN2 match MIN1 and MIN2 for the mobile station, then a page match shall be declared. If MIN1 but not MIN2 is present in a record, MIN1 matches MIN1 for the mobile station, and a home (non-roaming) (SID, NID) pair matches the SID and NID of the base station, then a page match shall be declared (see 6.6.5.3). Any other combination shall be considered a mismatch.

If a page match is declared, and the mobile station is configured to receive mobile station terminated calls in its present roaming status (see 6.6.5.3), the mobile station shall enter the *Update Overhead Information Substate* of the *System Access State* (see 6.6.3.2) with a page response indication within T_{33m} seconds after the page message is received.

If the mobile station is not configured to receive mobile station terminated calls in its present roaming status, the mobile station may ignore the record.

6.6.2.4 Mobile Station Order and Message Processing Operation

During the *Mobile Station Order and Message Processing Operation*, the mobile station processes all messages except overhead messages (see 6.6.2.2) and page messages (see 6.6.2.3).

The mobile station shall compare the ADDRESS field of the message to the corresponding mobile station identification data (e.g., MIN or ESN). If the identification data matches the ADDRESS field, the mobile station shall process the message; otherwise the mobile station shall ignore the message.

The following cases occur for messages received on the Paging Channel whose ADDRESS field matches the mobile station's identification data:

- If the message requires acknowledgement, and is not the *Lock Until Power-Cycled Order* or the *Unlock Order*, the mobile station shall acknowledge the message as specified in 6.6.2.1.2. The mobile station shall enter the *Update Overhead Information Substate* of the *System Access State* with an order/message response indication within T_{33m} seconds, unless otherwise specified for a particular message.

- If the message does not require acknowledgement, the mobile station shall transmit a response only if it is required by the message or order. If a response is required, the mobile station shall enter the *Update Overhead Information Substate* of the *System Access State* with an order/message response indication within T_{33m} seconds, unless otherwise specified for a particular message.

- If the message is a message that cannot be processed by the mobile station, the mobile station shall respond with a *Mobile Station Reject Order* with the ORDQ field set to indicate the reason for rejection. The mobile station shall enter the *Update Overhead Information Substate* of the *System Access State* with an order/message response indication within T_{33m} seconds, unless otherwise specified for a particular message.

The following directed messages and orders can be received. If any field value of the message is outside its permissible range, the mobile station shall send a *Mobile Station Reject Order* with ORDQ equal to '00000100' (message field not in valid range) or '00000010' (message not accepted in this state), as appropriate.

1. *Abbreviated Alert Order*: The mobile station may alert the user.

2. *Audit Order*

3. *Authentication Challenge Message*: The mobile station shall process the message and shall respond with an *Authentication Challenge Response Message* as specified in 6.3.12.1.5. The mobile station shall enter the *Update Overhead Information Substate* of the *System Access State* with an order/message response indication within T_{32m} seconds

4. *Base Station Acknowledgement Order*

5. *Base Station Challenge Confirmation Order*: The mobile station shall process the message and shall respond with an *SSD Update Confirmation Order* or *SSD Update Rejection Order* as specified in 6.3.12.1.9. The mobile station shall enter the *Update Overhead Information Substate* of the *System Access State* with an order/message response indication within T_{32m} seconds.

6. *Channel Assignment Message*: If the message specifies a Paging Channel assignment (ASSIGN_MODE equal to '001'), the mobile station shall perform the following actions: If a CDMA channel (CDMA_FREQ) is specified in the assignment, the mobile station shall set $CDMACH_s = CDMA\_FREQ_r$ and shall tune to the new frequency assignment. The mobile station shall set $ACC\_MSG\_SEQ_s$ to NULL (see 6.6.2.2) and shall set $PILOT\_PN_s$ to the pilot PN sequence offset of the strongest pilot in the list ($PILOT\_PN_r$). If the mobile station has not stored configuration

parameters for the Primary Paging Channel of the new base station, or if the stored information is not current (see 6.6.2.2), the mobile station shall set CONFIG_MSG_SEQ$_s$, SYS_PAR_MSG_SEQ$_s$, NGHBR_LST_MSG_SEQ$_s$, and CHAN_LST_MSG_SEQ$_s$ to NULL. The mobile station shall then begin monitoring the Primary Paging Channel of the selected base station.

If the ASSIGN_MODE field is any value other than '001', the mobile station shall respond with a *Mobile Station Reject Order* with ORDQ equal to '00000010' (message not accepted in this state).

7. *Data Burst Message*
8. *Feature Notification Message*
9. *Local Control Order*
10. *Lock Until Power-Cycled Order:* The mobile station shall record the reason for the *Lock Until Power-Cycled Order* in the mobile station's semi-permanent memory (LCKRSN_P$_{s-p}$ equals the least-significant four bits of ORDQ$_r$). After a mobile station receives this order, it shall not enter the *System Access State* (see 6.6.3) until it has received an *Unlock Order* or until after power-cycling the mobile station (i.e., after the next mobile station power-up). This requirement shall take precedence over any other mobile station requirement specifying entry to the *System Access State*. The mobile station should notify the user of the locked condition. The mobile station may exit the *Mobile Station Idle State* and enter the *System Determination Substate* of the *Mobile Station Initialization State*. This allows the mobile station to operate in the analog mode while locked.
11. *Maintenance Required Order:* The mobile station shall record the reason for the *Maintenance Required Order* in the mobile station's semi-permanent memory (MAINTRSN$_{s-p}$ equals the least-significant four bits of ORDQ$_r$). If the mobile station has previously received a *Lock Until Power-Cycled Order*, it shall remain in the locked condition; otherwise the mobile station shall remain in the unlocked condition. The mobile station should notify the user of the maintenance required condition.
12. *Registration Accepted Order*
13. *Registration Rejected Order*
14. *Registration Request Order:* The mobile station shall process the message and perform registration procedures as specified in 6.6.5.5.2.3.
15. *SSD Update Message:* The mobile station shall process the message and shall respond with a *Base Station Challenge Order* as specified in 6.3.12.1.9. The mobile station shall enter the *Update Overhead Information Substate* of the *System Access State* with an order/message response indication within T_{32m} seconds.
16. *Unlock Order:* After receiving this order, the mobile station is no longer locked. The mobile station should notify the user that the locked condition has been removed. The mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*.

If any message or order directed to the mobile station is received that is not listed above, the mobile station shall respond with a *Mobile Station Reject Order* with ORDQ equal to '00000010' (message not accepted in this state).

6.6.2.5 Mobile Station Origination Operation

The *Mobile Station Origination Operation* is performed when the mobile station is directed by the user to initiate a call.

The mobile station shall enter the *Update Overhead Information Substate* of the *System Access State* (see 6.6.3) with a call origination indication within T_{33m} seconds.

6.6.2.6 Mobile Station Message Transmission Operation

Support of this operation is optional. If the mobile station supports the *Mobile Station Message Transmission Operation*, the operation is performed when the user directs the mobile station to transmit a message.

If the mobile station supports this operation, the mobile station shall enter the *Update Overhead Information Substate* of the *System Access State* (see 6.6.3.2) with a message transmission indication within T_{33m} seconds.

6.6.2.7 Mobile Station Power-Down Operation

The *Mobile Station Power-Down Operation* is performed when the user directs the mobile station to power down.

The mobile station shall update stored parameters and perform other registration procedures as specified in 6.6.5.5.2.4.

If no power-down registration is performed (see 6.6.5.5.2.4), the mobile station may power down.

6.6.3 System Access State

In this state, the mobile station sends messages to the base station on the Access Channel(s) and receives messages from the base station on the Paging Channel.

As illustrated in Figure 6.6.3-1, the System Access State consists of the following substates:

- *Update Overhead Information Substate* - In this substate, the mobile station monitors the Paging Channel until it has received a current set of configuration messages.
- *Mobile Station Origination Attempt Substate* - In this substate, the mobile station sends an *Origination Message* to the base station.
- *Page Response Substate* - In this substate, the mobile station sends a *Page Response Message* to the base station.
- *Mobile Station Order/Message Response Substate* - In this substate, the mobile station sends a response to a message received from the base station.
- *Registration Access Substate* - In this substate, the mobile station sends a *Registration Message* to the base station.

- *Mobile Station Message Transmission Substate* - In this substate, the mobile station sends a *Data Burst Message* to the base station.

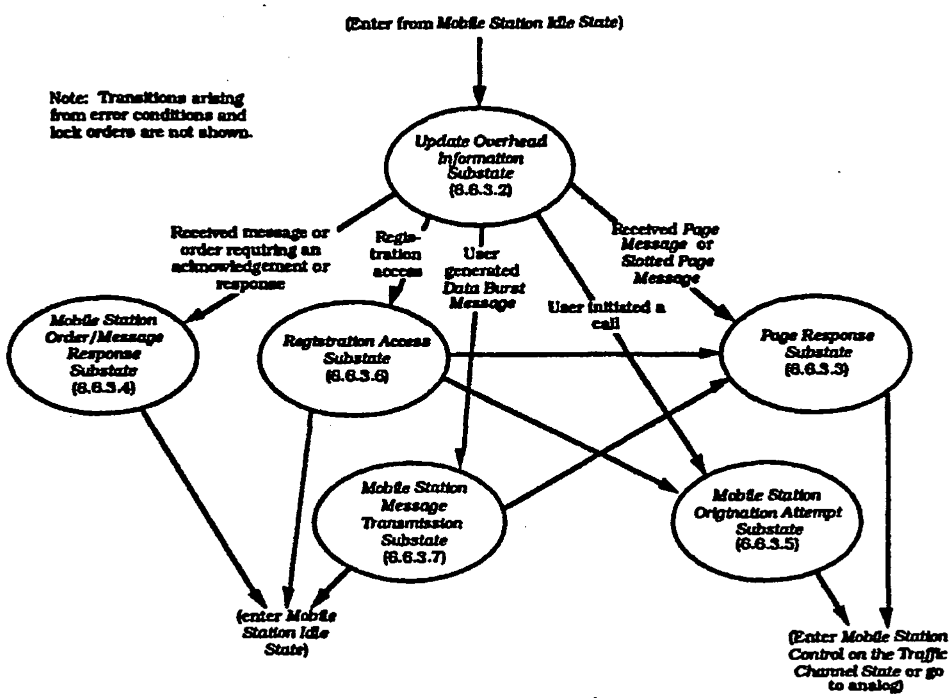

Figure 6.6.3-1. System Access State

6.6.3.1 Access Procedures

6.6.3.1.1 Access Attempts

6.6.3.1.1.1 Overview

The mobile station transmits on the Access Channel using a random access procedure. Many parameters of the random access procedure are supplied by the base station in the *Access Parameters Message*.

The entire process of sending one message and receiving (or failing to receive) an acknowledgement for that message is called an access attempt (see Figures 6.6.3.1.1.1-1 and 6.6.3.1.1.1-2). Each transmission in the access attempt is called an access probe. The mobile station transmits the same message in each access probe in an access attempt. Each access probe consists of an Access Channel preamble and an Access Channel message capsule (see Figure 6.6.3.1.1.1-1B).

Within an access attempt, access probes are grouped into access probe sequences. Each access probe sequence consists of up to 1 + NUM_STEP access probes, all transmitted on the same Access Channel. The Access Channel used for each access probe sequence is chosen pseudorandomly from among all the Access Channels associated with the current Paging Channel. The first access probe of each access probe sequence is transmitted at a specified power level relative to the nominal open loop power level. Each subsequent access probe is transmitted at a power level a specified amount higher than the previous access probe (see 6.1.2.3.1).

The timing of access probes and access probe sequences is expressed in terms of Access Channel slots (see 6.7.1.1). The transmission of an access probe begins at the start of an Access Channel Slot.

There are two types of messages sent on the Access Channel: a response message (one that is a response to a base station message) or a request message (one that is sent autonomously by the mobile station). Different procedures are used for sending a response message and for sending a request message. The timing of the start of each access probe sequence is determined pseudorandomly. For every access probe sequence, a backoff delay, RS, from 0 to 1 + BKOFF slots is generated pseudorandomly. For request access probe sequences only, an additional delay is imposed by the use of a persistence test.[14] For each slot after the backoff delay, RS, the mobile station performs a pseudorandom test, with parameters that depend on the reason for the access attempt and the access overload class, $ACCOLC_p$, of the mobile station. If the test passes, the first access probe of the sequence begins in that slot. If the test fails, the access probe sequence is deferred until at least the next slot.

Timing between access probes of an access probe sequence is also generated pseudorandomly. After transmitting each access probe, the mobile station waits a specified period, TA = (2 + ACC_TMO) × 80 ms, from the end of the slot to receive an acknowledgement from the base station. If an acknowledgement is received, the access attempt ends. If no acknowledgement is received, the next access probe is transmitted after an additional backoff delay, RT, from 0 to 1 + PROBE_BKOFF slots.

The precise timing of the Access Channel transmissions in an access attempt is determined by a procedure called PN randomization. For each access attempt, the mobile station computes a delay, RN, from 0 to $2^{PROBE\_PN\_RAN} - 1$ PN chips using a (non-random) hash function that depends on its ESN. The mobile station delays its transmit timing by RN PN chips. This transmit timing adjustment includes delay of the direct sequence spreading long code and of the quadrature spreading I and Q pilot PN sequences, so it effectively increases the apparent range from the mobile station to the base station.[15]

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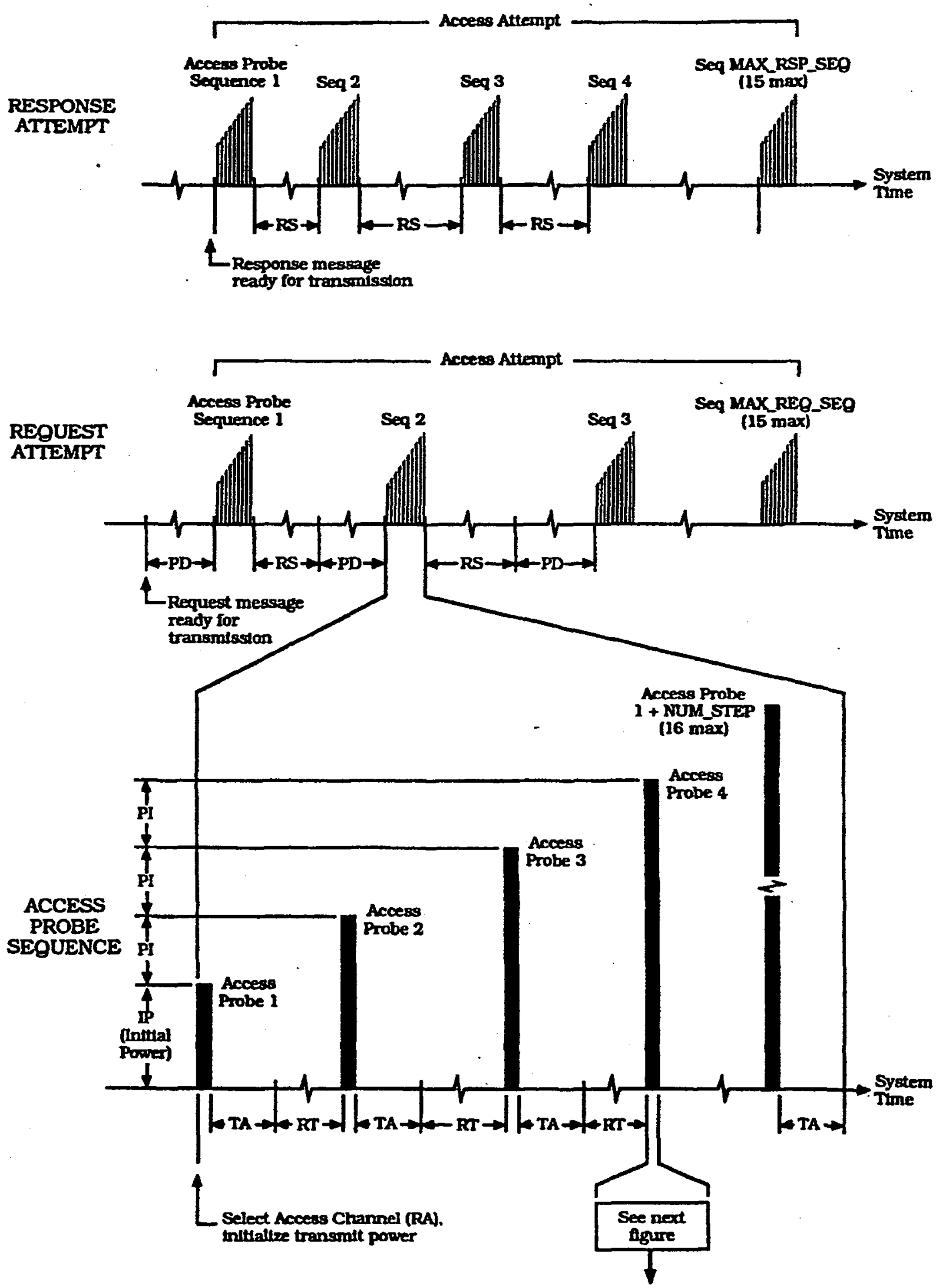
[14] A persistence test is not needed for response access attempts, because the base station controls the arrival rate of response messages directly by controlling the rate at which it transmits messages requiring responses.

[15] This increases the probability that the base station will be able to separately demodulate transmissions from multiple mobile stations in the same Access Channel slot, especially when many mobile stations are at a similar range from the base station. Use of a non-random algorithm for PN randomization permits the base station to separate the PN randomization from the actual propagation delay from the mobile station, so it can accurately estimate the timing of Reverse Traffic Channel transmissions from the mobile station.



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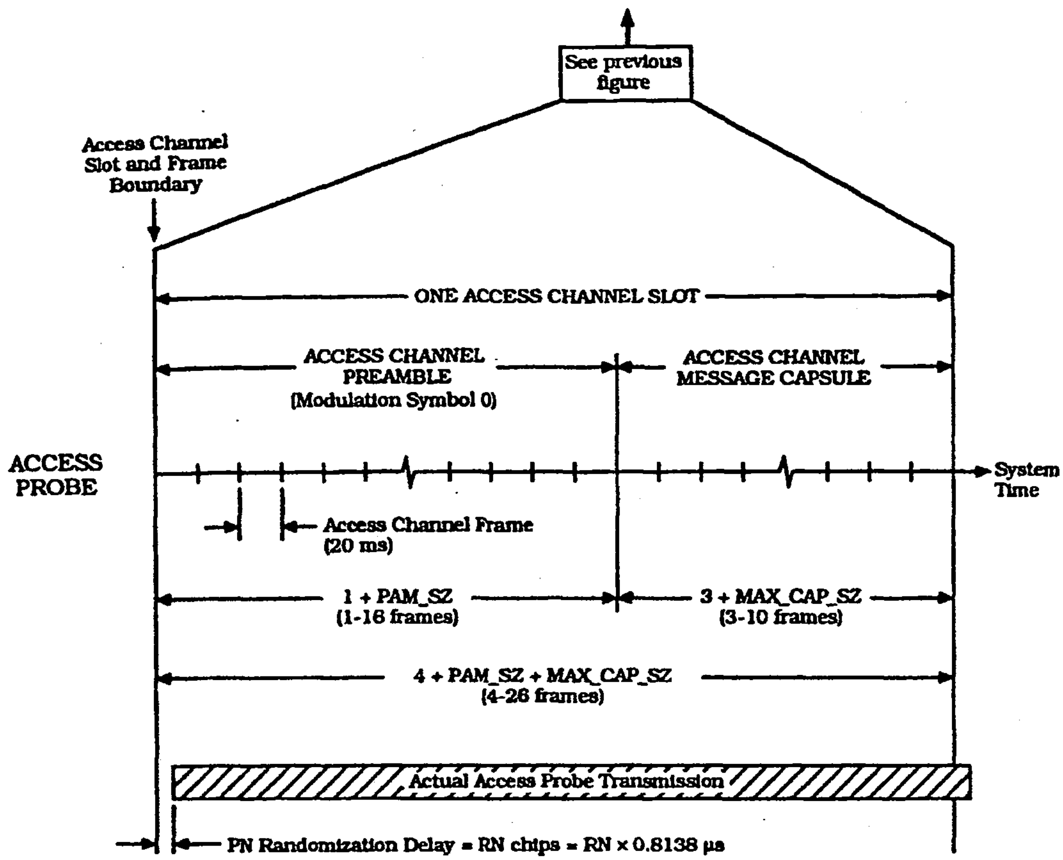
2 **Figure 6.6.3.1.1.1-1A. Access Channel Request and Response Attempts**



Calculated, Random, and Hashed Variables

Var-iable	Name	Generation	Range	Units
IP	Initial Open-Loop Power	IP = −73 −Mean Input Power (dBm) + NOM_PWR + INIT_PWR	See 6.1.2.1 6.1.2.2.1	dBm
PD	Persistence Delay	Delay continues slot-by-slot until persistence test (run every slot) passes.	—	slots
PI	Power Increment	PI = PWR_STEP	0 to 7	dB
RA	Access Channel Number	Random between 0 and ACC_CHAN; generated before every sequence.	0 to 31	—
RN	PN Randomization Delay	Hash using ESN between 0 and $2^{PROBE\_PN\_RAN} - 1$; generated once at beginning of attempt.	0 to 511	chips
RS	Sequence Backoff	Random between 0 and 1 + BKOFF; generated before every sequence (except the first sequence).	0 to 16	slots
RT	Probe Backoff	Random between 0 and 1 + PROBE_BKOFF; generated before subsequent probes.	0 to 16	slots
TA	Ack Response Timeout	TA = 80 × (2 + ACC_TMO); timeout from end of slot	160 to 1360	ms

Figure 6.6.3.1.1.1-1B. Access Channel Request and Response Attempts

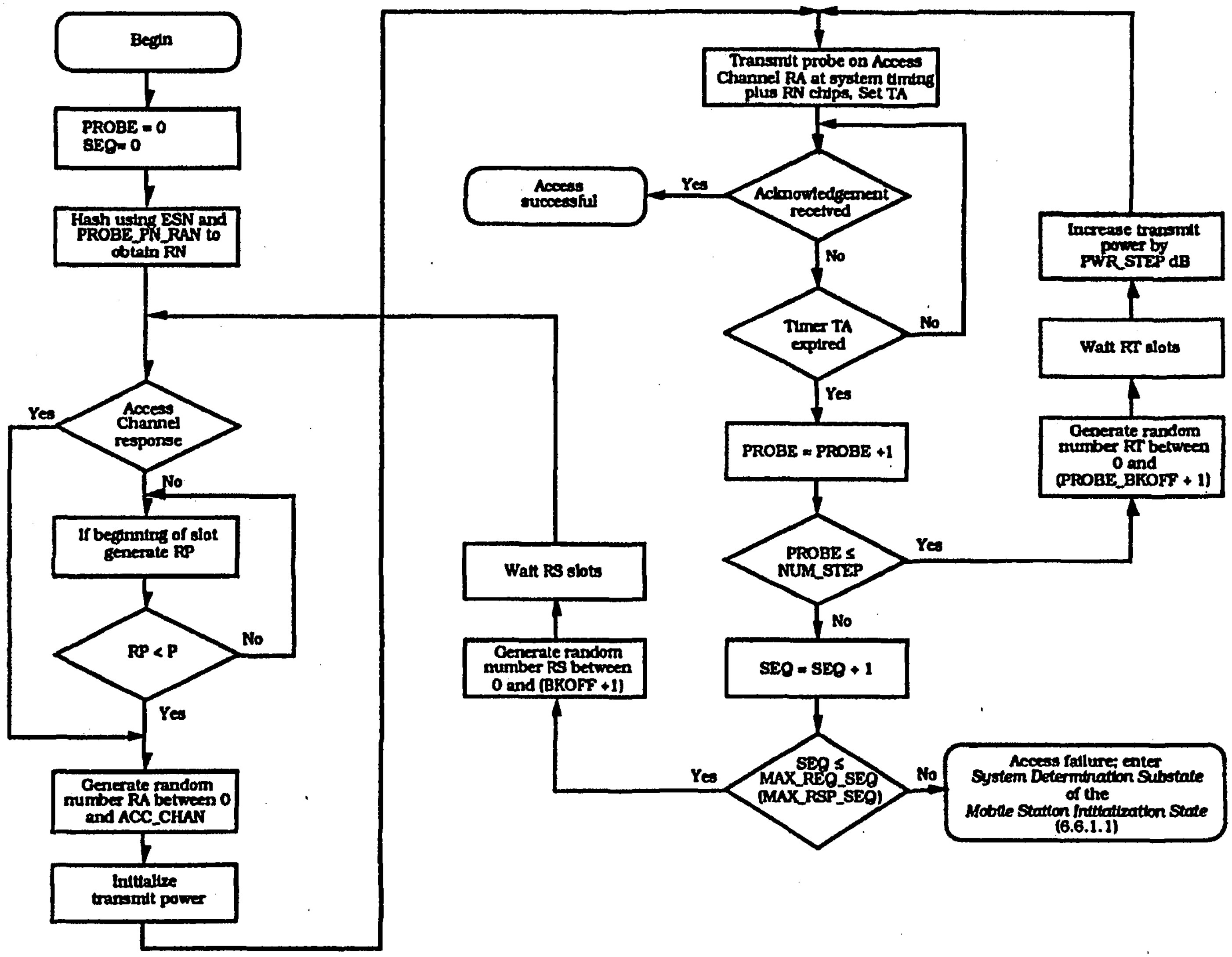


Figure 6.6.3.1.1-2. Access Procedure

6.6.3.1.1.2 Requirements

Each time the mobile station performs an access attempt, it shall compute a number, RN, from 0 to $2^{PROBE\_PN\_RAN} - 1$, using the hashing technique described in 6.6.7.1. For the duration of this access attempt, the mobile station shall delay its transmit timing (see 6.1.3.2.1), including long code direct sequence spreading (see 6.1.3.2.8) and I and Q pilot PN sequence quadrature spreading (see 6.1.3.2.9), by RN PN chips.

When the mobile station performs an access attempt, it shall transmit one or more access probe sequences. If the access attempt is an Access Channel request, the mobile station shall transmit no more than $MAX\_REQ\_SEQ_s$ access probe sequences; if the access attempt is an Access Channel response, the mobile station shall transmit no more than $MAX\_RSP\_SEQ_s$ access probe sequences.

Before transmitting each access probe sequence, the mobile station shall generate a random number, RA, from 0 to ACC_CHAN_s using the procedure described in 6.6.7.2. The mobile station shall use this random number, RA, as the Access Channel number for all access probes in that access probe sequence (see 6.1.3.1.8).

Before transmitting each access probe sequence other than the first access probe sequence, the mobile station shall generate a random number, RS, from 0 to $(BKOFF_s + 1)$, using the procedure described in 6.6.7.2. The mobile station shall delay the transmission of the access probe sequence for RS slots.

If the access attempt is an Access Channel request, then before transmitting the first access probe in each access probe sequence, and after the delay of RS if applicable, the mobile station shall perform a persistence test for each Access Channel slot. The mobile station shall transmit the first access probe of a probe sequence in a slot only if the test passes for that slot. To perform the persistence test, the mobile station shall generate a random number RP, $0 < RP < 1$, using the technique described in 6.6.7.2. The persistence test is said to pass when RP is less than the current value of P for the type of this access attempt. If P equals 0, the access attempt fails, and the mobile station shall end the access attempt, update its registration variables as specified in 6.6.5.6.3.2, and enter the *System Determination Substate* of the *Mobile Station Initialization State*.

If the Access Channel request is a registration, P shall be computed by

$$P = \begin{cases} 2^{-PSIST(n)/4} \times 2^{-REG\_PSIST} & \text{if } PSIST(n) \neq 63 \\ 0 & \text{otherwise} \end{cases} \qquad n = 0, 1, \ldots, 9$$

$$P = \begin{cases} 2^{-PSIST(n)} \times 2^{-REG\_PSIST} & \text{if } PSIST(n) \neq 7 \\ 0 & \text{otherwise} \end{cases} \qquad n = 10, 11, \ldots, 15$$

where n is the overload class ($ACCOLC_p$) assigned to the mobile station.

If the Access Channel request is a message transmission, P shall be computed by

$$P = \begin{cases} 2^{-PSIST(n)/4} \times 2^{-MSG\_PSIST} & \text{if } PSIST(n) \neq 63 \\ 0 & \text{otherwise} \end{cases} \qquad n = 0, 1, \ldots, 9$$

$$P = \begin{cases} 2^{-PSIST(n)} \times 2^{-MSG\_PSIST} & \text{if } PSIST(n) \neq 7 \\ 0 & \text{otherwise} \end{cases} \qquad n = 10, 11, \ldots, 15$$

where n is the overload class assigned to the mobile station.

If the Access Channel request is other than a registration or a message transmission, P shall be computed by

$$P = \begin{cases} 2^{-PSIST(n)/4} & \text{if } PSIST(n) \neq 63 \\ 0 & \text{otherwise} \end{cases} \qquad n = 0, 1, \ldots, 9$$

$$P = \begin{cases} 2^{-PSIST(n)} & \text{if } PSIST(n) \neq 7 \\ 0 & \text{otherwise} \end{cases} \qquad n = 10, 11, \ldots, 15$$

where n is the overload class assigned to the mobile station.

The mobile station shall transmit the first probe in each access probe sequence at the power level specified in 6.1.2.3.1. The mobile station shall transmit each subsequent probe in the access probe sequence at a power level PWR_STEP_s dB greater than that of the previous probe. Between access probes, the mobile station shall disable its transmitter.

After transmitting each probe, the mobile station shall wait $TA = (2 + ACC\_TMO_s) \times 80$ ms from the end of the Access Channel slot. If no acknowledgement is received within TA seconds, the mobile station shall perform the following:

- If NUM_STEP_s or fewer access probes have been transmitted in this access probe sequence, the mobile station shall generate a random number, RT, from 0 to 1 + PROBE_BKOFF, using the procedure described in 6.6.7.2. The mobile station shall delay RT additional Access Channel slots, and then transmit the next access probe.
- Otherwise, if fewer than MAX_REQ_SEQ (for a request access) or MAX_RSP_SEQ (for a response access) access probe sequences have been transmitted in this access attempt, the mobile station shall begin the randomization procedures for another access probe sequence.
- Otherwise, the mobile station shall update its registration variables as specified in 6.6.5.5.3.2 and enter the *System Determination Substate* of the *Mobile Station Initialization State*.

6.6.3.1.2 Acknowledgement Procedures

The acknowledgement procedures facilitate the reliable exchange of messages between the base station and the mobile station. The mobile station uses the fields ACK_TYPE (acknowledgement address type), ACK_SEQ (acknowledgement sequence number), MSG_SEQ (message sequence number), ACK_REQ (acknowledgement required), and

VALID_ACK (valid acknowledgement) to support this mechanism. These fields are referred to as layer 2 fields, and the acknowledgement procedures are referred to as layer 2 procedures. All other message fields and the processing thereof are referred to as pertaining to layer 3. (See Appendix C for further discussion of layering.)

The mobile station shall set the ACK_TYPE, ACK_SEQ and VALID_ACK fields of all messages sent on the Access Channel as specified in 6.6.2.1.2.

The mobile station shall generate a single set of MSG_SEQ numbers for messages sent on the Access Channel. The mobile station shall set the MSG_SEQ field of the first message sent on the Access Channel after powering on to '000'. The mobile station shall increment MSG_SEQ, modulo 8, for each new access attempt, even if the contents of the new message are identical to those of the previous message.

The mobile station shall monitor the Paging Channel while in the *System Access State*. When the mobile station receives a message with the VALID_ACK field set to '1' and the ACK_SEQ field set to the MSG_SEQ number of the message currently being sent, the mobile station shall consider the current message to have been acknowledged and shall end the access attempt.

The mobile station shall not begin a new access attempt until the previous access attempt has ended.

6.6.3.1.3 Handoffs

While in the *System Access State*, the mobile station should continue its pilot search (see 6.6.2.1.4.1), but shall not perform idle handoffs.

6.6.3.1.4 System Access State Exit Procedures

Upon exiting the *System Access State*, the mobile station shall abort any access attempt in progress and discard the associated message.

6.6.3.2 Update Overhead Information Substate

In this substate, the mobile station monitors the Paging Channel until it has received the current configuration messages. The mobile station compares sequence numbers to determine whether all the configuration messages are up to date. To make sure it has the latest access parameters, the mobile station receives at least one message containing the ACC_MSG_SEQ field (except in case of a page response, since the initiating *Page Message* or *Slotted Page Message* contains ACC_MSG_SEQ), and waits, if necessary, for an *Access Parameters Message*.

Upon entering the *Update Overhead Information Substate*, the mobile station shall set the *System Access State* timer to a value of T_{41m} seconds. The mobile station shall set PAGED to NO. If the *Update Overhead Information Substate* was entered with a page response indication, the mobile station shall set CURR_ACC_MSG_SEQ to ACC_MSG_SEQ$_s$; otherwise, it shall set CURR_ACC_MSG_SEQ to NULL.

If the state timer expires while in this substate, the mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*.

While in the *Update Overhead Information Substate*, the mobile station shall monitor the Paging Channel. If the mobile station declares a loss of the Paging Channel (see 6.4.3), it shall enter the *Mobile Station Idle State*. If the mobile station receives any of the following messages or orders containing an ADDRESS field matching the corresponding mobile station identification data, the mobile station shall process the message as follows:

1. *Local Control Order*

2. *Lock Until Power-Cycled Order*: The mobile station shall record the reason for the *Lock Until Power-Cycled Order* in the mobile station's semi-permanent memory ($LCKRSN\_P_{s-p}$ equals the least-significant four bits of $ORDQ_r$). The mobile station should notify the user of the locked condition. The mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*, and shall not enter the *System Access State* again until after the next mobile station power-up or until it has received an *Unlock Order*. This requirement shall take precedence over any other mobile station requirement specifying entry to the *System Access State*.

3. *Maintenance Required Order*: The mobile station shall record the reason for the *Maintenance Required Order* in the mobile station's semi-permanent memory ($MAINTRSN_{s-p}$ equals the least-significant four bits of $ORDQ_r$). The mobile station shall remain in the unlocked condition. The mobile station should notify the user of the maintenance required condition.

If the mobile station receives any of the following messages, it shall process the message as follows:

1. *System Parameters Message*: The mobile station shall process the parameters from the message (see 6.6.2.2.1).

2. *Access Parameters Message*: The mobile station shall process the parameters from the message (see 6.6.2.2.2).

3. *Neighbor List Message*: The mobile station shall process the parameters from the message (see 6.6.2.2.3).

4. *CDMA Channel List Message*: The mobile station shall process the parameters from the message (see 6.6.2.2.4).

5. *Slotted Page Message*: The mobile station shall set CURR_ACC_MSG_SEQ to $ACC\_MSG\_SEQ_r$. If this substate was not entered with an origination or page response indication, the mobile station shall compare its MIN with the MIN in each record of the message. If a match is declared (see 6.6.2.3), the mobile station shall set PAGED to YES.

6. *Page Message*: The mobile station shall set CURR_ACC_MSG_SEQ to $ACC\_MSG\_SEQ_r$. If this substate was not entered with an origination or page response indication, the mobile station shall compare its MIN with the MIN in each record of the message. If a match is declared (see 6.6.2.3), the mobile station shall set PAGED to YES.

7. *Any other message*: If the mobile station receives any other message with a MSG_TYPE specified in Table 7.7.2.3-1, it shall process all layer 2 fields of the message and may ignore all other fields. The mobile station may ignore all other messages.

When the stored configuration parameters are current (see 6.6.2.2) and CURR_ACC_MSG_SEQ and $ACC\_MSG\_SEQ_s$ are equal and are not NULL, the mobile station shall disable the *System Access State* timer and do one of the following:

- If PAGED is equal to YES or if this substate was entered with a page response indication, the mobile station shall determine whether the message resulting in the page match was received on the current Paging Channel. If the message was received on the current Paging Channel, the mobile station shall enter the *Page Response Substate*; otherwise the mobile station shall enter the *Mobile Station Idle State*.
- If this substate was entered with a page response retransmission indication, the mobile station shall enter the *Page Response Substate*.
- If this substate was entered with an origination indication, the mobile station shall enter the *Mobile Station Origination Attempt Substate*.
- If this substate was entered with an order/message response indication, the mobile station shall determine whether the message resulting in the response was received on the current Paging Channel. If the message was received on the current Paging Channel, the mobile station shall enter the *Mobile Station Order/Message Response Substate*; otherwise the mobile station shall discard the response and enter the *Mobile Station Idle State*.
- If this substate was entered with a registration indication, the mobile station shall enter the *Registration Access Substate*.
- If this substate was entered with a message transmission indication, the mobile station shall enter the *Mobile Station Message Transmission Substate*.

6.6.3.3 Page Response Substate

In this substate, the mobile station sends a *Page Response Message* in response to a *Page Message* or *Slotted Page Message* from the base station. If the base station responds to the *Page Response Message* with an authentication request, the mobile station responds in this substate.

Upon entering the *Page Response Substate*, the mobile station shall send a *Page Response Message*, using the access procedures specified in 6.6.3.1.1.2. If message authentication is enabled (see 6.3.12.1), the mobile station shall calculate the values of the AUTHR and RANDC fields using the current value of $RAND_S$.

While in this substate, the mobile station shall monitor the Paging Channel. If the mobile station declares a loss of the Paging Channel (see 6.4.3), it shall disable its transmitter and enter the *Mobile Station Idle State*. If the mobile station receives an acknowledgement to any message sent by the mobile station in this substate, the mobile station shall end the access attempt. If the acknowledgement was not included in a *Channel Assignment*

Message, Authentication Challenge Message, Base Station Challenge Confirmation Order, or *SSD Update Message*, the mobile station shall set the *System Access State* timer to T_{42m}.

If the access attempt for the *Page Response Message* ends by the receipt of an acknowledgement from the base station, the mobile station shall update its registration variables as specified in 6.6.5.5.3.1.

If the *System Access State* timer expires while in this substate, the mobile station shall enter the *Mobile Station Idle State*.

If the mobile station receives any of the following messages addressed to the mobile station, then the mobile station shall process the message as described.

1. *Authentication Challenge Message*: If the mobile station receives this message while an access attempt is in progress, the mobile station shall ignore the message. If the mobile station receives this message after the acknowledgement to any message sent by the mobile station in this substate, or if the acknowledgment is included in this message, the mobile station shall disable the *System Access State* timer and respond to the message as specified in 6.3.12.1.5, using the access procedures specified in 6.6.3.1.1.2.

2. *Base Station Challenge Confirmation Order*: If the mobile station receives this message while an access attempt is in progress, the mobile station shall ignore the message. If the mobile station receives this message after the acknowledgement to any message sent by the mobile station in this substate, or if the acknowledgment is included in this message, the mobile station shall disable the *System Access State* timer and respond to the message as specified in 6.3.12.1.9, using the access procedures specified in 6.6.3.1.1.2.

3. *Channel Assignment Message*: The mobile station shall terminate any access attempt in progress. It shall then process the message as follows:

   If $ASSIGN\_MODE_r$ equals '000', the mobile station shall store the Forward Traffic Channel code channel ($CODE\_CHAN_s = CODE\_CHAN_r$), the frame offset ($FRAME\_OFFSET_s = FRAME\_OFFSET_r$), the message encryption mode indicator ($ENCRYPT\_MODE_s = ENCRYPT\_MODE_r$), and, if $FREQ\_INCL_r$ equals '1', the frequency assignment ($CDMACH_s = CDMA\_FREQ_r$), and then enter the *Traffic Channel Initialization Substate* of the *Mobile Station Control on the Traffic Channel State*.

   If $ASSIGN\_MODE_r$ equals '001', the mobile station shall perform the following actions: If a CDMA channel (CDMA_FREQ) is listed in the assignment, the mobile station shall set $CDMACH_s = CDMA\_FREQ_r$ and shall tune to the new frequency assignment. The mobile station shall set $ACC\_MSG\_SEQ_s$ to NULL (see 6.6.2.2) and shall set $PILOT\_PN_s$ to the pilot PN sequence offset of the strongest pilot in the list ($PILOT\_PN_r$). If the mobile station has not stored configuration parameters for the Primary Paging Channel of the new base station, or if the stored information is not current (see 6.6.2.2), the mobile station shall set $CONFIG\_MSG\_SEQ_s$, $SYS\_PAR\_MSG\_SEQ_s$, $NGHBR\_LST\_MSG\_SEQ_s$, and $CHAN\_LST\_MSG\_SEQ_s$ to NULL. The mobile station shall then begin monitoring the Primary Paging Channel of the selected base station. If $RESPOND_r$ is equal to '1', the mobile station shall enter the *Update Overhead Information Substate* with a page response retransmission indication. If $RESPOND_r$ is equal to '0', the mobile station shall enter the *Mobile Station Idle State*.

If $ASSIGN\_MODE_r$ equals '010' and $RESPOND_r$ equals '1', the mobile station shall enter the Initialization Task with a page response indication (see 2.6.1).

If $ASSIGN\_MODE_r$ equals '010' and $RESPOND_r$ equals '0', the mobile station shall enter the Initialization Task (see 2.6.1) with a wait for page indication.

If $ASSIGN\_MODE_r$ equals '011', the mobile station shall store the system identification ($SID_s = SID_r$), voice mobile station attenuation code ($VMAC_s = VMAC_r$), voice channel number ($ANALOG\_CHAN_s = ANALOG\_CHAN_r$), SAT color code ($SCC_s = SCC_r$), and message encryption mode indicator ($MEM_s = MEM_r$) and enter the Confirm Initial Voice Channel Task (see 2.6.4.2) with a page response indication.

4. Feature Notification Message

5. Local Control Order

6. Lock Until Power-Cycled Order: The mobile station shall disable its transmitter and record the reason for the *Lock Until Power-Cycled Order* in the mobile station's semi-permanent memory ($LCKRSN\_P_{s-p}$ equals the least-significant four bits of $ORDQ_r$). The mobile station should notify the user of the locked condition. The mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*, and shall not enter the *System Access State* again until after the next mobile station power-up or until it has received an *Unlock Order*. This requirement shall take precedence over any other mobile station requirement specifying entry to the *System Access State*.

7. Maintenance Required Order: The mobile station shall record the reason for the *Maintenance Required Order* in the mobile station's semi-permanent memory ($MAINTRSN_{s-p}$ equals the least-significant four bits of $ORDQ_r$). The mobile station shall remain in the unlocked condition. The mobile station should notify the user of the maintenance required condition.

8. Release Order: The mobile station shall enter the *Mobile Station Idle State* or the *System Determination Substate* of the *Mobile Station Initialization State*.

9. SSD Update Message: If the mobile station receives this message while an access attempt is in progress, the mobile station shall ignore the message. If the mobile station receives this message after the acknowledgement to any message sent by the mobile station in this substate, or if the acknowledgment is included in this message, the mobile station shall disable the *System Access State* timer and respond to the message as specified in 6.3.12.1.9, using the access procedures specified in 6.6.3.1.1.2.

10. Any other message: If the mobile station receives any other message with a MSG_TYPE specified in Table 7.7.2.3-1, it shall process all layer 2 fields of the message and may ignore all other fields. The mobile station may ignore all other messages.

6.6.3.4 Mobile Station Order/Message Response Substate

In this substate, the mobile station sends a message that is a response to a message received from the base station. If the base station responds to the mobile station's message with an authentication request, the mobile station responds in this substate.

Upon entering the *Mobile Station Order/Message Response Substate*, the mobile station shall send the response message using the access procedures specified in 6.6.3.1.1.2.

While in this substate, the mobile station shall monitor the Paging Channel. If the mobile station declares a loss of the Paging Channel (see 6.4.3), it shall disable its transmitter and enter the *Mobile Station Idle State*. If the mobile station receives an acknowledgement to any message sent by the mobile station in this substate, it shall end the access attempt. If the acknowledgement was not included in an *Authentication Challenge Message*, *Base Station Challenge Confirmation Order*, or *SSD Update Message*, the mobile station shall enter the *Mobile Station Idle State*.

If the mobile station receives any of the following messages addressed to the mobile station, then the mobile station shall process the message as follows:

1. *Authentication Challenge Message*: If the mobile station receives this message while an access attempt is in progress, the mobile station shall ignore the message. If the mobile station receives this message after the acknowledgement to any message sent by the mobile station in this substate, or if the acknowledgment is included in this message, the mobile station shall respond to the message as specified in 6.3.12.1.5, using the access procedures specified in 6.6.3.1.1.2.

2. *Base Station Challenge Confirmation Order*: If the mobile station receives this message while an access attempt is in progress, the mobile station shall ignore the message. If the mobile station receives this message after the acknowledgement to any message sent by the mobile station in this substate, or if the acknowledgment is included in this message, the mobile station shall respond to the message as specified in 6.3.12.1.9, using the access procedures specified in 6.6.3.1.1.2.

3. *Feature Notification Message*

4. *Local Control Order*

5. *Lock Until Power-Cycled Order*: The mobile station shall disable its transmitter and record the reason for the *Lock Until Power-Cycled Order* in the mobile station's semi-permanent memory ($LCKRSN\_P_{S-p}$ equals the least-significant four bits of $ORDQ_r$). The mobile station should notify the user of the locked condition. The mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*, and shall not enter the *System Access State* again until after the next mobile station power-up or until it has received an *Unlock Order*. This requirement shall take precedence over any other mobile station requirement specifying entry to the *System Access State*.

6. *Maintenance Required Order*: The mobile station shall record the reason for the *Maintenance Required Order* in the mobile station's semi-permanent memory ($MAINTRSN_{S-p}$ equals the least-significant four bits of $ORDQ_r$). The mobile station

shall remain in the unlocked condition. The mobile station should notify the user of the maintenance required condition.

7. *SSD Update Message*: If the mobile station receives this message while an access attempt is in progress, the mobile station shall ignore the message. If the mobile station receives this message after the acknowledgement to any message sent by the mobile station in this substate, or if the acknowledgment is included in this message, the mobile station shall respond to the message as specified in 6.3.12.1.9, using the access procedures specified in 6.6.3.1.1.2.

8. *Any other message*: If the mobile station receives any other message with a MSG_TYPE specified in Table 7.7.2.3-1, it shall process all layer 2 fields of the message and may ignore all other fields. The mobile station may ignore all other messages.

6.6.3.5 Mobile Station Origination Attempt Substate

In this substate, the mobile station sends an *Origination Message*. If the base station responds to the *Origination Message* with an authentication request, the mobile station responds in this substate.

Upon entering the *Mobile Station Origination Attempt Substate*, the mobile station shall send the *Origination Message* using the access procedures specified in 6.6.3.1.1.2. The mobile station shall include in the *Origination Message* as many of the dialed digits as possible without exceeding the message capsule size. If message authentication is enabled (see 6.3.12.1), the mobile station shall calculate the values of the AUTHR and RANDC fields using the current value of $RAND_s$.

While in this substate, the mobile station shall monitor the Paging Channel. If the mobile station declares a loss of the Paging Channel (see 6.4.3), it shall disable its transmitter and enter the *Mobile Station Idle State*. If the mobile station receives an acknowledgement to any message sent by the mobile station in this substate, it shall end the access attempt. If the acknowledgement was not included in a *Channel Assignment Message*, *Authentication Challenge Message*, *Base Station Challenge Confirmation Order*, or *SSD Update Message*, the mobile station shall set the *System Access State* timer to T_{42m}.

If the access attempt for the *Origination Message* ends by the receipt of an acknowledgement from the base station, the mobile station shall update its registration variables as specified in 6.6.5.5.3.1.

If the *System Access State* timer expires while in this substate, the mobile station shall enter the *Mobile Station Idle State*.

If the mobile station is directed by the user to disconnect the call, the mobile station shall abort any access attempt in progress and enter the *System Determination Substate* of the *Mobile Station Initialization State*.

If the mobile station receives any of the following messages addressed to the mobile station, then the mobile station shall process the message as follows

1. *Authentication Challenge Message*: If the mobile station receives this message while an access attempt is in progress, the mobile station shall ignore the message. If

the mobile station receives this message after the acknowledgement to any message sent by the mobile station in this substate, or if the acknowledgement is included in this message, the mobile station shall disable the *System Access State* timer and respond to the message as specified in 6.3.12.1.5, using the access procedures specified in 6.6.3.1.1.2.

2. *Base Station Challenge Confirmation Order*: If the mobile station receives this message while an access attempt is in progress, the mobile station shall ignore the message. If the mobile station receives this message after the acknowledgement to any message sent by the mobile station in this substate, or if the acknowledgement is included in this message, the mobile station shall disable the *System Access State* timer and respond to the message as specified in 6.3.12.1.9, using the access procedures specified in 6.6.3.1.1.2.

3. *Channel Assignment Message*: The mobile station shall terminate any access attempt in progress. It shall then process the message as follows:

   If $ASSIGN\_MODE_r$ equals '000', the mobile station shall store the Forward Traffic Channel code channel ($CODE\_CHAN_s = CODE\_CHAN_r$), the frame offset ($FRAME\_OFFSET_s = FRAME\_OFFSET_r$), the message encryption mode indicator ($ENCRYPT\_MODE_s = ENCRYPT\_MODE_r$), and, if $FREQ\_INCL_r$ equals '1', the frequency assignment ($CDMACH_s = CDMA\_FREQ_r$), and then enter the *Traffic Channel Initialization Substate* of the *Mobile Station Control on the Traffic Channel State*.

   If $ASSIGN\_MODE_r$ equals '001', the mobile station shall perform the following actions: If a CDMA channel (CDMA_FREQ) is specified in the assignment, the mobile station shall set $CDMACH_s = CDMA\_FREQ_r$ and shall tune to the new frequency assignment. The mobile station shall set $ACC\_MSG\_SEQ_s$ to NULL (see 6.6.2.2) and shall set $PILOT\_PN_s$ to the pilot PN sequence offset of the strongest pilot in the list ($PILOT\_PN_r$). If the mobile station has not stored configuration parameters for the Primary Paging Channel of the new base station, or if the stored information is not current (see 6.6.2.2), the mobile station shall set $CONFIG\_MSG\_SEQ_s$, $SYS\_PAR\_MSG\_SEQ_s$, $NGHBR\_LST\_MSG\_SEQ_s$, and $CHAN\_LST\_MSG\_SEQ_s$ to NULL. The mobile station shall then begin monitoring the Primary Paging Channel of the selected base station. If $RESPOND_r$ is equal to '1', the mobile station shall enter the *Update Overhead Information Substate* with an origination indication.

   If $ASSIGN\_MODE_r$ equals '010' and $RESPOND_r$ equals '1', the mobile station shall enter the Initialization Task with an origination indication (see 2.6.1).

   If $ASSIGN\_MODE_r$ equals '011', the mobile station shall store the system identification ($SID_s = SID_r$), voice mobile station attenuation code ($VMAC_s = VMAC_r$), voice channel number ($ANALOG\_CHAN_s = ANALOG\_CHAN_r$), SAT color code ($SCC_s = SCC_r$), and message encryption mode indicator ($MEM_s = MEM_r$) and enter the Confirm Initial Voice Channel Task (see 2.6.4.2) with an origination indication.

4. *Feature Notification Message*: If $RELEASE_r$ is equal to '1', the mobile station shall terminate any access attempt in progress and enter the *Mobile Station Idle State* or the *System Determination Substate* of the *Mobile Station Initialization State*. If $RELEASE_r$ is equal to '0', the mobile station shall reset the System Access State timer to T_{42m}.

5. *Intercept Order*: The mobile station shall terminate any access attempt in progress and enter the *Mobile Station Idle State*.

6. *Local Control Order*

7. *Lock Until Power-Cycled Order*: The mobile station shall disable its transmitter and record the reason for the *Lock Until Power-Cycled Order* in the mobile station's semi-permanent memory ($LCKRSN\_P_{s-p}$ equals the least-significant four bits of $ORDQ_r$). The mobile station should notify the user of the locked condition. The mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*, and shall not enter the *System Access State* again until after the next mobile station power-up or until it has received an *Unlock Order*. This requirement shall take precedence over any other mobile station requirement specifying entry to the *System Access State*.

8. *Maintenance Required Order*: The mobile station shall record the reason for the *Maintenance Required Order* in the mobile station's semi-permanent memory ($MAINTRSN_{s-p}$ equals the least-significant four bits of $ORDQ_r$). The mobile station shall remain in the unlocked condition. The mobile station should notify the user of the maintenance required condition.

9. *Release Order*: The mobile station shall enter the *Mobile Station Idle State* or the *System Determination Substate* of the *Mobile Station Initialization State*.

10. *Reorder Order*: The mobile station shall terminate any access attempt in progress and enter the *Mobile Station Idle State*.

11. *SSD Update Message*: If the mobile station receives this message while an access attempt is in progress, the mobile station shall ignore the message. If the mobile station receives this message after the acknowledgement to any message sent by the mobile station in this substate, or if the acknowledgement is included in this message, the mobile station shall disable the *System Access State* timer and respond to the message as specified in 6.3.12.1.9, using the access procedures specified in 6.6.3.1.1.2.

12. *Any other message*: If the mobile station receives any other message with a MSG_TYPE specified in Table 7.7.2.3-1, it shall process all layer 2 fields of the message and may ignore all other fields. The mobile station may ignore all other messages.

6.6.3.6 Registration Access Substate

In this substate, the mobile station sends a *Registration Message*. If the base station responds with an authentication request, the mobile station responds in this substate.

Upon entering the *Registration Access Substate*, the mobile station shall send the *Registration Message*, using the access procedures specified in 6.6.3.1.1.2. If message authentication is enabled (see 6.3.12.1), the mobile station shall calculate the values of the AUTHR and RANDC fields using the current value of $RAND_s$.

While in this substate, the mobile station shall monitor the Paging Channel. If the mobile station declares a loss of the Paging Channel (see 6.4.3), it shall disable its transmitter and enter the *Mobile Station Idle State*. If the mobile station receives an acknowledgement to any message sent by the mobile station in this substate, it shall end the access attempt. If the acknowledgement was not included in an *Authentication Challenge Message*, *Base Station Challenge Confirmation Order*, *SSD Update Message*, or *Release Order*, or if the registration access was initiated due to a user direction to power down, the mobile station shall do one of the following:

- If the registration access was initiated due to a user direction to power down, the mobile station shall update registration variables as specified in 6.6.5.5.3.3 and may power down.
- Otherwise, the mobile station shall enter the *Mobile Station Idle State*.

If the access attempt for a *Registration Message* ends by the receipt of an acknowledgement from the base station, the mobile station shall update its registration variables as specified in 6.6.5.5.3.1.

If the mobile station is directed by the user to originate a call, the mobile station may abort any access attempt in progress and enter the *Mobile Station Origination Attempt Substate*.

If the mobile station receives a *Page Message* or a *Slotted Page Message*, the mobile station may compare its MIN with the MIN in each record of the message. If a match is declared (see 6.6.2.3), the mobile station shall abort any access attempt in progress and enter the *Page Response Substate*.

If the mobile station receives any of the following messages addressed to the mobile station, then the mobile station shall process the message as described.

1. *Authentication Challenge Message*: If the mobile station receives this message while an access attempt is in progress, or if the registration access was initiated due to a user direction to power down, the mobile station shall ignore the message. If the mobile station receives this message after the acknowledgement to any message sent by the mobile station in this substate, or if the acknowledgement is included in this message, the mobile station shall respond to the message as specified in 6.3.12.1.5, using the access procedures specified in 6.6.3.1.1.2.

2. *Base Station Challenge Confirmation Order*: If the mobile station receives this message while an access attempt is in progress, or if the registration access was initiated due to a user direction to power down, the mobile station shall ignore the message. If the mobile station receives this message after the acknowledgement to any message sent by the mobile station in this substate, or if the acknowledgement is included in this message, the mobile station shall respond to the message as specified in 6.3.12.1.9, using the access procedures specified in 6.6.3.1.1.2.

3. *Feature Notification Message*

4. *Local Control Order*

5. *Lock Until Power-Cycled Order*: The mobile station shall disable its transmitter and record the reason for the *Lock Until Power-Cycled Order* in the mobile station's semi-permanent memory (LCKRSN_P$_{s-p}$ equals the least-significant four bits of ORDQ$_r$). The mobile station should notify the user of the locked condition. The mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*, and shall not enter the *System Access State* again until after the next mobile station power-up or until it has received an *Unlock Order*. This requirement shall take precedence over any other mobile station requirement specifying entry to the *System Access State*.

6. *Maintenance Required Order*: The mobile station shall record the reason for the *Maintenance Required Order* in the mobile station's semi-permanent memory (MAINTRSN$_{s-p}$ equals the least-significant four bits of ORDQ$_r$). The mobile station shall remain in the unlocked condition. The mobile station should notify the user of the maintenance required condition.

7. *Registration Accepted Order*

8. *Registration Rejected Order*

9. *Release Order*: The mobile station shall enter the *Mobile Station Idle State* or the *System Determination Substate* of the *Mobile Station Initialization State*.

10. *SSD Update Message*: If the mobile station receives this message while an access attempt is in progress, or if the registration access was initiated due to a user direction to power down, the mobile station shall ignore the message. If the mobile station receives this message after the acknowledgement to any message sent by the mobile station in this substate, or if the acknowledgement is included in this message, the mobile station shall respond to the message as specified in 6.3.12.1.9, using the access procedures specified in 6.6.3.1.1.2.

11. *Any other message*: If the mobile station receives any other message with a MSG_TYPE specified in Table 7.7.2.3-1, it shall process all layer 2 fields of the message and may ignore all other fields. The mobile station may ignore all other messages.

6.6.3.7 Mobile Station Message Transmission Substate

In this substate, the mobile station sends a *Data Burst Message*. If the base station responds with an authentication request, the mobile station responds in this substate.

Support of this substate is optional.

Upon entering the *Mobile Station Message Transmission Substate*, the mobile station shall transmit the *Data Burst Message* using the access procedures specified in 6.6.3.1.1.2.

While in this substate, the mobile station shall monitor the Paging Channel. If the mobile station declares a loss of the Paging Channel (see 6.4.3), it shall disable its transmitter and enter the *Mobile Station Idle State*. If the mobile station receives an acknowledgement to any message sent by the mobile station in this substate, it shall end the access attempt. If the acknowledgement was not included in an *Authentication Challenge Message*, *Base Station Challenge Confirmation Order*, or *SSD Update Message*, the mobile station shall enter the *Mobile Station Idle State*.

If the mobile station receives a *Page Message* or a *Slotted Page Message*, the mobile station may compare its MIN with the MIN in each record of the message. If a match is declared (see 6.6.2.3), the mobile station shall abort any access attempt in progress and enter the *Page Response Substate*. The mobile station may store the message for later transmission.

If the mobile station receives any of the following messages addressed to the mobile station, then the mobile station shall process the message as described.

1. *Authentication Challenge Message*: If the mobile station receives this message while an access attempt is in progress, the mobile station shall ignore the message. If the mobile station receives this message after the acknowledgement to any message sent by the mobile station in this substate, or if the acknowledgement is included in this message, the mobile station shall respond to the message as specified in 6.3.12.1.5, using the access procedures specified in 6.6.3.1.1.2.

2. *Base Station Challenge Confirmation Order*: If the mobile station receives this message while an access attempt is in progress, the mobile station shall ignore the message. If the mobile station receives this message after the acknowledgement to any message sent by the mobile station in this substate, or if the acknowledgement is included in this message, the mobile station shall respond to the message as specified in 6.3.12.1.9, using the access procedures specified in 6.6.3.1.1.2.

3. *Data Burst Message*

4. *Local Control Order*

5. *Lock Until Power-Cycled Order*: The mobile station shall disable its transmitter and record the reason for the *Lock Until Power-Cycled Order* in the mobile station's semi-permanent memory ($LCKRSN\_P_{s-p}$ equals the least-significant four bits of $ORDQ_r$). The mobile station should notify the user of the locked condition. The mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*, and shall not enter the *System Access State* again until after the next mobile station power-up or until it has received an *Unlock Order*. This requirement shall take precedence over any other mobile station requirement specifying entry to the *System Access State*.

6. *Maintenance Required Order*: The mobile station shall record the reason for the *Maintenance Required Order* in the mobile station's semi-permanent memory ($MAINTRSN_{s-p}$ equals the least-significant four bits of $ORDQ_r$). The mobile station shall remain in the unlocked condition. The mobile station should notify the user of the maintenance required condition.

7. *SSD Update Message*: If the mobile station receives this message while an access attempt is in progress, the mobile station shall ignore the message. If the mobile station receives this message after the acknowledgement to any message sent by the mobile station in this substate, or if the acknowledgement is included in this

message, the mobile station shall respond to the message as specified in 6.3.12.1.9, using the access procedures specified in 6.6.3.1.1.2.

8. *Any other message*: If the mobile station receives any other message with a MSG_TYPE specified in Table 7.7.2.3-1, it shall process all layer 2 fields of the message and may ignore all other fields. The mobile station may ignore all other messages.

6.6.4 Mobile Station Control on the Traffic Channel State

In this state, the mobile station communicates with the base station using the Forward and Reverse Traffic Channels.

As illustrated in Figure 6.6.4-1, the *Mobile Station Control on the Traffic Channel State* consists of the following substates:

- *Traffic Channel Initialization Substate* - In this substate, the mobile station verifies that it can receive the Forward Traffic Channel and begins transmitting on the Reverse Traffic Channel.
- *Waiting for Order Substate* - In this substate, the mobile station waits for an *Alert With Information Message.*
- *Waiting for Mobile Station Answer Substate* - In this substate, the mobile station waits for the user to answer the call.
- *Conversation Substate* - In this substate, the mobile station's primary service option application exchanges primary traffic packets with the base station.
- *Release Substate* - In this substate, the mobile station disconnects the call.

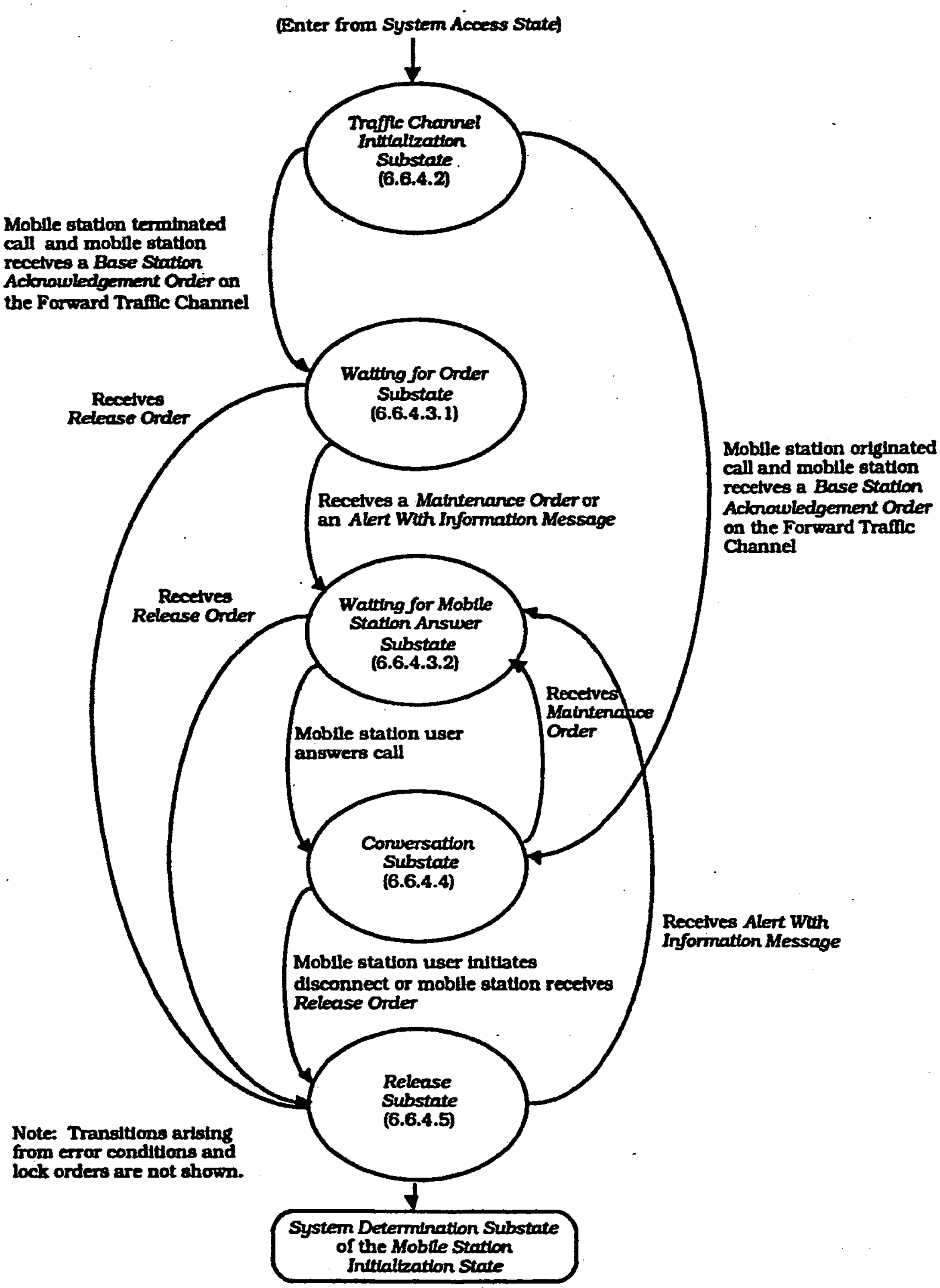


Figure 6.6.4-1. Mobile Station Control on the Traffic Channel State

6.6.4.1 Special Functions and Actions

The mobile station performs the following special functions and actions in one or more of the substates of the *Mobile Station Control on the Traffic Channel State*.

6.6.4.1.1 Forward Traffic Channel Power Control

To support Forward Traffic Channel power control, the mobile station reports frame error rate statistics to the base station. If the base station enables periodic reporting, the mobile station reports frame error rate statistics at specified intervals. If the base station enables threshold reporting, the mobile station reports frame error rate statistics when the frame error rate reaches a specified threshold.[16]

The mobile station shall maintain a counter (TOT_FRAMES_s) for the total number of received frames and a counter (BAD_FRAMES_s) for the number of received bad frames, where bad frames are defined as frame categories 9 and 10 (see 6.2.2.2).

The mobile station shall perform the following for each received frame:

- The mobile station shall increment TOT_FRAMES_s by 1.
- If the received frame is bad, the mobile station shall increment BAD_FRAMES_s by 1.
- If either
  - $PWR\_THRESH\_ENABLE_s$ is equal to '1' and BAD_FRAMES_s is equal to $PWR\_REP\_THRESH_s$ or
  - $PWR\_PERIOD\_ENABLE_s$ is equal to '1' and TOT_FRAMES_s is equal to $\lfloor(2^{(PWR\_REP\_FRAMES_s/2)} \times 5)\rfloor$,

  the mobile station shall send a *Power Measurement Report Message* to the base station.
- If TOT_FRAMES_s is equal to $\lfloor(2^{(PWR\_REP\_FRAMES_s/2)} \times 5)\rfloor$, the mobile station shall set TOT_FRAMES_s and BAD_FRAMES_s to zero.

After sending a *Power Measurement Report Message*, the mobile station shall set TOT_FRAMES_s and BAD_FRAMES_s to zero and shall not increment either counter for a period of $PWR\_REP\_DELAY_s \times 4$ frames following the first transmission of the message.

6.6.4.1.1.1 Forward Traffic Channel Power Control Initialization

To initialize Forward Traffic Channel power control, the mobile station shall set TOT_FRAMES_s and BAD_FRAMES_s to zero.

6.6.4.1.1.2 Processing the Power Control Parameters Message

The mobile station shall store the following parameters from the *Power Control Parameters Message*:

[16]Both periodic and threshold reporting may be enabled simultaneously, either one of them may be enabled, or both forms of reporting may be disabled at any given time.

- Power control reporting threshold ($PWR\_REP\_THRESH_s$ = $PWR\_REP\_THRESH_r$)
- Power control reporting frame count ($PWR\_REP\_FRAMES_s$ = $PWR\_REP\_FRAMES_r$)
- Threshold report mode indicator ($PWR\_THRESH\_ENABLE_s$ = $PWR\_THRESH\_ENABLE_r$)
- Periodic report mode indicator ($PWR\_PERIOD\_ENABLE_s$ = $PWR\_PERIOD\_ENABLE_r$)
- Power report delay ($PWR\_REP\_DELAY_s$ = $PWR\_REP\_DELAY_r$)

The mobile station shall set TOT_FRAMES_s and BAD_FRAMES_s to zero.

6.6.4.1.2 Service Options

6.6.4.1.2.1 Overview

During Traffic Channel operation, the mobile station and base station may support primary traffic services. Each such service, referred to as a service option, has a set of requirements that govern the way in which the primary traffic bits (see 7.1.3.5.11 and 6.1.3.3.11) from forward and reverse Traffic Channel frames are processed by the mobile station and base station.

Either the mobile station or base station can request a service option. The mobile station can request a particular service option at the time of call origination, when responding to a page, or during Traffic Channel operation. If the service option request is acceptable to the base station, the mobile station and base station begin using the new service option. If the mobile station requests a service option that is not acceptable to the base station, the base station can reject the requested service option or request an alternative service option. If the base station requests an alternative service option, the mobile station can accept or reject the base station's alternative service option, or request another service option. This process, called service option negotiation, ends when the mobile station and base station find a mutually acceptable service option, or when the mobile station rejects a service option request from the base station or the base station rejects a service option request from the mobile station.

The mobile station and base station use the *Service Option Request Order* either to request a service option or suggest an alternative service option, and the *Service Option Response Order* to accept or reject a service option request. In addition, the mobile station can request a service option in the *Origination Message* or the *Page Response Message*, and the base station can request a service option in the *Page Message* or the *Slotted Page Message*. The mobile station and base station use the *Service Option Control Order* to invoke service option specific functions.

The mobile station uses a variable (SO_REQ_s) to record the number of the service option for which the mobile station has sent an outstanding request, either in an *Origination Message*, a *Page Response Message*, or a *Service Option Request Order*. SO_REQ_s is set to a special value, NULL, when the mobile station does not have an outstanding service option request. The mobile station uses another variable (SO_CUR_s) to record the number of the service option which is currently active. SO_CUR_s is set to NULL when there is no active service option.

6.6.4.1.2.2 Requirements

6.6.4.1.2.2.1 Processing the *Service Option Request Order*

When the mobile station receives a *Service Option Request Order*, it shall perform the following:

- If the mobile station accepts the requested service option, the mobile station shall set SO_REQ_s to NULL and shall send a *Service Option Response Order* accepting the requested service option within T_{58m} seconds. The mobile station shall interpret the message action time of the *Service Option Request Order* in accordance with the requirements for the requested service option and shall begin using the requested service option in accordance with those requirements. The mobile station shall set SO_CUR_s to the requested service option number when the service option becomes active.
- If the mobile station does not accept the requested service option and has an alternative service option to request, the mobile station shall set SO_REQ_s to the alternative service option number and shall send a *Service Option Request Order* requesting the alternative service option within T_{58m} seconds.
- If the mobile station does not accept the requested service option and does not have an alternative service option to request, the mobile station shall set SO_REQ_s to NULL and shall send a *Service Option Response Order* to reject the request within T_{58m} seconds. The mobile station shall continue to process primary traffic as it did prior to receiving the *Service Option Request Order* and shall remain in the current state.

6.6.4.1.2.2.2 Processing the *Service Option Response Order*

When the mobile station receives a *Service Option Response Order*, it shall perform the following:

- If the service option number specified in the order is equal to SO_REQ_s, the mobile station shall set SO_REQ_s to NULL. The mobile station shall interpret the message action time of the *Service Option Response Order* in accordance with the requirements for the specified service option, and shall begin using the specified service option in accordance with those requirements. The mobile station shall set SO_CUR_s to the specified service option number when the service option becomes active.
- If the order indicates a service option rejection, the mobile station shall set SO_REQ_s to NULL. The mobile station shall continue to process primary traffic as it did prior to receiving the *Service Option Response Order* and shall remain in the current state.
- If the order does not indicate a service option rejection and the service option specified in the order is not equal to SO_REQ_s, the mobile station shall set SO_REQ_s to NULL and shall send a *Mobile Station Reject Order* (ORDQ = '00000100') within T_{58m} seconds. The mobile station shall continue to process primary traffic as it did

prior to receiving the *Service Option Response Order* and shall remain in the current state.

6.6.4.1.2.2.3 Processing the Received *Service Option Control Order*

If there is an active service option (SO_CUR_s is not equal to NULL), the mobile station shall interpret the message action time of the *Service Option Control Order* in accordance with the requirements for the active service option and shall process the *Service Option Control Order* in accordance with those requirements; otherwise, the mobile station shall send a *Mobile Station Reject Order* (ORDQ = '00000001') within T_{56m} seconds.

6.6.4.1.2.2.4 Service Option Request Initialization

To perform service option request initialization, the mobile station shall set SO_REQ_s to the specified service option number.

6.6.4.1.3 Acknowledgement Procedures

The acknowledgement procedures facilitate the reliable exchange of messages between the base station and the mobile station. The mobile station uses the fields ACK_SEQ (acknowledgement sequence number), MSG_SEQ (message sequence number) and ACK_REQ (acknowledgement required indicator) to detect duplicate messages and provide a reference for acknowledgements. These message fields are referred to as layer 2 fields, and the acknowledgement procedures are referred to as layer 2 procedures. All other message fields are referred to as layer 3 fields, and the processing of layer 3 fields is referred to as layer 3 processing. (See Appendix C for further discussion of layering.)

On both the Forward Traffic Channel and the Reverse Traffic Channel, the procedure for messages requiring acknowledgement is a selective repeat scheme in which a message is retransmitted only if an acknowledgement for it is not received.

6.6.4.1.3.1 Messages Requiring Acknowledgement

A Traffic Channel message requires acknowledgement when the ACK_REQ field is set to '1'.

6.6.4.1.3.1.1 Transmitting Messages and Receiving Acknowledgements

The Layer 2 protocol does not guarantee delivery of messages in any order. If the mobile station requires that the base station receive a set of messages in a certain order, the mobile station must wait for an acknowledgement to each message before transmitting the next message in the set. For messages requiring acknowledgement whose relative ordering is not important, the mobile station may transmit up to four such messages before receiving an acknowledgement for the first message.

The mobile station shall store a message sequence number for messages requiring acknowledgement ($MSG\_SEQ\_ACK_s$). The mobile station shall store an acknowledgement status indicator ($ACK\_WAITING_s[n]$, where n is 0 through 7) for each possible value of the Reverse Traffic Channel message MSG_SEQ field. The mobile station shall not send a new message requiring acknowledgement when $ACK\_WAITING_s[(MSG\_SEQ\_ACK_s + 4) \bmod 8]$ is equal to YES.

The mobile station shall perform the following procedures:

- When the mobile station receives any message on the Forward Traffic Channel, it shall set $ACK\_WAITING_s[ACK\_SEQ_r]$ to NO.
- When the mobile station sends a new message requiring acknowledgement on the Reverse Traffic Channel, it shall set $ACK\_WAITING_s[MSG\_SEQ\_ACK_s]$ to YES and shall set the MSG_SEQ field of the message to $MSG\_SEQ\_ACK_s$. The mobile station shall then increment $MSG\_SEQ\_ACK_s$, modulo 8.

The mobile station shall not retransmit a message for which it has received an acknowledgement.

If the mobile station has not received an acknowledgement within T_{1m} seconds after transmitting the message, the mobile station shall retransmit the message (see Figure 6.6.4.1.3.1.1-1). If the mobile station retransmits a message, the mobile station shall use the same MSG_SEQ number for the retransmission. The mobile station shall not retransmit a message sooner than T_{1m} seconds after the previous transmission of the same message.

The mobile station shall store a retransmission counter ($RETRY\_COUNT_s$) for each transmitted message requiring acknowledgement. The mobile station shall set $RETRY\_COUNT_s$ to zero prior to the first transmission of the message. After each transmission of the message, the mobile station shall increment $RETRY\_COUNT_s$ if no acknowledgement is received. When $RETRY\_COUNT_s$ is equal to N_{1m}, the mobile station shall declare an acknowledgement failure.

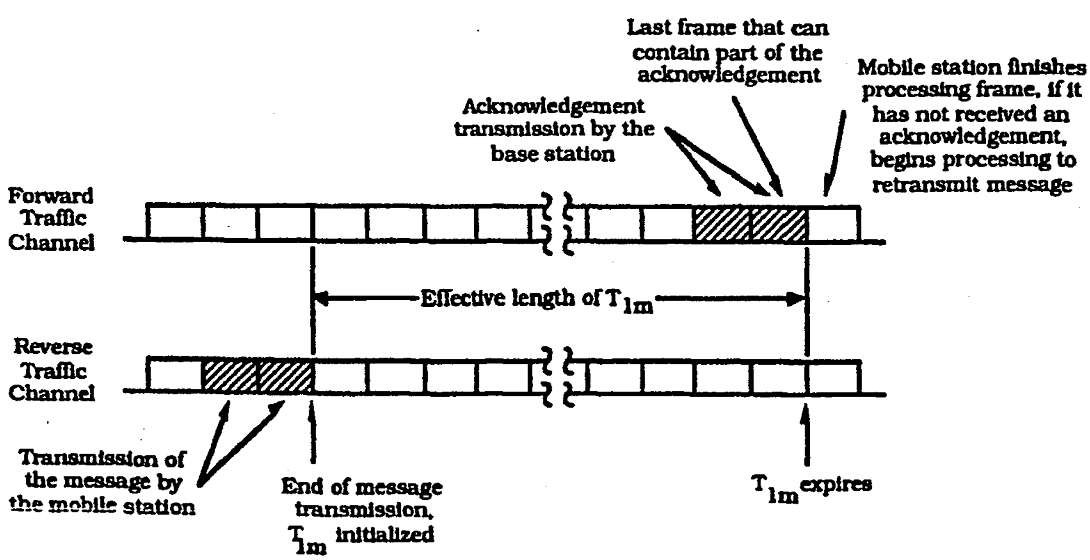


Figure 6.6.4.1.3.1.1-1. Time Limit for Acknowledgement of Reverse Traffic Channel Messages

6.6.4.1.3.1.2 Receiving Messages and Returning Acknowledgements

Messages received on the Forward Traffic Channel contain MSG_SEQ fields that are incremented by the same rules as messages transmitted on the Reverse Traffic Channel. Separate sequence numbers are maintained for Forward Traffic Channel Messages that require acknowledgement and for messages that do not require acknowledgement.

The mobile station acknowledges a received message by transmitting a message with the ACK_SEQ field set equal to the MSG_SEQ field of the received message. A message transmitted with the ACK_SEQ field set in this manner is referred to as including an acknowledgement of the received message.

Whenever a message requiring acknowledgement is received, the mobile station shall set the ACK_SEQ field of subsequent Reverse Traffic Channel messages to $\mathrm{MSG\_SEQ}_r$. If no message has been received, the mobile station shall set this field to '111'.

After receiving a message requiring acknowledgement, the mobile station shall transmit a message including an acknowledgement within T_{2m} seconds as shown in Figure 6.6.4.1.3.1.2-1.

When a received message requires acknowledgement and no message is available within T_{2m} seconds after the message is received, the mobile station shall transmit a *Mobile Station Acknowledgement Order* including the acknowledgement. The *Mobile Station Acknowledgement Order* shall be sent as a message not requiring acknowledgement.

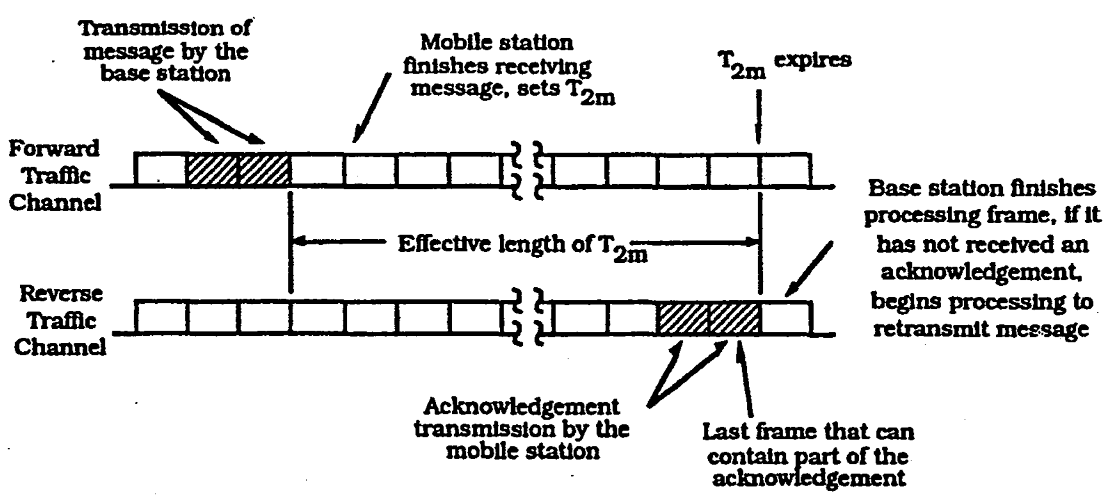


Figure 6.6.4.1.3.1.2-1. Time Limit for Acknowledgement of Forward Traffic Channel Messages

For duplicate message detection, the mobile station shall store a received status indicator for each possible value of the Forward Traffic Channel message MSG_SEQ field ($\mathrm{MSG\_SEQ\_RCVD}_s[n]$, where n is 0 through 7). The mobile station shall perform the following procedures:

- When a message requiring acknowledgement is received with message sequence number MSG_SEQ_r, and $MSG\_SEQ\_RCVD_s[MSG\_SEQ_r]$ is equal to NO, the mobile station shall process the message as a new message. The mobile station shall then set $MSG\_SEQ\_RCVD_s[MSG\_SEQ_r]$ to YES, and shall set $MSG\_SEQ\_RCVD_s[(4 + MSG\_SEQ_r) \bmod 8]$ to NO.
- When a message requiring acknowledgement is received with message sequence number MSG_SEQ_r, and $MSG\_SEQ\_RCVD_s[MSG\_SEQ_r]$ is equal to YES, the mobile station shall acknowledge the message but shall not perform any further processing of the message.

6.6.4.1.3.2 Messages Not Requiring Acknowledgement

A Traffic Channel message does not require acknowledgement when the ACK_REQ field is set to '0'.

The mobile station shall store a message sequence number for messages not requiring acknowledgement ($MSG\_SEQ\_NOACK_s$). For each new message sent that does not require acknowledgement, the mobile station shall set the MSG_SEQ field of the message to $MSG\_SEQ\_NOACK_s$ and shall then increment $MSG\_SEQ\_NOACK_s$, modulo 8.

The mobile station shall consider all messages received within T_{3m} seconds that do not require acknowledgement and have the same MSG_SEQ number to be duplicates, as shown in Figure 6.6.4.1.3.2-1. If the mobile station receives multiple copies of a message as determined by the MSG_SEQ number, it shall discard the duplicate copies.

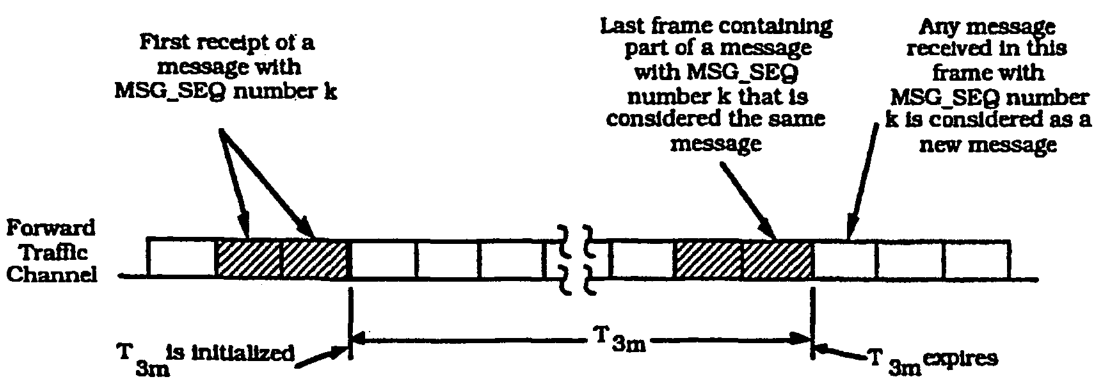


Figure 6.6.4.1.3.2-1. Time Window for Detecting Duplicate Messages not Requiring Acknowledgement

6.6.4.1.3.3 Acknowledgement Procedures Reset

The mobile station shall reset the acknowledgement procedures as follows:

- Message sequence number reset.
  - If $ACK\_WAITING_s[n]$ is equal to YES for any n, the mobile station should save the corresponding messages and retransmit them after completing the reset of the

acknowledgement procedures. For each such message the mobile station shall set the retransmission counter ($RETRY\_COUNT_s$) to zero.

- The mobile station shall set $MSG\_SEQ\_ACK_s$ to 0, $MSG\_SEQ\_NOACK_s$ to 0, and shall set $ACK\_WAITING_s[n]$ to NO for all values of n from 0 to 7.

- Acknowledgement sequence number reset. The mobile station shall set the ACK_SEQ field of all Reverse Traffic Channel messages to '111' until the first message requiring acknowledgement is received.
- Duplicate detection reset. The mobile station shall set $MSG\_SEQ\_RCVD_s[n]$ to NO for all values of n from 0 to 7.

6.6.4.1.4 Processing the *In-Traffic System Parameters Message*

The mobile station shall store the following parameters from the *In-Traffic System Parameters Message*:

- System identification ($SID_s = SID_r$)
- Network identification ($NID_s = NID_r$)
- Search window size for the Active Set and the Candidate Set ($SRCH\_WIN\_A_s = SRCH\_WIN\_A_r$)
- Search window size for the Neighbor Set ($SRCH\_WIN\_N_s = SRCH\_WIN\_N_r$)
- Search window size for the Remaining Set ($SRCH\_WIN\_R_s = SRCH\_WIN\_R_r$)
- Pilot detection threshold ($T\_ADD_s = T\_ADD_r$)
- Pilot drop threshold $T\_DROP_s = T\_DROP_r$)
- Active Set versus Candidate Set comparison threshold ($T\_COMP_s = T\_COMP_r$)
- Drop timer value ($T\_TDROP_s = T\_TDROP_r$)
- Maximum age for retention of Neighbor Set members ($NGHBR\_MAX\_AGE_s = NGHBR\_MAX\_AGE_r$)

The mobile station shall determine its roaming status (see 6.6.5.3). The mobile station should indicate to the user whether the mobile station is roaming.

6.6.4.1.5 Message Action Times

A message without a USE_TIME field or with a USE_TIME field set to '0' has an implicit action time. A message whose USE_TIME field is set to '1' has an explicit action time which is specified in the ACTION_TIME field of the message. A message with a future action time is called a pending message.

Unless otherwise specified, a message having an implicit action time shall take effect no later than the first 80 ms boundary (relative to System Time) occurring at least 80 ms after the end of the frame containing the last bit of the message. A message with an explicit action time shall take effect when System Time (in 80 ms units) modulo 64 becomes equal to the message's ACTION_TIME field. The difference in time between ACTION_TIME and the end of the frame containing the last bit of the message shall be at least 80 ms.

The mobile station shall support one pending message at any given time, not including pending *Service Option Control Orders*. The number of pending *Service Option Control Orders* that the mobile station is required to support is specific to the service option (see the relevant service option description).

6.6.4.1.6 Long Code Transition Request Processing

The mobile station performs these procedures upon receiving a *Long Code Transition Request Order*.

If the *Long Code Transition Request Order* requests a transition to the private long code, and the mobile station is able to generate the private long code (see 6.3.12.3), and the mobile station accepts the request, the mobile station shall send a *Long Code Transition Response Order* (ORDQ = '00000011') within T_{56m} seconds. The mobile station shall use the private long code on both the Forward Traffic Channel and the Reverse Traffic Channel. If USE_TIME equals '0', the mobile station shall begin using the private long code at the first 80 ms boundary (relative to the start of System Time) after N_{4m} frames from the end of the response transmission. The mobile station should indicate to the user that the voice privacy mode is active. If the *Long Code Transition Request Order* requests a private long code transition, and the mobile station is not able to generate the private long code or the mobile station does not accept the request, the mobile station shall send a *Long Code Transition Response Order* (ORDQ = '00000010') within T_{56m} seconds.

If the *Long Code Transition Request Order* requests a transition to the public long code and the mobile station accepts the request, the mobile station shall send a *Long Code Transition Response Order* (ORDQ = '00000010') within T_{56m} seconds. The mobile station should indicate to the user that the voice privacy mode is inactive. If the *Long Code Transition Request Order* requests a public long code transition, and the mobile station does not accept the request, the mobile station shall send a *Long Code Transition Response Order* (ORDQ = '00000011') within T_{56m} seconds.

6.6.4.2 Traffic Channel Initialization Substate

In this substate, the mobile station verifies that it can receive the Forward Traffic Channel and begins transmitting on the Reverse Traffic Channel.

Upon entering the *Traffic Channel Initialization Substate*, the mobile station shall perform the following:

- The mobile station shall perform registration initialization as specified in 6.6.5.5.4.1.
- The mobile station shall reset the acknowledgement procedures as specified in 6.6.4.1.3.3.
- The mobile station shall initialize Forward Traffic Channel power control as specified in 6.6.4.1.1.1.
- The mobile station shall set SO_CUR_s to NULL to indicate that there is no active service option.

- If the call is mobile station originated and the *Origination Message* requests a special service option, the mobile station shall perform service option request initialization (see 6.6.4.1.2.2.4) specifying the special service option number.

- If the call is mobile station originated and the *Origination Message* does not request a special service option, the mobile station shall perform service option request initialization (see 6.6.4.1.2.2.4) specifying 1 (the default service option number).

- If the call is mobile station terminated, the mobile station shall perform service option request initialization (see 6.6.4.1.2.2.4) specifying the service option number requested in the *Page Response Message*.

While in the *Traffic Channel Initialization Substate*, the mobile station shall perform the following:

- The mobile station shall perform pilot strength measurements as specified in 6.6.6.2.2, but shall not send *Pilot Strength Measurement Messages*.

- The mobile station shall perform registration timer maintenance as specified in 6.6.5.5.4.2.

If the mobile station does not support the assigned CDMA Channel (see 6.2.1.1) or the assigned Forward Traffic code channel (see 7.1.3.1.8), the mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*.

If the mobile station supports the assigned CDMA Channel and the assigned Forward Traffic code channel, the mobile station shall perform the following:

- The mobile station shall tune to the assigned CDMA Channel.

- The mobile station shall set its code channel for the assigned Forward Traffic code channel.

- The mobile station shall set its Forward and Reverse Traffic Channel frame offsets to the assigned frame offset as determined by $FRAME\_OFFSET_s$.

- The mobile station shall set its Forward and Reverse Traffic Channel long code masks to the public long code mask (see 6.1.3.1.8).

If the mobile station does not receive N_{5m} consecutive good frames within T_{50m} seconds after entering this substate, the mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*.

If the mobile station receives N_{5m} consecutive good frames within T_{50m} seconds after entering this substate, the mobile station shall perform the following additional functions while it remains in the *Traffic Channel Initialization Substate*:

- The mobile station shall perform Forward Traffic Channel supervision as specified in 6.4.4. If a loss of the Forward Traffic Channel is declared, the mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*.

- The mobile station shall adjust its transmit power as specified in 6.1.2.3.

- The mobile station shall transmit the Traffic Channel preamble as specified in 6.1.3.3.2.3.

- The mobile station shall perform the acknowledgement procedures as specified in 6.6.4.1.3. If an acknowledgement failure is declared, the mobile station shall disable its transmitter and enter the *System Determination Substate* of the *Mobile Station Initialization State*.

If the mobile station does not receive a *Base Station Acknowledgement Order* within T_{51m} seconds after entering this substate, the mobile station shall disable its transmitter and enter the *System Determination Substate* of the *Mobile Station Initialization State*.

If the mobile station receives a *Base Station Acknowledgement Order* within T_{51m} seconds after entering this substate, the mobile station shall perform the following:

- If the call is mobile station terminated, the mobile station shall enter the *Waiting for Order Substate*.
- If the call is mobile station originated, the mobile station shall enter the *Conversation Substate*.

6.6.4.3 Alerting

6.6.4.3.1 Waiting for Order Substate

In this substate, the mobile station waits for an *Alert With Information Message*.

Upon entering the *Waiting for Order Substate*, the mobile station shall set the substate timer for T_{52m} seconds.

While in the *Waiting for Order Substate*, the mobile station shall perform the following:

- If the substate timer expires, the mobile station shall disable its transmitter and enter the *System Determination Substate* of the *Mobile Station Initialization State*.
- The mobile station shall perform Forward Traffic Channel supervision as specified in 6.4.4. If a loss of the Forward Traffic Channel is declared, the mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*.
- The mobile station shall adjust its transmit power as specified in 6.1.2.3.
- The mobile station shall perform Forward Traffic Channel power control as specified in 6.6.4.1.1.
- The mobile station shall perform handoff processing as specified in 6.6.6.
- If there is an active service option (SO_CUR_s is not equal to NULL), the mobile station shall process the received primary traffic bits in accordance with the requirements for the active service option; otherwise, the mobile station shall discard the received primary traffic bits.
- If there is an active service option (SO_CUR_s is not equal to NULL), the mobile station shall transmit primary traffic bits in accordance with the requirements for the active service option; otherwise, the mobile station shall transmit null Traffic Channel data.
- The mobile station shall perform registration timer maintenance as specified in 6.6.5.5.4.2.

- If the mobile station is directed by the user to transmit a message, the mobile station shall send a *Data Burst Message*.
- If the mobile station is directed by the user to request a service option, the mobile station shall perform service option request initialization (see 6.6.4.1.2.2.4) specifying the requested service option number, and shall send a *Service Option Request Order* (ORDQ = requested service option number).
- If there is an active service option (SO_CUR_s is not equal to NULL), the mobile station may send a *Service Option Control Order* (ORDQ = function code) to invoke a service option specific function in accordance with the requirements for the active service option.
- If the mobile station is directed by the user to request a private long code transition and has the long code mask (see 6.3.12.3), the mobile station shall send a *Long Code Transition Request Order* (ORDQ = '00000001') as a message requiring acknowledgement.
- If the mobile station is directed by the user to request a public long code transition, the mobile station shall send a *Long Code Transition Request Order* (ORDQ = '00000000') as a message requiring acknowledgement.
- If the mobile station is directed by the user to operate in analog mode, the mobile station shall send the *Request Analog Service Order* as a message requiring acknowledgement.
- If the mobile station is directed by the user to power down, the mobile station shall enter the *Release Substate* with a power-down indication (see 6.6.4.5).
- The mobile station shall perform the acknowledgement procedures as specified in 6.6.4.1.3. If an acknowledgement failure is declared, the mobile station shall disable its transmitter and enter the *System Determination Substate* of the *Mobile Station Initialization State*.
- If the mobile station receives a message which is included in the following list and every message field value is within its permissible range, the mobile station shall process the message as described below and in accordance with the message's action time (see 6.6.4.1.5).

  1. <u>*Alert With Information Message*</u>: If the message contains a Signal information record, the mobile station should alert the user in accordance with the Signal information record; otherwise, the mobile station should use Standard Alert as defined in 7.7.5.5. The mobile station shall enter the *Waiting for Mobile Station Answer Substate* (see 6.6.4.3.2).
  2. <u>*Analog Handoff Direction Message*</u>: The mobile station shall process the message as specified in 6.6.6.2.9, and enter the Waiting For Order Task (see 2.6.4.3.1) with a handoff from CDMA indication.
  3. <u>*Audit Order*</u>

4. Authentication Challenge Message: The mobile station shall reset the substate timer for T_{52m} seconds. The mobile station shall then process the message and respond as specified in 6.3.12.1.5 within T_{32m} seconds.

5. Base Station Acknowledgement Order

6. Base Station Challenge Confirmation Order: The mobile station shall reset the substate timer for T_{52m} seconds. The mobile station shall then process the message and respond with an *SSD Update Confirmation Order* or *SSD Update Rejection Order* as specified in 6.3.12.1.9 within T_{32m} seconds.

7. Data Burst Message

8. Handoff Direction Message: The mobile station shall process the message as specified in 6.6.6.2.5.1. The mobile station shall reset the substate timer for T_{52m} seconds.

9. In-Traffic System Parameters Message: The mobile station shall process the message as specified in 6.6.4.1.4.

10. Local Control Order

11. Lock Until Power-Cycled Order: The mobile station shall disable its transmitter and record the reason for the *Lock Until Power-Cycled Order* in the mobile station's semi-permanent memory ($LCKRSN\_P_{s-p}$ equals the least-significant four bits of $ORDQ_r$). The mobile station should notify the user of the locked condition. The mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*, and shall not enter the *System Access State* again until after the next mobile station power-up or until it has received an *Unlock Order*. This requirement shall take precedence over any other mobile station requirement specifying entry to the *System Access State*.

12. Long Code Transition Request Order: The mobile station shall process the message as specified in 6.6.4.1.6.

13. Maintenance Order: The mobile station shall enter the *Waiting for Mobile Station Answer Substate*.

14. Maintenance Required Order: The mobile station shall record the reason for the *Maintenance Required Order* in the mobile station's semi-permanent memory ($MAINTRSN_{s-p}$ equals the least-significant four bits of $ORDQ_r$). The mobile station shall remain in the unlocked condition. The mobile station should notify the user of the maintenance required condition.

15. Message Encryption Mode Order: The mobile station shall process the message as specified in 6.3.12.2.

16. Mobile Station Registered Message: The mobile station shall process the message as specified in 6.6.5.5.4.3.

17. Neighbor List Update Message: The mobile station shall process the message as specified in 6.6.6.2.6.3.

18. Parameter Update Order: The mobile station shall reset the substate timer for T_{52m} seconds. The mobile station shall increment $COUNT_{s-p}$ (see 2.3.12.1.3). The mobile station shall send a *Parameter Update Confirmation Order* within T_{56m} seconds. The mobile station shall set the ORDQ field of the *Parameter Update Confirmation Order* to the same value as the ORDQ field of the *Parameter Update Order.*

19. Pilot Measurement Request Order: The mobile station shall process the order as specified in 6.6.6.2.5.1.

20. Power Control Parameters Message: The mobile station shall process the message as specified in 6.6.4.1.1.2.

21. Release Order: The mobile station shall enter the *Release Substate* with a base station release indication (see 6.6.4.5).

22. Retrieve Parameters Message: The mobile station shall send, within T_{56m} seconds, a *Parameters Response Message.*

23. Service Option Control Order: The mobile station shall process the message as specified in 6.6.4.1.2.2.3.

24. Service Option Request Order: The mobile station shall process the message as specified in 6.6.4.1.2.2.1.

25. Service Option Response Order: The mobile station shall process the message as specified in 6.6.4.1.2.2.2.

26. Set Parameters Message: If the mobile station can set all of the parameters specified by the PARAMETER_ID fields in the message, the mobile station shall set them; otherwise, the mobile station shall send, within T_{56m} seconds, a *Mobile Station Reject Order.*

27. SSD Update Message: The mobile station shall reset the substate timer for T_{52m} seconds. The mobile station shall then process the message and respond with a *Base Station Challenge Order* as specified in 6.3.12.1.9 within T_{32m} seconds.

28. Status Request Order: The mobile station shall send, within T_{56m} seconds, a *Status Message.*

- If the mobile station receives any other message with a MSG_TYPE specified in Table 7.7.3.3-1, it shall process all layer 2 fields of the message. If the mobile station receives a message that is not included in the above list or cannot be processed, the mobile station shall discard the message and send a *Mobile Station Reject Order* (ORDQ set to the applicable reason code as determined from Table 6.7.3-1) within T_{56m} seconds.

6.6.4.3.2 Waiting for Mobile Station Answer Substate

In this substate, the mobile station waits for the user to answer the mobile station terminated call.

Upon entering the *Waiting for Mobile Station Answer Substate*, the mobile station shall set the substate timer for T_{53m} seconds.

While in the *Waiting for Mobile Station Answer Substate*, the mobile station shall perform the following:

- If the substate timer expires, the mobile station shall disable its transmitter and enter the *System Determination Substate* of the *Mobile Station Initialization State*.
- The mobile station shall perform Forward Traffic Channel supervision as specified in 6.4.4. If a loss of the Forward Traffic Channel is declared, the mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*.
- The mobile station shall adjust its transmit power as specified in 6.1.2.3.
- The mobile station shall perform Forward Traffic Channel power control as specified in 6.6.4.1.1.
- The mobile station shall perform handoff processing as specified in 6.6.6.
- If there is an active service option (SO_CUR_s is not equal to NULL), the mobile station shall process the received primary traffic bits in accordance with the requirements for the active service option; otherwise, the mobile station shall discard the received primary traffic bits.
- If there is an active service option (SO_CUR_s is not equal to NULL), the mobile station shall transmit primary traffic bits in accordance with the requirements for the active service option; otherwise, the mobile station shall transmit null Traffic Channel data.
- The mobile station shall perform registration timer maintenance as specified in 6.6.5.5.4.2.
- If the mobile station is directed by the user to answer the call, the mobile station shall send a *Connect Order* to the base station as a message requiring acknowledgement. The mobile station shall enter the *Conversation Substate*.
- If the mobile station is directed by the user to transmit a message, the mobile station shall send a *Data Burst Message*.
- If the mobile station is directed by the user to request a service option, the mobile station shall perform service option request initialization (see 6.6.4.1.2.2.4) specifying the requested service option number, and shall send a *Service Option Request Order* (ORDQ = requested service option number).
- If there is an active service option (SO_CUR_s is not equal to NULL), the mobile station may send a *Service Option Control Order* (ORDQ = function code) to invoke a service option specific function in accordance with the requirements for the active service option.
- If the mobile station is directed by the user to request a private long code transition and has the long code mask (see 6.3.12.3), the mobile station shall send a *Long Code Transition Request Order* (ORDQ = '00000001') as a message requiring acknowledgement.
- If the mobile station is directed by the user to request a public long code transition, the mobile station shall send a *Long Code Transition Request Order* (ORDQ = '00000000') as a message requiring acknowledgement.

- If the mobile station is directed by the user to operate in analog mode, the mobile station shall send the *Request Analog Service Order* as a message requiring acknowledgement.
- If the mobile station is directed by the user to power down, the mobile station shall enter the *Release Substate* with a power-down indication (see 6.6.4.5).
- The mobile station shall perform the acknowledgement procedures as specified in 6.6.4.1.3. If an acknowledgement failure is declared, the mobile station shall disable its transmitter and enter the *System Determination Substate* of the *Mobile Station Initialization State*.
- If the mobile station receives a message which is included in the following list and every message field value is within its permissible range, the mobile station shall process the message as described below and in accordance with the message's action time (see 6.6.4.1.5).

1. *Alert With Information Message*: The mobile station shall reset the substate timer for T_{53m} seconds. If the *Alert With Information Message* does not contain a Signal information record, the mobile station should use Standard Alert as defined in 7.7.5.5.
2. *Analog Handoff Direction Message*: The mobile station shall process the message as specified in 6.6.6.2.9 and enter the Waiting For Answer Task (see 2.6.4.3.2).
3. *Audit Order*
4. *Authentication Challenge Message*: The mobile station shall process the message and respond as specified in 6.3.12.1.5 within T_{32m} seconds.
5. *Base Station Acknowledgement Order*
6. *Base Station Challenge Confirmation Order*: The mobile station shall process the message and respond with an *SSD Update Confirmation Order* or *SSD Update Rejection Order* as specified in 6.3.12.1.9 within T_{32m} seconds.
7. *Data Burst Message*
8. *Handoff Direction Message*: The mobile station shall process the message as specified in 6.6.6.2.5.1.
9. *In-Traffic System Parameters Message*: The mobile station shall process the message as specified in 6.6.4.1.4.
10. *Local Control Order*
11. *Lock Until Power-Cycled Order*: The mobile station shall disable its transmitter and record the reason for the *Lock Until Power-Cycled Order* in the mobile station's semi-permanent memory ($LCKRSN\_P_{s-p}$ equals the least-significant four bits of $ORDQ_r$). The mobile station should notify the user of the locked condition. The mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*, and shall not enter the *System Access State* again until after the next mobile station power-up or until it has received

an *Unlock Order*. This requirement shall take precedence over any other mobile station requirement specifying entry to the *System Access State*.

12. *Long Code Transition Request Order*: The mobile station shall process the message as specified in 6.6.4.1.6.

13. *Maintenance Order*: The mobile station shall reset the substate timer for T_{53m} seconds.

14. *Maintenance Required Order*: The mobile station shall record the reason for the *Maintenance Required Order* in the mobile station's semi-permanent memory ($MAINTRSN_{s-p}$ equals the least-significant four bits of $ORDQ_r$). The mobile station shall remain in the unlocked condition. The mobile station should notify the user of the maintenance required condition.

15. *Message Encryption Mode Order*: The mobile station shall process the message as specified in 6.3.12.2.

16. *Mobile Station Registered Message*: The mobile station shall process the message as specified in 6.6.5.5.4.3.

17. *Neighbor List Update Message*: The mobile station shall process the message as specified in 6.6.6.2.6.3.

18. *Parameter Update Order*: The mobile station shall increment $COUNT_{s-p}$ (see 2.3.12.1.3). The mobile station shall send a *Parameter Update Confirmation Order* within T_{56m} seconds. The mobile station shall set the ORDQ field of the *Parameter Update Confirmation Order* to the same value as the ORDQ field of the *Parameter Update Order*.

19. *Pilot Measurement Request Order*: The mobile station shall process the order as specified in 6.6.6.2.5.1.

20. *Power Control Parameters Message*: The mobile station shall process the message as specified in 6.6.4.1.1.2.

21. *Release Order*: The mobile station shall enter the *Release Substate* with a base station release indication (see 6.6.4.5).

22. *Retrieve Parameters Message*: The mobile station shall send, within T_{56m} seconds, a *Parameters Response Message*.

23. *Service Option Control Order*: The mobile station shall process the message as specified in 6.6.4.1.2.2.3.

24. *Service Option Request Order*: The mobile station shall process the message as specified in 6.6.4.1.2.2.1.

25. *Service Option Response Order*: The mobile station shall process the message as specified in 6.6.4.1.2.2.2.

26. *Set Parameters Message*: If the mobile station can set all of the parameters specified by the PARAMETER_ID fields in the message, the mobile station shall set them; otherwise, the mobile station shall send, within T_{56m} seconds, a *Mobile Station Reject Order*.

27. *SSD Update Message*: The mobile station shall process the message and respond with a *Base Station Challenge Order* as specified in 6.3.12.1.9 within T_{32m} seconds.

28. *Status Request Order*: The mobile station shall send, within T_{56m} seconds, a *Status Message*.

- If the mobile station receives any other message with a MSG_TYPE specified in Table 7.7.3.3-1, it shall process all layer 2 fields of the message. If the mobile station receives a message that is not included in the above list or cannot be processed, the mobile station shall discard the message and send a *Mobile Station Reject Order* (ORDQ set to the applicable reason code as determined from Table 6.7.3-1) within T_{56m} seconds.

6.6.4.4 Conversation Substate

In this substate, the mobile station's primary traffic service option application exchanges primary traffic bits with the base station.

While in the *Conversation Substate*, the mobile station shall perform the following:

- The mobile station shall perform Forward Traffic Channel supervision as specified in 6.4.4. If a loss of the Forward Traffic Channel is declared, the mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*.
- The mobile station shall adjust its transmit power as specified in 6.1.2.3.
- The mobile station shall perform Forward Traffic Channel power control as specified in 6.6.4.1.1.
- The mobile station shall perform handoff processing as specified in 6.6.6.
- If there is an active service option (SO_CUR_s is not equal to NULL), the mobile station shall process the received primary traffic bits in accordance with the requirements for the active service option; otherwise, the mobile station shall discard the received primary traffic bits.
- If there is an active service option (SO_CUR_s is not equal to NULL), the mobile station shall transmit primary traffic bits in accordance with the requirements for the active service option; otherwise, the mobile station shall transmit null Traffic Channel data.
- The mobile station shall perform registration timer maintenance as specified in 6.6.5.5.4.2.
- If the mobile station originated the call and did not send all the dialed digits in the *Origination Message*, the mobile station shall send the remaining dialed digits to the base station in the *Origination Continuation Message*. The mobile station shall send the *Origination Continuation Message* as a message requiring acknowledgement within T_{54m} seconds after entering the *Conversation Substate*.
- If the mobile station is directed by the user to transmit a message, the mobile station shall send a *Data Burst Message*.

- If the mobile station is directed by the user to request a service option, the mobile station shall perform service option request initialization (see 6.6.4.1.2.2.4) specifying the requested service option number, and shall send a *Service Option Request Order* (ORDQ = requested service option number).
- If there is an active service option (SO_CUR_s is not equal to NULL), the mobile station may send a *Service Option Control Order* (ORDQ = function code) to invoke a service option specific function in accordance with the requirements for the active service option.
- If the mobile station is directed by the user to request a private long code transition and has the long code mask (see 6.3.12.3), the mobile station shall send a *Long Code Transition Request Order* (ORDQ = '00000001') as a message requiring acknowledgement.
- If the mobile station is directed by the user to request a public long code transition, the mobile station shall send a *Long Code Transition Request Order* (ORDQ = '00000000') as a message requiring acknowledgement.
- If the mobile station is directed by the user to issue a flash, the mobile station shall build a *Flash With Information Message* with the collected digits contained in a *Keypad Facility* information record and send the message to the base station as a message requiring acknowledgement.
- If the mobile station is directed by the user to send burst DTMF digits, the mobile station shall build the *Send Burst DTMF Message* with the dialed digits and send the message as a message requiring acknowledgement.
- If the mobile station is directed by the user to send a continuous DTMF digit, the mobile station shall build the *Continuous DTMF Tone Order* with the dialed digit and send the order as a message requiring acknowledgement. When the mobile station is directed by the user to cease sending the continuous DTMF digit, the mobile station shall send the *Continuous DTMF Tone Order* (ORDQ = '11111111') as a message requiring acknowledgement.
- If the mobile station is directed by the user to operate in analog mode, the mobile station shall send the *Request Analog Service Order* as a message requiring acknowledgement.
- If the mobile station is directed by the user to disconnect the call, the mobile station shall enter the *Release Substate* with a mobile station release indication (see 6.6.4.5).
- If the mobile station is directed by the user to power down, the mobile station shall enter the *Release Substate* with a power-down indication (see 6.6.4.5).
- The mobile station shall perform the acknowledgement procedures as specified in 6.6.4.1.3. If an acknowledgement failure is declared, the mobile station shall disable its transmitter and enter the *System Determination Substate* of the *Mobile Station Initialization State.*
- If the mobile station receives a message which is included in the following list and every message field value is within its permissible range, the mobile station shall

process the message as described below and in accordance with the message's action time (see 6.6.4.1.5).

1. <u>*Alert With Information Message*</u>: If the message contains a Signal information record with the SIGNAL_TYPE field set to '01' or '10', or if the message does not contain a Signal information record, the mobile station shall enter the *Waiting For Mobile Station Answer Substate*. If the *Alert With Information Message* does not contain a Signal information record, the mobile station should use Standard Alert as defined in 7.7.5.5.

2. <u>*Analog Handoff Direction Message*</u>: The mobile station shall process the message as specified in 6.6.6.2.9 and enter the Conversation Task (see 2.6.4.4) with a handoff from CDMA indication.

3. <u>*Audit Order*</u>

4. <u>*Authentication Challenge Message*</u>: The mobile station shall process the message and respond as specified in 6.3.12.1.5 within T_{32m} seconds.

5. <u>*Base Station Acknowledgement Order*</u>

6. <u>*Base Station Challenge Confirmation Order*</u>: The mobile station shall process the message and respond with an *SSD Update Confirmation Order* or *SSD Update Rejection Order* as specified in 6.3.12.1.9 within T_{32m} seconds.

7. <u>*Continuous DTMF Tone Order*</u>: Support of this order by the mobile station is optional.

8. <u>*Data Burst Message*</u>

9. <u>*Flash with Information Message*</u>

10. <u>*Handoff Direction Message*</u>: The mobile station shall process the message as specified in 6.6.6.2.5.1.

11. <u>*In-Traffic System Parameters Message*</u>: The mobile station shall process the message as specified in 6.6.4.1.4.

12. <u>*Local Control Order*</u>

13. <u>*Lock Until Power-Cycled Order*</u>: The mobile station shall disable its transmitter and record the reason for the *Lock Until Power-Cycled Order* in the mobile station's semi-permanent memory ($LCKRSN\_P_{s-p}$ equals the least-significant four bits of $ORDQ_r$). The mobile station should notify the user of the locked condition. The mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*, and shall not enter the *System Access State* again until after the next mobile station power-up or until it has received an *Unlock Order*. This requirement shall take precedence over any other mobile station requirement specifying entry to the *System Access State*.

14. <u>*Long Code Transition Request Order*</u>: The mobile station shall process the message as specified in 6.6.4.1.6.

15. <u>*Maintenance Order*</u>: The mobile station shall enter the *Waiting for Mobile Station Answer Substate*.

16. Maintenance Required Order: The mobile station shall record the reason for the *Maintenance Required Order* in the mobile station's semi-permanent memory ($MAINTRSN_{s-p}$ equals the least-significant four bits of $ORDQ_r$). The mobile station shall remain in the unlocked condition. The mobile station should notify the user of the maintenance required condition.

17. Message Encryption Mode Order: The mobile station shall process the message as specified in 6.3.12.2.

18. Mobile Station Registered Message: The mobile station shall process the message as specified in 6.6.5.5.4.3.

19. Neighbor List Update Message: The mobile station shall process the message as specified in 6.6.6.2.6.3.

20. Parameter Update Order: The mobile station shall increment $COUNT_{s-p}$ (see 2.3.12.1.3). The mobile station shall send a *Parameter Update Confirmation Order* within T_{56m} seconds. The mobile station shall set the ORDQ field of the *Parameter Update Confirmation Order* to the same value as the ORDQ field of the *Parameter Update Order*.

21. Pilot Measurement Request Order: The mobile station shall process the order as specified in 6.6.6.2.5.1.

22. Power Control Parameters Message: The mobile station shall process the message as specified in 6.6.4.1.1.2.

23. Release Order: The mobile station shall enter the *Release Substate* with a base station release indication (see 6.6.4.5).

24. Retrieve Parameters Message: The mobile station shall send, within T_{56m} seconds, a *Parameters Response Message*.

25. Send Burst DTMF Message: Support of this order by the mobile station is optional.

26. Service Option Control Order: The mobile station shall process the message as specified in 6.6.4.1.2.2.3.

27. Service Option Request Order: The mobile station shall process the message as specified in 6.6.4.1.2.2.1.

28. Service Option Response Order: The mobile station shall process the message as specified in 6.6.4.1.2.2.2.

29. Set Parameters Message: If the mobile station can set all of the parameters specified by the PARAMETER_ID fields in the message, the mobile station shall set them; otherwise, the mobile station shall send, within T_{56m} seconds, a *Mobile Station Reject Order*.

30. SSD Update Message: The mobile station shall process the message and respond with a *Base Station Challenge Order* as specified in 6.3.12.1.9 within T_{32m} seconds.

31. Status Request Order: The mobile station shall send, within T_{56m} seconds, a *Status Message*.

- If the mobile station receives any other message with a MSG_TYPE specified in Table 7.7.3.3-1, it shall process all layer 2 fields of the message. If the mobile station receives a message that is not included in the above list or cannot be processed, the mobile station shall discard the message and send a *Mobile Station Reject Order* (ORDQ set to the applicable reason code as determined from Table 6.7.3-1) within T_{56m} seconds.

6.6.4.5 Release Substate

In this substate, the mobile station confirms the call disconnect.

Upon entering the *Release Substate*, the mobile station shall perform the following:

- The mobile station shall set the substate timer for T_{55m} seconds.
- If the mobile station enters the *Release Substate* with a power-down indication, the mobile station shall send a *Release Order* (ORDQ = '00000001'), and perform power-down registration procedures (see 6.6.5.5.4.4).
- If the mobile station enters the *Release Substate* with a mobile station release indication, the mobile station shall send a *Release Order* (ORDQ = '00000000').
- If the mobile station enters the *Release Substate* with a base station release indication, the mobile station shall send a *Release Order* (ORDQ = '00000000'). The mobile station shall disable its transmitter and enter the *System Determination Substate* of the *Mobile Station Initialization State*.

While in the *Release Substate*, the mobile station shall perform the following:

- If the substate timer expires, the mobile station shall disable its transmitter and enter the *System Determination Substate* of the *Mobile Station Initialization State*.
- The mobile station shall perform Forward Traffic Channel supervision as specified in 6.4.4. If a loss of the Forward Traffic Channel is declared, the mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*.
- The mobile station shall adjust its transmit power as specified in 6.1.2.3.
- The mobile station shall perform Forward Traffic Channel power control as specified in 6.6.4.1.1.
- The mobile station shall perform handoff processing as specified in 6.6.6.
- The mobile station shall transmit null Traffic Channel data on the Reverse Traffic Channel (see 6.1.3.3.2.4).
- The mobile station shall perform registration timer maintenance as specified in 6.6.5.5.4.2.
- The mobile station shall perform the acknowledgement procedures as specified in 6.6.4.1.3. If an acknowledgement failure is declared, the mobile station shall disable

its transmitter and enter the *System Determination Substate* of the *Mobile Station Initialization State*.

- If the mobile station receives a message which is included in the following list and every message field value is within its permissible range, the mobile station shall process the message as described below and in accordance with the message's action time (see 6.6.4.1.5).

  1. *Alert With Information Message*: The mobile station shall enter the *Waiting for Mobile Station Answer Substate*. If the *Alert With Information Message* does not contain a Signal information record, the mobile station should use Standard Alert as defined in 7.7.5.5.
  2. *Base Station Acknowledgement Order*
  3. *Data Burst Message*
  4. *Handoff Direction Message*: The mobile station shall process the message as specified in 6.6.6.2.5.1.
  5. *In-Traffic System Parameters Message*: The mobile station shall process the message as specified in 6.6.4.1.4.
  6. *Local Control Order*
  7. *Lock Until Power-Cycled Order*: The mobile station shall disable its transmitter and record the reason for the *Lock Until Power-Cycled Order* in the mobile station's semi-permanent memory ($LCKRSN\_P_{s-p}$ equals the least-significant four bits of $ORDQ_r$). The mobile station should notify the user of the locked condition. The mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*, and shall not enter the *System Access State* again until after the next mobile station power-up or until it has received an *Unlock Order*. This requirement shall take precedence over any other mobile station requirement specifying entry to the *System Access State*.
  8. *Maintenance Required Order*: The mobile station shall record the reason for the *Maintenance Required Order* in the mobile station's semi-permanent memory ($MAINTRSN_{s-p}$ equals the least-significant four bits of $ORDQ_r$). The mobile station shall remain in the unlocked condition. The mobile station should notify the user of the maintenance required condition.
  9. *Mobile Station Registered Message*: The mobile station shall process the message as specified in 6.6.5.5.4.3.
  10. *Neighbor List Update Message*: The mobile station shall process the message as specified in 6.6.6.2.6.3.
  11. *Power Control Parameters Message*: The mobile station shall process the message as specified in 6.6.4.1.1.2.
  12. *Release Order*: The mobile station shall disable its transmitter. If the mobile station enters the *Release Substate* with a power-down indication, the mobile

station may power down; otherwise, the mobile station shall enter the *System Determination Substate* of the *Mobile Station Initialization State*.

13. Retrieve Parameters Message: The mobile station shall send, within T_{56m} seconds, a *Parameters Response Message*.

14. Service Option Control Order: The mobile station shall process the message as specified in 6.6.4.1.2.2.3.

15. Status Request Order: The mobile station shall send, within T_{56m} seconds, a *Status Message*.

- If the mobile station receives any other message with a MSG_TYPE specified in Table 7.7.3.3-1, it shall process all layer 2 fields of the message. If the mobile station receives a message that is not included in the above list or cannot be processed, the mobile station shall discard the message and send a *Mobile Station Reject Order* (ORDQ set to the applicable reason code as determined from Table 6.7.3-1) within T_{56m} seconds.

6.6.5 Registration

6.6.5.1 Forms of Registration

Registration is the process by which the mobile station notifies the base station of its location, status, identification, slot cycle, and other characteristics. The mobile station informs the base station of its location and status so that the base station can efficiently page the mobile station when establishing a mobile terminated call. For operation in the slotted mode, the mobile station supplies the SLOT_CYCLE_INDEX parameter so that the base station can determine which slots the mobile station is monitoring. The mobile station supplies the station class mark and protocol revision number so that the base station knows the capabilities of the mobile station.

The CDMA system supports nine different forms of registration:

1. Power-up registration. The mobile station registers when it powers on, switches from using the alternate serving system, or switches from using the analog system.

2. Power-down registration. The mobile station registers when it powers off if previously registered in the current serving system.

3. Timer-based registration. The mobile station registers when a timer expires.

4. Distance-based registration. The mobile station registers when the distance between the current base station and the base station in which it last registered exceeds a threshold.

5. Zone-based registration. The mobile station registers when it enters a new zone.

6. Parameter-change registration. The mobile station registers when certain of its stored parameters change.

7. Ordered registration. The mobile station registers when the base station requests it.

8. Implicit registration. When a mobile station successfully sends an *Origination Message* or *Page Response Message*, the base station can infer the mobile station's location. This is considered an implicit registration.

9. Traffic Channel registration. Whenever the base station has registration information for a mobile station that has been assigned to a Traffic Channel, the base station can notify the mobile station that it is registered.

The first five forms of registration, as a group, are called autonomous registration and are enabled by roaming status (see 6.6.5.3). Parameter-change registration is independent of roaming status. Ordered registration is initiated by the base station through an *Order Message*. Implicit registration does not involve the exchange of any registration messages between the base station and the mobile station. While a mobile station is assigned a Traffic Channel, the base station can obtain registration information by using the *Status Request Order* to obtain *Status Messages* from the mobile station. The mobile station can be notified that it is registered through the *Mobile Station Registered Message*.

Any of the various forms of autonomous registration and parameter-change registration can be enabled or disabled. The forms of registration that are enabled and the corresponding registration parameters are communicated in the *System Parameters Message*.

In addition, the mobile station may enable or disable autonomous registration for each type of roaming described in 6.6.5.3.

6.6.5.1.1 Power-Up Registration

Power-up registration is performed when the mobile station is turned on. To prevent multiple registrations when power is quickly turned on and off, the mobile station delays $T57_m$ seconds before registering after entering the *Mobile Station Idle State*.

The mobile station shall maintain a power-up/initialization timer. While the power-up/initialization timer is active, the mobile station shall not make registration access attempts.

6.6.5.1.2 Power-Down Registration

Power-down registration is performed when the user directs the mobile station to power off. If power-down registration is performed, the mobile station does not power down until after completing the registration attempt.

The mobile station does not perform power down registration if it has not previously registered in the system that corresponds to the current SID_s and NID_s (see 6.6.5.5.2.4).

6.6.5.1.3 Timer-Based Registration

Timer-based registration causes the mobile station to register at regular intervals. Its use also allows the system to automatically deregister mobile stations that did not perform a successful power-down registration. Timer-based registration uses a Paging Channel slot counter (equivalent to a timer with time increments of 80 ms). Timer-based registration is performed when the counter reaches a maximum value ($REG\_COUNT\_MAX_s$) that is controlled by the base station via the REG_PRD field of the *System Parameters Message*. The base station disables timer-based registration by setting REG_PRD to zero.

The counter is reset on power-up and when switching from analog or alternate serving systems. The counter is also reset after each successful or implicit registration.

The mobile station shall maintain a timer-based registration counter (REG_COUNT_s). The mobile station shall compute and store the timer expiration count ($REG\_COUNT\_MAX_s$) as

$$REG\_COUNT\_MAX_s = \lfloor 2^{REG\_PRD/4} \rfloor.$$

The mobile station shall maintain an indicator of timer-based registration timer enable status ($COUNTER\_ENABLED_s$).

Whenever the mobile station changes $COUNTER\_ENABLED_s$ from NO to YES, it shall set REG_COUNT_s to a pseudorandom value between 0 and $REG\_COUNT\_MAX_s$ - 1, using the pseudorandom number generator specified in 6.6.7.2.

If the mobile station is operating in the non-slotted mode, it shall increment the timer-based registration counter once per 80 ms whenever $COUNTER\_ENABLED_s$ equals YES. If the mobile station is operating in slotted mode, it may increment the timer-based registration counter when it begins to monitor the Paging Channel (see 6.6.2.1.1.3). A mobile station operating in the slotted mode shall increment the counter by the same amount that the counter would have been incremented if the mobile station had been operating in the non-slotted mode.[17]

6.6.5.1.4 Distance-Based Registration

Distance-based registration causes a mobile station to register when the distance between the current base station and the base station in which it last registered exceeds a threshold. The mobile station determines that it has moved a certain distance by computing a distance measure based on the difference in latitude and longitude between the current base station and the base station where the mobile station last registered. If this distance measure exceeds the threshold value, the mobile station registers.

The mobile station stores the base station latitude ($BASE\_LAT\_REG_{s-p}$), the base station longitude ($BASE\_LONG\_REG_{s-p}$) and the registration distance ($REG\_DIST\_REG_{s-p}$), of the base station whose Access Channel was used for the mobile station's last registration (see 6.3.4). The mobile station shall compute the current base station's distance from the last registration point (DISTANCE) as:

$$DISTANCE = \left\lfloor \frac{\sqrt{(\Delta lat)^2 + (\Delta long)^2}}{16} \right\rfloor,$$

where

$$\Delta lat = BASE\_LAT_s - BASE\_LAT\_REG_{s-p}$$

$$\Delta long = (BASE\_LONG_s - BASE\_LONG\_REG_{s-p}) \times \cos(\pi/180 \times BASE\_LAT\_REG_{s-p}/14400).$$

[17]For example, if the mobile station uses a 2.56 second slot cycle, then it may increment the counter by 32 every time it becomes active.

The mobile station shall compute DISTANCE with an error of no more than ±5% of its true value when $|BASE\_LAT\_REG_{s-p}/14400|$ is less than 60 and with an error of no more than ±7% of its true value when $|BASE\_LAT\_REG_{s-p}/14400|$ is between 60 and 70.[18]

6.6.5.1.5 Zone-Based Registration

Zones are groups of base stations within a given system and network. A base station's zone assignment is identified by the REG_ZONE field of the *System Parameters Message.*

Zone-based registration causes a mobile station to register whenever it moves into a new zone not on its internally stored list of visited registration zones. A zone is added to the list whenever a registration (including implicit registration) occurs, and is deleted upon expiration of a timer. After a system access, timers are enabled for every zone except one that was successfully registered by the access. Timers are also enabled at the start of a call.

A mobile station can be registered in more than one zone. Zones are uniquely identified by a zone number (REG_ZONE) plus the SID and NID of the zone.

The mobile station shall store a list of the zones in which the mobile station has registered ($ZONE\_LIST_s$). Each entry in $ZONE\_LIST_s$ shall include the zone number (REG_ZONE) and the (SID, NID) pair for the zone. The mobile station shall be capable of storing at least N_{9m} entries in $ZONE\_LIST_s$. A base station shall be considered to be in $ZONE\_LIST_s$ only if the base station's REG_ZONE, SID and NID are found in an entry in $ZONE\_LIST_s$. The mobile station provides storage for one entry of $ZONE\_LIST_s$ in semi-permanent memory, $ZONE\_LIST_{s-p}$ (see 6.3.4).

The mobile station shall maintain a zone list entry timer for each entry in $ZONE\_LIST_s$. When an entry in $ZONE\_LIST_s$ is removed from the list, the corresponding zone list entry timer shall be disabled. The timer duration shall be as determined from the stored value of $ZONE\_TIMER_s$ using Table 7.7.2.3.2.1-1. The mobile station shall provide a means to examine each timer's value while the timer is active, so that the age of list entries can be compared.

The base station controls the maximum number of zones in which a mobile station may be considered registered, by means of the TOTAL_ZONES field of the *System Parameters Message*. When an entry is added to the zone list, or if TOTAL_ZONES is decreased, the mobile station removes entries from the zone list if there are more entries than allowed by the setting of TOTAL_ZONES.

Whenever $ZONE\_LIST_s$ contains more than $TOTAL\_ZONES_s$ entries, the mobile station shall delete the excess entries according to the following rules:

- If $TOTAL\_ZONES_s$ is equal to zero, the mobile station shall delete all entries.
- If $TOTAL\_ZONES_s$ is not equal to zero, the mobile station shall delete those entries having active zone list entry timers (excluding any such entry selected to be retained).

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[18] BASE_LAT and BASE_LONG are given in units of 1/4 seconds. BASE_LAT/14400 and BASE_LONG/14400 are in units of degrees.

starting with the oldest entry, as determined by the timer values, and continuing in order of decreasing age until no more than $TOTAL\_ZONES_s$ entries remain.

The mobile station shall store a list of the systems/networks in which the mobile station has registered ($SID\_NID\_LIST_s$). Each entry in $SID\_NID\_LIST_s$ shall include the (SID, NID) pair for the system/network. The mobile station shall be capable of storing N_{10m} entries in $SID\_NID\_LIST_s$. A base station shall be considered to be in the $SID\_NID\_LIST_s$ only if the base station's SID and NID are found in an entry in $SID\_NID\_LIST_s$. The mobile station shall provide storage for one entry of $SID\_NID\_LIST_s$ in semi-permanent memory ($SID\_NID\_LIST_{s-p}$).

The mobile station shall maintain a SID/NID list entry timer for each entry in $SID\_NID\_LIST_s$. When an entry in $SID\_NID\_LIST_s$ is removed from the list, the corresponding SID/NID list entry timer shall be disabled. The timer duration shall be as determined from the stored value of $ZONE\_TIMER_s$ using Table 7.7.2.3.2.1-1. The mobile station shall provide a means to examine each timer's value while the timer is active, so that the age of list entries can be compared.

Whenever $SID\_NID\_LIST_s$ contains more than N_{10m} entries, the mobile station shall delete the excess entries according to the following rule:

- The mobile station shall delete those entries having active SID/NID list entry timers, starting with the oldest entry, as determined by the timer values, and continuing in order of decreasing age.

Whenever $MULT\_SIDS_s$ is equal to '0' and SID_NID_LIST contains entries with different SIDs, the mobile station shall delete the excess entries according to the following rules:

- If the SID/NID entry timer for any entry is disabled, the mobile station shall delete all entries not having the same SID as the entry whose timer is disabled;
- Otherwise, the mobile station shall delete all entries not having the same SID as the newest entry in SID_NID_LIST, as determined by the timer values.

Whenever $MULT\_NIDS_s$ is equal to '0' and SID_NID_LIST contains more than one entry for any SID, the mobile station shall delete the excess entries for each SID according to the following rules:

- If the SID/NID entry timer for any entry is disabled, the mobile station shall delete all entries for that SID except the entry whose timer is disabled;
- For all other SIDs, the mobile station shall delete all entries for each SID except the newest entry, as determined by the timer values.

6.6.5.1.6 Parameter-Change Registration

Parameter-change registration is performed when a mobile station modifies any of the following stored parameters:

- The preferred slot cycle index ($SLOT\_CYCLE\_INDEX_p$)
- The station class mark (SCM_p)
- The call termination enabled indicator (MOB_TERM_s)

Parameter-change registration is independent of the roaming status of the mobile station.[19]

Whenever a parameter changes, the mobile station shall delete all entries from $SID\_NID\_LIST_s$.

6.6.5.1.7 Ordered Registration

The base station can command the mobile station to register by sending a *Registration Request Order*. Ordered registration is performed in the *Mobile Station Order and Message Processing Operation* (6.6.2.4). Requirements are specified in 6.6.5.5.2.3.

6.6.5.1.8 Implicit Registration

Whenever an *Origination Message* or *Page Response Message* is sent, the base station can infer the location of the mobile station. This is considered an implicit registration. Requirements are specified in 6.6.5.5.3.

6.6.5.1.9 Traffic Channel Registration

While a mobile station is assigned a Traffic Channel, the mobile station is notified that it is registered through the *Mobile Station Registered Message*. Requirements are specified in 6.6.5.5.4.3.

6.6.5.2 Systems and Networks

A base station is a member of a cellular system and a network. A network is a subset of a system.

Systems are labeled with an identification called the system identification or SID; networks within a system are given a network identification or NID. A network is uniquely identified by the pair (SID, NID). The NID number 0 is a reserved value indicating all base stations that are not included in a specific network. The NID number 65535 (2^{16}-1) is a reserved value the mobile station may use for roaming status determination (see 6.6.5.3) to indicate that the mobile station considers the entire SID (regardless of NID) as home (non-roaming).

Figure 6.6.5.2-1 shows an example of systems and networks. SID i contains three networks labeled t, u, and v. A base station in system i that is not in one of these three networks is in NID 0.

[19]The indicator REG_ENABLED does not govern parameter-change registration.

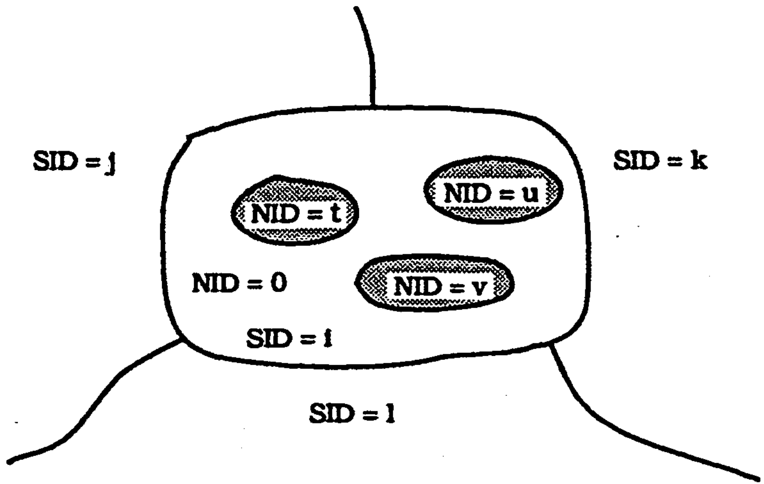

Figure 6.6.5.2-1. Systems and Networks Example

6.6.5.3 Roaming

The mobile station has a list of one or more home (non-roaming) (SID, NID) pairs. A mobile station is roaming if the stored (SID_S, NID_S) pair (received in the *System Parameters Message*) does not match one of the mobile station's non-roaming (SID, NID) pairs. Two types of roaming are defined: A mobile station is a foreign NID roamer if the mobile station is roaming and there is some (SID, NID) pair in the mobile station's (SID, NID) list for which SID is equal to SID_S. A mobile station is a foreign SID roamer if there is no (SID, NID) pair in the mobile station's (SID, NID) list for which SID is equal to SID_S.[20] The mobile station may use the special NID value 65535 to indicate that the mobile station considers all NIDs within a SID to be non-roaming (i.e., that the mobile station is not roaming when operating with any base station in that system).

The mobile station shall store three 1-bit parameters in its permanent memory (see 6.3.8). These parameters are $MOB\_TERM\_HOME_p$, $MOB\_TERM\_FOR\_SID_p$, and $MOB\_TERM\_FOR\_NID_p$. The mobile station shall set $MOB\_TERM\_HOME_p$ to '1' if the mobile station is configured to receive mobile station terminated calls when using a home (SID, NID) pair; otherwise $MOB\_TERM\_HOME_p$ shall be set to '0'. The mobile station shall set $MOB\_TERM\_FOR\_SID_p$ to '1' if the mobile station is configured to receive mobile station terminated calls when it is a foreign SID roamer; otherwise $MOB\_TERM\_FOR\_SID_p$ shall be set to '0'. The mobile station shall set $MOB\_TERM\_FOR\_NID_p$ to '1' if the mobile station is configured

[20] For example, suppose a mobile station has the following SID, NID list (2, 3) (2, 0) (3, 1). If the base station (SID, NID) pair is (2, 3) then the mobile station is not roaming because the (SID, NID) pair is in the list. If the base station (SID, NID) pair is (2, 7) then the mobile station is a foreign NID roamer because the SID 2 is in the list, but the (SID, NID) pair (2, 7) is not in the list. If the base station (SID, NID) pair is (4, 0) then the mobile station is a foreign SID roamer because SID 4 is not in the list.

to receive mobile station terminated calls when it is a foreign NID roamer; otherwise $MOB\_TERM\_FOR\_NID_p$ shall be set to '0'.

The mobile station determines the registration status using these parameters and the HOME_REG, FOR_NID_REG, and FOR_SID_REG fields of the *System Parameters Message*.

The mobile station shall store a mobile station call termination enabled indicator, MOB_TERM_s. The mobile station shall set MOB_TERM_s to YES if any of the following conditions is met; otherwise MOB_TERM_s shall be set to NO:

- The mobile station is not roaming, and $MOB\_TERM\_HOME_p$ is equal to '1'; or
- The mobile station is a foreign NID roamer and $MOB\_TERM\_FOR\_NID_p$ is equal to '1'; or
- The mobile station is a foreign SID roamer and $MOB\_TERM\_FOR\_SID_p$ is equal to '1'.

The mobile station shall store a registration status indicator, $REG\_ENABLED_s$. The indicator $REG\_ENABLED_s$ shall be set to YES if any of the following conditions is met for the mobile station; otherwise $REG\_ENABLED_s$ shall be set to NO:

- The mobile station is not roaming, and both $HOME\_REG_s$ and $MOB\_TERM\_HOME_p$ are equal to '1'; or
- The mobile station is a foreign NID roamer and both $FOR\_NID\_REG_s$ and $MOB\_TERM\_FOR\_NID_p$ are equal to '1'; or
- The mobile station is a foreign SID roamer and both $FOR\_SID\_REG_s$ and $MOB\_TERM\_FOR\_SID_p$ are equal to '1'.

The mobile station performs autonomous registrations if $REG\_ENABLED_s$ is YES.

6.6.5.4 Registration Timers and Indicators

The mobile station shall provide the following registration timers:

- Power-up/initialization timer (see 6.6.5.1.1).
- Timer-based registration timer (see 6.6.5.1.3).
- Zone list entry timers (see 6.6.5.1.5).
- SID/NID list entry timers (see 6.6.5.1.5).

The mobile station shall provide a means of enabling and disabling each timer. When a timer is disabled, it shall not be considered expired. A timer that has been enabled is referred to as active.

6.6.5.5 Registration Procedures

6.6.5.5.1 Actions in the *Mobile Station Initialization State*

6.6.5.5.1.1 Power-up or Serving System Change

Upon power-up, the mobile station shall perform the following actions:

- Delete all entries of $ZONE\_LIST_s$.

- If ZONE_LIST$_{s\text{-}p}$ contains an entry, copy the entry to ZONE_LIST$_s$ and disable the corresponding entry timer.
- Delete all entries of SID_NID_LIST$_s$.
- If SID_NID_LIST$_{s\text{-}p}$ contains an entry, copy the entry to SID_NID_LIST$_s$ and disable the corresponding entry timer.

Upon power-up or after switching from analog or the alternate CDMA serving system, the mobile station shall perform the following actions:

- Set timer-based registration enable status (COUNTER_ENABLED$_s$) to NO.
- Set autonomous registration enable status (REG_ENABLED$_s$) to NO.
- Disable all registration timers (see 6.6.5.4).

6.6.5.5.1.2 Timer Maintenance

While in the *Mobile Station Initialization State*, the mobile station shall update all active registration timers (see 6.6.5.4). If any timer expires while in this state, the mobile station shall preserve the expiration status so that further action can be taken in the *Mobile Station Idle State*.

6.6.5.5.1.3 Entering the *Mobile Station Idle State*

Before entering the *Mobile Station Idle State*, the mobile station shall perform the following action:

- If SID_NID_LIST$_s$ is empty, enable the power-up/initialization timer with an expiration time of T_{57m} seconds (see 6.6.5.1.1).

6.6.5.5.2 Actions in the *Mobile Station Idle State*

Requirements in this section and its subsections apply only when the mobile station is in the *Mobile Station Idle State*.

6.6.5.5.2.1 Idle Registration Procedures

These procedures are performed whenever the mobile station is in the *Mobile Station Idle State* (see 6.6.2.1.3).

While in the *Mobile Station Idle State*, the mobile station shall update all active registration timers (see 6.6.5.4).

If the power-up/initialization timer has expired or is disabled, the mobile station shall perform the following actions in the order given; except that if any action causes a registration to be performed, the remaining actions, if any, shall not be performed and the mobile station shall enter the *Update Overhead Information Substate* of the *System Access State* (see 6.6.3) with a registration indication.

1. The timer-based registration timer shall be enabled (COUNTER_ENABLED$_s$ = YES) and the timer count (REG_COUNT$_s$) shall be set to a pseudorandom number as specified in 6.6.5.1.3, if the following conditions are met:

a. $COUNTER\_ENABLED_S$ is equal to NO; and

b. The stored configuration parameters are current (see 6.6.2.2); and

c. $REG\_ENABLED_S$ is equal to YES; and

d. REG_PRD_S is not equal to zero.

2. If any zone list entry timer (see 6.6.5.1.5) has expired, the mobile station shall delete the corresponding entry from $ZONE\_LIST_S$.

3. If any SID/NID list entry timer (see 6.6.5.1.5) has expired, the mobile station shall delete the corresponding entry from $SID\_NID\_LIST_S$.

4. The mobile station shall perform power-up registration, as specified in 6.6.5.1.1, if all the following conditions are met:

a. $POWER\_UP\_REG_S$ is equal to '1'; and

b. The stored configuration parameters are current (see 6.6.2.2); and

c. $SID\_NID\_LIST_S$ is empty; and

d. $REG\_ENABLED_S$ is equal to YES.

5. The mobile station shall perform parameter-change registration (see 6.6.5.1.6) if all the following conditions are met:

a. $PARAMETER\_REG_S$ is equal to '1'; and

b. The stored configuration parameters are current (see 6.6.2.2); and

c. There is no entry of $SID\_NID\_LIST_S$ whose SID and NID fields match the stored SID_S and NID_S.

6. The mobile station shall perform timer-based registration (see 6.6.5.1.3) if all the following conditions are met:

a. $COUNTER\_ENABLED_S$ is equal to YES; and

b. The stored configuration parameters are current (see 6.6.2.2); and

c. $REG\_ENABLED_S$ is equal to YES; and

d. REG_COUNT_S is greater than or equal to $REG\_COUNT\_MAX_S$.

7. The mobile station shall perform distance-based registration (see 6.6.5.1.4) if all the following conditions are met:

a. REG_DIST_S is not equal to zero; and

b. The stored configuration parameters are current (see 6.6.2.2); and

c. $REG\_ENABLED_S$ is equal to YES; and

d. The current base station's distance from the base station in which the mobile station last registered (see 6.6.5.1.4) is greater than or equal to $REG\_DIST\_REG_{S-P}$.

8. The mobile station shall perform zone-based registration (see 6.6.5.1.5) if all the following conditions are met:
   a. $TOTAL\_ZONES_s$ is not equal to zero; and
   b. The stored configuration parameters are current (see 6.6.2.2); and
   c. $REG\_ENABLED_s$ is equal to YES; and
   d. There is no entry of $ZONE\_LIST_s$ whose SID, NID and REG_ZONE fields match the stored SID_s, NID_s and REG_ZONE_s.

6.6.5.5.2.2 Processing the Registration Fields of the *System Parameters Message*

When the mobile station processes the *System Parameters Message*, it shall perform the following actions:

1. If REG_PRD_s is equal to zero, the mobile station shall set $COUNTER\_ENABLED_s$ to NO.
2. If REG_PRD_s is not equal to zero, the mobile station shall set $REG\_COUNT\_MAX_s$ as specified in 6.6.5.1.3.
3. The mobile station shall update its roaming status and set $REG\_ENABLED_s$ as specified in 6.6.5.3.
4. If $ZONE\_LIST_s$ contains more than $TOTAL\_ZONES_s$ entries, the mobile station shall delete the excess entries according to the rules specified in 6.6.5.1.5.
5. If $SID\_NID\_LIST_s$ contains more than N_{10m} entries, the mobile station shall delete the excess entries according to the rules specified in 6.6.5.1.5.
6. If $MULT\_SIDS_s$ is equal to '0' and SID_NID_LIST contains entries with different SIDs, delete the excess entries according to the rules specified in 6.6.5.1.5.
7. If $MULT\_NIDS_s$ is equal to '0' and SID_NID_LIST contains more than one entry for any SID, delete the excess entries according to the rules specified in 6.6.5.1.5.

6.6.5.5.2.3 Ordered Registration

Ordered registration is performed after receiving a *Registration Request Order* while in the *Mobile Station Order and Message Processing Operation* (see 6.6.2.4).

The mobile station shall enter the *Update Overhead Information Substate* of the *System Access State* with a registration indication within T_{33m} seconds after the *Registration Request Order* is received.

6.6.5.5.2.4 Power Down

These procedures are performed when the mobile station is directed by the user to power down.

If $POWER\_UP\_REG_s$ is equal to '0', the mobile station shall perform the following actions:

- If an entry of $ZONE\_LIST_s$ does not have an active timer, copy that entry to $ZONE\_LIST_{s\text{-}p}$; otherwise, delete any entry in $ZONE\_LIST_{s\text{-}p}$.

- If an entry of $SID\_NID\_LIST_s$ does not have an active timer, copy that entry to $SID\_NID\_LIST_{s-p}$; otherwise, delete any entry in $SID\_NID\_LIST_{s-p}$.

If $POWER\_UP\_REG_s$ is equal to '1', the mobile station shall delete all entries from $ZONE\_LIST_{s-p}$ and $SID\_NID\_LIST_{s-p}$.

The mobile station shall perform power-down registration, as specified in 6.6.5.1.2, if all the following conditions are met:

- $REG\_ENABLED_s$ equals YES; and
- $POWER\_DOWN\_REG_s$ equals '1'; and
- There is an entry of $SID\_NID\_LIST_s$ for which the SID and NID fields are equal to SID_s and NID_s; and
- The power-up/initialization timer (see 6.6.5.1.1) is disabled or has expired.

6.6.5.5.3 Actions in the *System Access State*

Requirements in this section and its subsections apply only when the mobile station is in the *System Access State*.

6.6.5.5.3.1 Successful Registration or Implicit Registration

These procedures are performed after the mobile station receives an acknowledgement for a *Registration Message*, *Origination Message*, or *Page Response Message* sent on the Access Channel (see 6.6.3.1.2).

The mobile station shall perform the following actions:

- Disable the power-up/initialization timer (see 6.6.5.1.1).
- Set the First-Idle ID status to enabled (see 2.6.1.1).
- Set REG_COUNT_s to zero.
- Add REG_ZONE_s, SID_s, and NID_s to $ZONE\_LIST_s$ if not already in the list.
- Disable the zone list entry timer for the entry of $ZONE\_LIST_s$ containing REG_ZONE_s, SID_s, and NID_s. For any other entry of $ZONE\_LIST_s$ whose entry timer is not active, enable the entry timer with the duration specified by $ZONE\_TIMER_s$ (see 6.6.5.1.5).
- If $ZONE\_LIST_s$ contains more than $TOTAL\_ZONES_s$ entries, delete the excess entries according to the rules specified in 6.6.5.1.5.
- Add SID_s and NID_s to $SID\_NID\_LIST_s$ if not already in the list.
- Disable the SID/NID list entry timer for the entry of $SID\_NID\_LIST_s$ containing SID_s, and NID_s. For any other entry of $SID\_NID\_LIST_s$ whose entry timer is not active, enable the entry timer with the duration specified in 6.6.5.1.5.
- If $SID\_NID\_LIST_s$ contains more than N_{10m} entries, delete the excess entries according to the rules specified in 6.6.5.1.5.
- If $MULT\_SIDS_s$ is equal to '0' and SID_NID_LIST contains entries with different SIDs, delete the excess entries according to the rules specified in 6.6.5.1.5.

- If $MULT\_NIDS_s$ is equal to '0' and SID_NID_LIST contains more than one entry for any SID, delete the excess entries according to the rules specified in 6.6.5.1.5.
- Set the stored location of last registration ($BASE\_LAT\_REG_{s-p}$ and $BASE\_LONG\_REG_{s-p}$) to the current base station's location ($BASE\_LAT_s$ and $BASE\_LONG_s$). Set the stored registration distance ($REG\_DIST\_REG_{s-p}$) to the current base station's registration distance (REG_DIST_s).
- Update its roaming status and set $REG\_ENABLED_s$ and MOB_TERM_s as specified in 6.6.5.3.

6.6.5.5.3.2 Unsuccessful Access

These procedures are performed when an access attempt fails.

The mobile station shall perform the following actions:

- If there is an entry of $ZONE\_LIST_s$ whose entry timer is not active, enable the entry timer with the duration specified by $ZONE\_TIMER_s$ (see 6.6.5.1.5).
- If there is an entry of $SID\_NID\_LIST_s$ whose entry timer is not active, enable the entry timer with the duration specified in 6.6.5.1.5.

6.6.5.5.3.3 Power Down

These procedures are performed when the mobile station is directed by the user to power down.

If $POWER\_UP\_REG_s$ is equal to '0', the mobile station shall perform the following actions:

- If an entry of $ZONE\_LIST_s$ does not have an active timer, copy that entry to $ZONE\_LIST_{s-p}$; otherwise, delete any entry in $ZONE\_LIST_{s-p}$.
- If an entry of $SID\_NID\_LIST_s$ does not have an active timer, copy that entry to $SID\_NID\_LIST_{s-p}$; otherwise, delete any entry in $SID\_NID\_LIST_{s-p}$.

If $POWER\_UP\_REG_s$ is equal to '1', the mobile station shall delete all entries from $ZONE\_LIST_{s-p}$ and $SID\_NID\_LIST_{s-p}$.

6.6.5.5.4 Actions in the *Mobile Station Control on the Traffic Channel State*

Requirements in this section and its subsections apply only when the mobile station is in the *Mobile Station Control on the Traffic Channel State.*

6.6.5.5.4.1 Traffic Channel Initialization

Upon entering the *Traffic Channel Initialization Substate* of the *Mobile Station Control on the Traffic Channel State*, the mobile station shall set $COUNTER\_ENABLED_s$ to NO.

6.6.5.5.4.2 Timer Maintenance

While in the *Mobile Station Control on the Traffic Channel State*, the mobile station shall update all active registration timers.

If a zone list entry timer expires, the mobile station shall delete the corresponding entry from $ZONE\_LIST_s$. If a SID/NID list entry timer expires, the mobile station shall delete the corresponding entry from $SID\_NID\_LIST_s$.

6.6.5.5.4.3 Processing the *Mobile Station Registered Message*

The mobile station receives the *Mobile Station Registered Message* on the Forward Traffic Channel when the mobile station is considered registered for the base station whose location and other parameters are included in the message.

The mobile station shall store the following parameters:

- System identification ($SID_s = SID_r$)
- Network identification ($NID_s = NID_r$)
- Registration zone ($REG\_ZONE_s = REG\_ZONE_r$)
- Number of registration zones to be retained ($TOTAL\_ZONES_s = TOTAL\_ZONES_r$)
- Zone timer length ($ZONE\_TIMER_s = ZONE\_TIMER_r$)
- Multiple SID storage indicator ($MULT\_SIDS_s = MULT\_SIDS_r$)
- Multiple NID storage indicator ($MULT\_NIDS_s = MULT\_NIDS_r$)
- Base station latitude ($BASE\_LAT_s = BASE\_LAT_r$)
- Base station longitude ($BASE\_LONG_s = BASE\_LONG_r$)
- Registration distance ($REG\_DIST_s = REG\_DIST_r$)

The mobile station shall perform the following actions:

- Set the First-Idle ID status to enabled (see 2.6.2.1).
- Add REG_ZONE_s, SID_s, and NID_s to $ZONE\_LIST_s$ if not already in the list.
- Disable the zone list entry timer for the entry of $ZONE\_LIST_s$ containing REG_ZONE_s, SID_s, and NID_s. For any other entry of $ZONE\_LIST_s$ whose entry timer is not active, enable the entry timer with the duration specified by $ZONE\_TIMER_s$ (see 6.6.5.1.5).
- If $ZONE\_LIST_s$ contains more than $TOTAL\_ZONES_s$ entries, delete the excess entries according to the rules specified in 6.6.5.1.5.
- Add SID_s and NID_s to $SID\_NID\_LIST_s$ if not already in the list.
- Disable the SID/NID list entry timer for the entry of $SID\_NID\_LIST_s$ containing SID_s, and NID_s. For any other entry of $SID\_NID\_LIST_s$ whose entry timer is not active, enable the entry timer with the duration specified in 6.6.5.1.5.
- If $SID\_NID\_LIST_s$ contains more than N_{10m} entries, delete the excess entries according to the rules specified in 6.6.5.1.5.
- If $MULT\_SIDS_s$ is equal to '0' and SID_NID_LIST contains entries with different SIDs, delete the excess entries according to the rules specified in 6.6.5.1.5.
- If $MULT\_NIDS_s$ is equal to '0' and SID_NID_LIST contains more than one entry for any SID, delete the excess entries according to the rules specified in 6.6.5.1.5.

- Set the stored location of last registration ($BASE\_LAT\_REG_{s-p}$ and $BASE\_LONG\_REG_{s-p}$) to the base station's location ($BASE\_LAT_s$ and $BASE\_LONG_s$). Set the stored registration distance ($REG\_DIST\_REG_{s-p}$) to the base station's registration distance (REG_DIST_s).
- Update its roaming status and set MOB_TERM_s as specified in 6.6.5.3. The mobile station should indicate to the user whether the mobile station is roaming.

6.6.5.5.4.4 Power Down

These procedures are performed when the mobile station is directed by the user to power down.

If $POWER\_UP\_REG_s$ is equal to '0', the mobile station shall perform the following actions:

- If an entry of $ZONE\_LIST_s$ does not have an active timer, copy that entry to $ZONE\_LIST_{s-p}$; otherwise, delete any entry in $ZONE\_LIST_{s-p}$.
- If an entry of $SID\_NID\_LIST_s$ does not have an active timer, copy that entry to $SID\_NID\_LIST_{s-p}$; otherwise, delete any entry in $SID\_NID\_LIST_{s-p}$.

If $POWER\_UP\_REG_s$ is equal to '1', the mobile station shall delete all entries from $ZONE\_LIST_{s-p}$ and $SID\_NID\_LIST_{s-p}$.

6.6.6 Handoff Procedures

This section presents an overview and mobile station requirements for handoffs occurring while the mobile station is in the *Mobile Station Control on the Traffic Channel State* (see 6.6.4). Mobile station requirements for handoffs occurring while the mobile station is in the *Mobile Station Idle State* are specified in 6.6.2.1.4.

6.6.6.1 Overview

6.6.6.1.1 Types of Handoff

The mobile station supports the following three handoff procedures while in the *Mobile Station Control on the Traffic Channel State*:

- *Soft Handoff:* A handoff in which the mobile station commences communications with a new base station without interrupting communications with the old base station. Soft handoff can only be used between CDMA Channels having identical frequency assignments. Soft handoff provides diversity of Forward Traffic Channels and Reverse Traffic Channel paths on the boundaries between base stations.
- *CDMA to CDMA Hard Handoff:* A handoff in which the mobile station is transitioned between disjoint sets of base stations, different frequency assignments, or different frame offsets.
- *CDMA to Analog Handoff:* A handoff in which the mobile station is directed from a Forward Traffic Channel to an analog voice channel.

6.6.6.1.2 Pilot Sets

In the following, the term pilot refers to a Pilot Channel identified by a pilot sequence offset (see 7.1.3.2.1) and a frequency assignment (see 7.1.1.1). A pilot is associated with the Forward Traffic Channels in the same Forward CDMA Channel. All pilots in a pilot set have the same CDMA frequency assignment.

Soft handoffs and CDMA to CDMA hard handoffs using the same frequency assignment are typically initiated by the mobile station. The mobile station searches for pilots to detect the presence of CDMA Channels and to measure their strengths. When the mobile station detects a pilot of sufficient strength that is not associated with any of the Forward Traffic Channels assigned to it, it sends a *Pilot Strength Measurement Message* to the base station. The base station can then assign a Forward Traffic Channel associated with that pilot to the mobile station and direct the mobile station to perform a handoff.

The pilot search parameters and the rules for *Pilot Strength Measurement Message* transmission are expressed in terms of the following sets of pilots:

- *Active Set:* The pilots associated with the Forward Traffic Channels assigned to the mobile station.
- *Candidate Set:* The pilots that are not currently in the Active Set but have been received by the mobile station with sufficient strength to indicate that the associated Forward Traffic Channels could be successfully demodulated.
- *Neighbor Set:* The pilots that are not currently in the Active Set or the Candidate Set and are likely candidates for handoff.
- *Remaining Set:* The set of all possible pilots in the current system (integer multiples of $PILOT\_INC_s$) on the current CDMA frequency assignment, excluding the pilots in the Neighbor Set, the Candidate Set, and the Active Set.

6.6.6.2 Requirements

6.6.6.2.1 Pilot Search

The base station specifies for each of the above pilot sets the search window (range of PN offsets) in which the mobile station is to search for usable multipath components (i.e., multipath components that the mobile station can use for demodulation of the associated Forward Traffic Channel) of the pilots in the set.

Search performance criteria are defined in IS-98 "Recommended Minimum Performance Standards for Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations."

This search shall be governed by the following:

- Active Set and Candidate Set: The search procedures for pilots in the Active Set and Candidate Set shall be identical. The search window size[21] for each pilot in the Active Set and Candidate Set shall be the number of PN chips specified in Table 6.6.6.2.1-1 corresponding to $SRCH\_WIN\_A_S$. The mobile station should center the search window for each pilot of the Active Set and Candidate Set around the earliest arriving usable multipath component of the pilot. If the mobile station receives a value greater than or equal to 13 for $SRCH\_WIN\_A_r$, it may store and use the value 13 in $SRCH\_WIN\_A_S$.

Table 6.6.6.2.1-1. Searcher Window Sizes

SRCH_WIN_A SRCH_WIN_N SRCH_WIN_R	Window Size (PN chips)	SRCH_WIN_A SRCH_WIN_N SRCH_WIN_R	Window Size (PN chips)
0	4	8	60
1	6	9	80
2	8	10	100
3	10	11	130
4	14	12	160
5	20	13	226
6	28	14	320
7	40	15	452

- Neighbor Set: The search window size for each pilot in the Neighbor Set shall be the number of PN chips specified in Table 6.6.6.2.1-1 corresponding to $SRCH\_WIN\_N_S$. The mobile station should center the search window for each pilot in the Neighbor Set around the pilot's PN sequence offset using timing defined by the mobile station's time reference (see 6.1.5.1).

- Remaining Set: The search window size for each pilot in the Remaining Set shall be the number of PN chips specified in Table 6.6.6.2.1-1 corresponding to $SRCH\_WIN\_R_S$. The mobile station should center the search window for each pilot in the Remaining Set around the pilot's PN sequence offset using timing defined by the mobile station's time reference (see 6.1.5.1). The mobile station should only search for Remaining Set pilots whose pilot PN sequence offset indices are equal to integer multiples of $PILOT\_INC_S$.

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[21]The table defines the entire search range. For example, $SRCH\_WIN\_A_S = 6$ corresponds to a 28 PN chip search window or ±14 PN chips around the search window center.

6.6.6.2.2 Pilot Strength Measurements

The mobile station assists the base station in the handoff process by measuring and reporting the strengths of received pilots.

The mobile station should use the searcher element (see 6.2.2.1) to compute the strength of a pilot by adding the ratios of received pilot energy per chip, E_C, to total received spectral density (noise and signals), I_0, of at most k usable multipath components, where k is the number of demodulating elements (see 6.2.2.1) supported by the mobile station.

6.6.6.2.3 Handoff Drop Timer

The mobile station shall maintain a handoff drop timer for each pilot in the Active Set and Candidate Set. The mobile station shall start the timer whenever the strength of the corresponding pilot becomes less than T_DROP_s. For the Active Set, the mobile station shall start the timer even if the timer has previously expired. The mobile station shall reset and disable the timer if the strength of the corresponding pilot exceeds T_DROP_s. If T_TDROP_s equals zero, the mobile station shall consider the timer expired within 100 ms of enabling it. Otherwise, the mobile station shall consider the timer expired within 10% of the timer expiration value shown in Table 6.6.6.2.3.-1 corresponding to T_TDROP_s. If T_TDROP_s changes, the mobile station shall begin using the new value within 100 ms.

Table 6.6.6.2.3-1. Handoff Drop Timer Expiration Values

T_TDROP	Timer Expiration (seconds)	T_TDROP	Timer Expiration (seconds)
0	≤ 0.1	8	27
1	1	9	39
2	2	10	55
3	4	11	79
4	6	12	112
5	9	13	159
6	13	14	225
7	19	15	319

The mobile station shall indicate the status of the handoff drop timer for all pilots in the Active Set and Candidate Set when transmitting a *Pilot Strength Measurement Message*.

6.6.6.2.4 Pilot PN Phase

The mobile station shall measure the arrival time, PILOT_ARRIVAL, for each pilot reported to the base station. The pilot arrival time shall be the time of occurrence, as measured at the mobile station antenna connector, of the earliest arriving usable multipath component of the pilot. The arrival time shall be measured relative to the mobile station's time reference (see 6.1.5.1) in units of PN chips. The mobile station shall compute the reported pilot PN phase, PILOT_PN_PHASE, as

$$\text{PILOT\_PN\_PHASE} = (\text{PILOT\_ARRIVAL} + (64 \times \text{PILOT\_PN})) \bmod 2^{15},$$

where PILOT_PN is the PN sequence offset index of the pilot (see 7.1.3.2.1).

6.6.6.2.5 Handoff Messages

6.6.6.2.5.1 Processing of Forward Traffic Channel Handoff Messages

If the mobile station receives any of the following messages, then the mobile station shall process the message as described.

1. <u>*Pilot Measurement Request Order*</u>: The mobile station shall send, within T_{56m} seconds, a *Pilot Strength Measurement Message*.
2. <u>*Handoff Direction Message*</u>: The message shall take effect at the following time:
   - If FRAME_OFFSET$_r$ is not equal to FRAME_OFFSET$_s$ and USE_TIME$_r$ equals '0', then the message shall take effect on the first 80 ms boundary (relative to System Time) occurring at least 80 ms after the end of the frame containing the last bit of the message.
   - Otherwise, the message shall take effect at the action time of the message as specified in 6.6.4.1.5.

   When the message takes effect, the mobile station shall perform the following:

   - Update the Active Set, Candidate Set, and Neighbor Set in accordance with the *Handoff Direction Message* (see 6.6.6.2.6.1, 6.6.6.2.6.2, and 6.6.6.2.6.3).
   - Discontinue use of all Forward Traffic Channels associated with pilots not listed in the *Handoff Direction Message*.
   - If FRAME_OFFSET$_r$ is not equal to FRAME_OFFSET$_s$, change the frame offset on both the Forward Traffic Channel and the Reverse Traffic Channel.
   - If the RESET_L2$_r$ is equal to '1', reset the acknowledgement procedures as specified in 6.6.4.1.3.3, and reset the Forward Traffic Channel power control counters as specified in 6.6.4.1.1.1.
   - Use the long code mask specified by the PRIVATE_LCM$_r$ (see 6.3.12.3) and indicate to the user the voice privacy mode status.
   - Process the ENCRYPT_MODE field as specified in 6.3.12.2.
   - If CDMA_FREQ$_r$ ≠ CDMACH$_s$, FRAME_OFFSET$_r$ ≠ FRAME_OFFSET$_s$, or the set of pilots specified by the message is disjoint from the Active Set prior to the action time of the message, the mobile station shall perform actions as indicated in 6.6.6.2.8. If the message specifies more than one pilot, the mobile station shall perform actions as specified in 6.6.6.2.7.
   - Store the following parameters from the *Handoff Direction Message*:

- *Handoff Direction Message* sequence number ($HDM\_SEQ_s = HDM\_SEQ_r$)
- Search window size for the Active Set and Candidate Set ($SRCH\_WIN\_A_s = SRCH\_WIN\_A_r$)
- Pilot detection threshold ($T\_ADD_s = T\_ADD_r$)
- Pilot drop threshold ($T\_DROP_s = T\_DROP_r$)
- Active Set versus Candidate Set comparison threshold ($T\_COMP_s = T\_COMP_r$)
- Drop timer value ($T\_TDROP_s = T\_TDROP_r$)
- Frame offset ($FRAME\_OFFSET_s = FRAME\_OFFSET_r$)
- Frequency assignment, if specified (if $FREQ\_INCL_r$ = '1', $CDMACH_s = CDMA\_FREQ_r$)

3. <u>*Analog Handoff Direction Message*</u>: The mobile station shall process the message as specified in 6.6.6.2.9.
4. <u>*Neighbor List Update Message*</u>: The mobile station shall process the message as specified in 6.6.6.2.6.3.

6.6.6.2.5.2 Processing of Reverse Traffic Channel Handoff Messages

The mobile station sends the following messages on the Reverse Traffic Channel in support of handoff when its transmitter is enabled and following the receipt of the first *Base Station Acknowledgement Order* on the Forward Traffic Channel:

1. <u>*Pilot Strength Measurement Message*</u>: The mobile station shall send an autonomous *Pilot Strength Measurement Message* whenever any of the following events occur:
   - The strength of a Neighbor Set or Remaining Set pilot is found to be above T_ADD_s.
   - The strength of a Candidate Set pilot exceeds the strength of an Active Set pilot by $T\_COMP_s \times 0.5$ dB and a *Pilot Strength Measurement Message* carrying this information has not been sent since the last *Handoff Direction Message* was received.
   - The handoff drop timer of an Active Set pilot has expired and a *Pilot Strength Measurement Message* carrying this information has not been sent since the last *Handoff Direction Message* was received.
2. <u>*Handoff Completion Message*</u>: The mobile station shall send the *Handoff Completion Message* as a message requiring acknowledgment within T_{56m} seconds after the action time of a received *Handoff Direction Message*.

6.6.6.2.6 Set Maintenance

6.6.6.2.6.1 Maintenance of the Active Set

The mobile station shall support a maximum Active Set size of N_{6m} pilots. The mobile station shall track the pilot strengths of all pilots in the Active Set.

When the mobile station is first assigned a Forward Traffic Channel, the mobile station shall initialize the Active Set to contain only the pilot associated with the assigned Forward Traffic Channel. When the mobile station processes a *Handoff Direction Message* it shall replace the Active Set with the pilots listed in the message.

6.6.6.2.6.2 Maintenance of the Candidate Set

The mobile station shall support a maximum Candidate Set size of N_{7m} pilots.

When the mobile station is first assigned a Forward Traffic Channel, the mobile station shall initialize the Candidate Set to contain no pilots. The mobile station shall adjust the Candidate Set whenever any of the following events occur:

- If the mobile station detects that the strength of a Neighbor Set pilot or a Remaining Set pilot exceeds T_ADD_s, the mobile station shall add the pilot to the Candidate Set.
- If the mobile station processes a *Handoff Direction Message* which does not list a pilot in the current Active Set, and the handoff drop timer corresponding to that pilot has not expired, the mobile station shall add the pilot to the Candidate Set.
- If the mobile station processes a *Handoff Direction Message* which lists a pilot in the current Candidate Set, the mobile station shall delete the pilot from the Candidate Set.
- If the handoff drop timer corresponding to a Candidate Set pilot expires, the mobile station shall delete the pilot from the Candidate Set.
- If the mobile station adds a pilot to the Candidate Set and the resulting Candidate Set size exceeds N_{7m}, the mobile station shall delete from the Candidate Set the pilot whose handoff drop timer is closest to expiration. If more than one such pilot exists, the mobile station shall delete one such pilot that has the lowest strength. If no pilot in the Candidate Set has an enabled handoff drop timer, the mobile station shall delete from the Candidate Set one of the pilots that has the lowest strength.

6.6.6.2.6.3 Maintenance of the Neighbor Set

The mobile station shall support a Neighbor Set size of at least N_{8m} pilots.

When the mobile station is first assigned a Forward Traffic Channel, the mobile station shall initialize the Neighbor Set to contain the pilots specified in the most recently received *Neighbor List Message*.

The mobile station shall maintain a counter, AGE_s, for each pilot in the Neighbor Set. The mobile station shall initialize this counter to zero when it moves the pilot from the Active Set or the Candidate Set to the Neighbor Set. The mobile station shall initialize this counter to $NGHBR\_MAX\_AGE_s$ when it moves the pilot from the Remaining Set to the Neighbor Set. The mobile station shall increment AGE_s for each pilot in the Neighbor Set upon receipt of a *Neighbor List Update Message*.

The mobile station shall adjust the Neighbor Set whenever any of the following events occur:

- If the mobile station receives a *Neighbor List Update Message*, it shall perform the following:
  - Increment AGE_S for each pilot in the Neighbor Set.
  - Delete from the Neighbor Set all pilots whose AGE_S exceeds $NGHBR\_MAX\_AGE_S$.
  - Add to the Neighbor Set each pilot named in the message, if it is not already a pilot of the Candidate Set or Neighbor Set. If the mobile station can store in the Neighbor Set only k additional pilots and more than k new pilots were sent in the *Neighbor List Update Message*, the mobile station shall store the first k new pilots listed in the message.
- If the handoff drop timer of a pilot in the Candidate Set expires, the mobile station shall add the pilot to the Neighbor Set.
- If the mobile station processes a *Handoff Direction Message* in which a pilot in the Active Set is not listed and the handoff drop timer corresponding to the pilot has expired, the mobile station shall add the pilot to the Neighbor Set.
- If the mobile station adds a pilot to the Candidate Set and the resulting Candidate Set size exceeds the size supported by the mobile station, the mobile station shall add the deleted Candidate Set pilot to the Neighbor Set (see 6.6.6.2.6.2).
- If the mobile station detects that the strength of a Neighbor Set pilot exceeds T_ADD_S, the mobile station shall delete the pilot from the Neighbor Set.
- If the mobile station processes a *Handoff Direction Message* which lists a pilot in the current Neighbor Set, the mobile station shall delete the pilot from the Neighbor Set.
- If the mobile station adds a pilot to the Neighbor Set and the resulting Neighbor Set size exceeds the size supported by the mobile station, the mobile station shall delete from the Neighbor Set the pilot whose AGE_S is largest. If more than one such pilot exists, the mobile station shall delete one such pilot that has the lowest strength.

6.6.6.2.7 Soft Handoff

6.6.6.2.7.1 Forward Traffic Channel Processing

All Forward Traffic Channels associated with pilots in the Active Set of the mobile station carry identical modulation symbols with the exception of the power control subchannel (see 7.1.3.1.7 and 7.6.6.2.4.2).

When the Active Set contains more than one pilot, the mobile station should provide diversity combining of the associated Forward Traffic Channels. The mobile station shall provide for differential propagation delays from zero to at least 150 μs.

6.6.6.2.7.2 Reverse Traffic Channel Power Control During Soft Handoff

The *Handoff Direction Message* identifies sets of Forward Traffic Channels that carry identical closed loop power control subchannels. A set consists of one or more Forward Traffic Channel transmissions with identical power control information.

In each power control group containing valid power control bits (see 6.1.2.3.2), the mobile station should provide diversity combining of the identical closed loop power control subchannels and shall obtain at most one power control bit from each set of identical closed loop power control subchannels. If the power control bits obtained from all sets are equal to '0', the mobile station shall increase its power as specified in 6.1.2.3.2. If the power control bit obtained from any set is equal to '1', the mobile station shall decrease its power as specified in 6.1.2.3.2.

6.6.6.2.8 CDMA to CDMA Hard Handoff

The base station directs the mobile station to perform a CDMA to CDMA hard handoff by sending a *Handoff Direction Message* in which the mobile station is transitioned between disjoint sets of base stations, different frequency assignments, or different frame offsets.

At the action time specified in the *Handoff Direction Message*, the mobile station shall disable its transmitter, reset the fade timer specified in 6.4.4, suspend incrementing TOT_FRAMES_8 and BAD_FRAMES_8 as specified in 6.6.4.1.1, and tune to the assigned Forward Traffic Channel. The mobile station shall perform acquisition of the pilots in the new Active Set. The mobile station shall not enable its transmitter until it receives at least N_{3m} consecutive good frames on the assigned Forward Traffic Channel. Upon receiving N_{3m} consecutive good frames, the mobile station shall resume incrementing TOT_FRAMES_8 and BAD_FRAMES_8 as specified in 6.6.4.1.1.

If the *Handoff Direction Message* specifies a CDMA frequency assignment different from the current CDMA frequency assignment and an Active Set containing pilots with pilot PN sequence offsets identical to those of the pilots in the current Active Set, the mobile station shall begin monitoring the assigned Forward Traffic Channel within T_{60m} seconds after the action time.

If the *Handoff Direction Message* specifies a CDMA frequency assignment different from the current CDMA frequency assignment and an Active Set containing a pilot with pilot PN sequence offset not equal to that of any pilot in the current Active Set, the mobile station shall begin monitoring the assigned Forward Traffic Channel within T_{61m} seconds after the action time.

If the *Handoff Direction Message* specifies a CDMA to CDMA hard handoff using the current CDMA frequency assignment, the mobile station shall begin monitoring the assigned Forward Traffic Channel within T_{62m} seconds after the action time.

6.6.6.2.9 CDMA to Analog Handoff

The base station directs the mobile station to perform a CDMA to Analog handoff by sending an *Analog Handoff Direction Message*.

The mobile station shall store the following parameters from the *Analog Handoff Direction Message*:

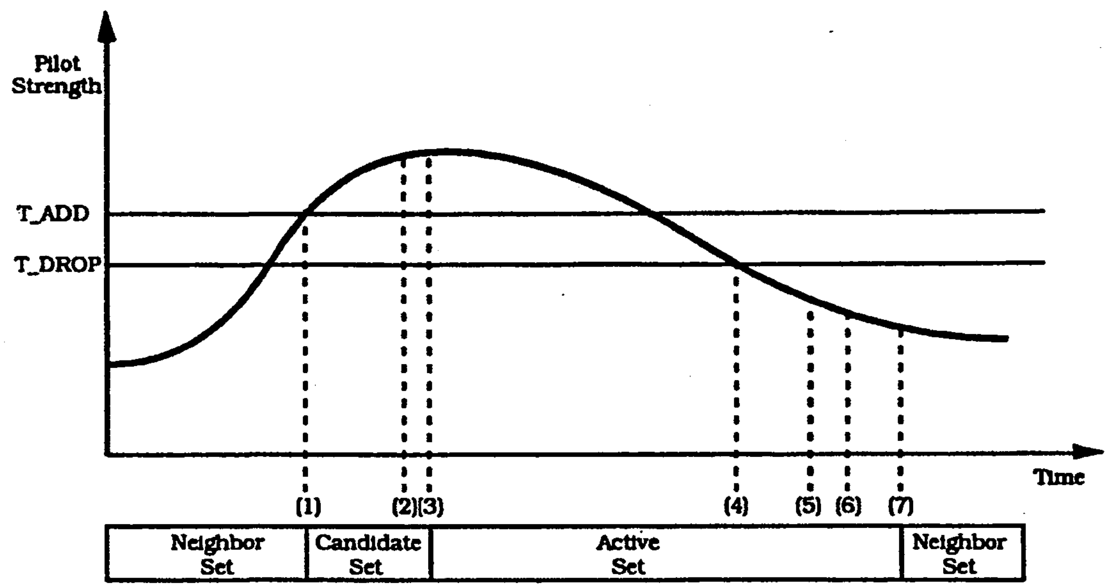
- System identification ($SID_s = SID_r$)
- Voice mobile station attenuation code ($VMAC_s = VMAC_r$)
- Analog voice channel number ($ANALOG\_CHAN_s = ANALOG\_CHAN_r$)
- SAT color code ($SCC_s = SCC_r$)
- Message encryption mode indicator ($MEM_s = MEM_r$)

At the action time specified by the *Analog Handoff Direction Message* (see 6.6.4.1.5), the mobile station shall disable its transmitter. The mobile station shall enable its transmitter on the analog voice channel within T_{63m} seconds after the action time.

6.6.6.3 Examples

The following examples illustrate typical message exchanges between the mobile station and the base station during handoff. Refer to Appendix B for examples of call processing during handoff.

Figure 6.6.6.3-1 shows an example of the messages exchanged between the mobile station and the base station during a typical handoff process.



(1) Pilot strength exceeds T_ADD. Mobile station sends a *Pilot Strength Measurement Message* and transfers pilot to the Candidate Set.

(2) Base station sends a *Handoff Direction Message.*

(3) Mobile station transfers pilot to the Active Set and sends a *Handoff Completion Message.*

(4) Pilot strength drops below T_DROP. Mobile station starts the handoff drop timer.

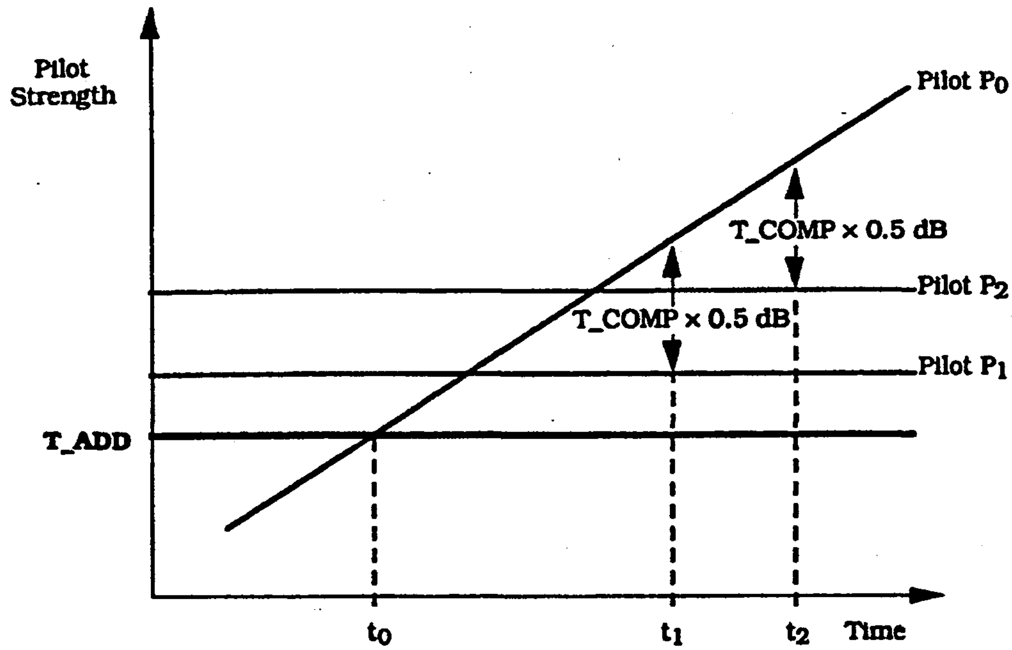
(5) Handoff drop timer expires. Mobile station sends a *Pilot Strength Measurement Message.*

(6) Base station sends a *Handoff Direction Message.*

(7) Mobile station moves pilot from the Active Set to the Neighbor Set and sends a *Handoff Completion Message.*

Figure 6.6.6.3-1. Handoff Threshold Example

Figure 6.6.6.3-2 illustrates the messaging triggered by a pilot of the Candidate Set as its strength gradually rises above the strength of each pilot of the Active Set. Note that the mobile station reports that a Candidate Set pilot is stronger than an Active Set pilot only if the difference between their respective strengths is at least $T\_COMP_s \times 0.5$ dB.



Candidate Set: Pilot P_0

Active Set: Pilots P_1, P_2

t_0 — *Pilot Strength Measurement Message* sent, $P_0 > T\_ADD$

t_1 — *Pilot Strength Measurement Message* sent, $P_0 > P_1 + T\_COMP \times 0.5$ dB

t_2 — *Pilot Strength Measurement Message* sent, $P_0 > P_2 + T\_COMP \times 0.5$ dB

Figure 6.6.6.3-2. Pilot Strength Measurements Triggered by a Candidate Pilot

6.6.7 Hash Functions and Randomization

6.6.7.1 Hash Function

Certain procedures require a uniform distribution of mobile stations among N resources. The following function returns an integer, using as arguments the mobile station's MIN or ESN, the number of resources N, and a modifier DECORR. The modifier serves to decorrelate the values obtained for the various applications from the same mobile station.

If the hashing function is to be used for determining the Access Channel PN Randomization, HASH_KEY shall be equal to the mobile station ESN. Otherwise, HASH_KEY shall be equal to the 32 least significant bits of $(MIN1 + 2^{24} \times MIN2)$.

Define:

- Word L to be bits 0-15 of HASH_KEY
- Word H to be bits 16-31 of HASH_KEY

where bit 0 is the least significant bit of HASH_KEY. The hash value is computed as follows:[22]

$$R = \lfloor N \times ((40503 \times (L \oplus H \oplus DECORR)) \bmod 2^{16}) / 2^{16} \rfloor$$

The mobile station shall choose the range N and the 16-bit modifier DECORR according to the application as shown in Table 6.6.7.1-1. In the table, HASH_KEY [0...11] denotes the 12 least significant bits of HASH_KEY.

Table 6.6.7.1-1. Hash Function Modifier

Application	N	DECORR	Return Value
CDMA Channel Number	Number of channels in last *CDMA Channel List Message* (up to 10)	0	R + 1
Paging Channel Number	$PAGE\_CHAN_s$ from *System Parameters Message* (up to 7)	2 × HASH_KEY [0...11]	R + 1
Paging Slot Number	2048	6 × HASH_KEY[0...11]	R
Access Channel PN Randomization	$2^{PROBE\_PN\_RAN_s}$ where PROBE_PN_RAN is from *Access Parameters Message* (up to 512)	14 × HASH_KEY[0...11]	R

6.6.7.2 Pseudorandom Number Generator

Where pseudorandom numbers are needed in the CDMA cellular protocols, a linear congruential generator shall be used. The mobile station shall implement the linear congruential generator defined by:

$$z_n = a \times z_{n-1} \bmod m$$

where $a = 7^5 = 16807$ and $m = 2^{31} - 1 = 2147483647$. z_n is the output of the generator.[23]

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[22]This formula is adapted from Knuth, D. N., *Sorting and Searching*, vol. 3 of *The Art of Computer Programming*, 3 vols., (Reading, MA: Addison-Wesley, 1973), pp. 508-513.

[23]This generator has full period, ranging over all integers from 1 to m-1; the values 0 and m are never produced. Several suitable implementations can be found in Park, Stephen K. and Miller, Keith W.,

During the *Mobile Station Initialization State*, the mobile station shall seed its generator with

$$z_0 = (\mathrm{ESN} \oplus \mathrm{RANDOM\_TIME}) \bmod m$$

where RANDOM_TIME shall be the least-significant 32-bits of $\mathrm{SYS\_TIME}_s$ stored from the *Sync Channel Message*. If the initial value so produced is found to be zero, it shall be replaced with one. The mobile station shall compute a new z_n for each subsequent use.

The mobile station shall use the value $u_n = z_n / m$ for those applications that require a binary fraction u_n, $0 < u_n < 1$.

The mobile station shall use the value $k_n = \lfloor N \times z_n / m \rfloor$ for those applications that require a small integer k_n, $0 \le k_n \le N-1$.

"Random Number Generators: Good Ones are Hard to Find," *Communications of the ACM*, vol. 31, no. 10, October 1988, pp. 1192-1201.

6.7 Signaling Formats

This section describes the messages sent by the mobile station.

Some bits in the following message formats are marked as RESERVED. These bits allow for extensions to the basic message for future features and capabilities. The mobile station sets all reserved bits to '0'.

All messages have a set of acknowledgement fields. These fields are ACK_SEQ, MSG_SEQ, ACK_REQ, and VALID_ACK for Access Channel messages and ACK_SEQ, MSG_SEQ, and ACK_REQ for Reverse Traffic Channel messages.

In any multi-bit field of a signaling message, the most significant bit shall be transmitted first.

6.7.1 Access Channel

This section describes the messages sent by the mobile station on the Access Channel (see 6.1.3.2).

6.7.1.1 Access Channel Structure

An Access Channel slot is (3 + MAX_CAP_SZ) + (1 + PAM_SZ) Access Channel frames in length. An Access Channel slot begins and ends on an Access Channel frame boundary. Access Channel slots begin at Access Channel frames in which

$$t \bmod (4 + MAX\_CAP\_SZ + PAM\_SZ) = 0,$$

where t is the System Time in frames. Note that all Access Channels associated with a particular Paging Channel have the same slot size and that all of the slots begin at the same time. Figure 6.7.1.1-1 shows an example of Access Channel slots. Figure 6.7.1.1-2 shows the Access Channel structure.

The Access Channel slot length may differ from base station to base station. A mobile station shall determine the beginning and length of the Access Channel slot prior to transmission.

An Access Channel transmission consists of the Access Channel preamble and the Access Channel message capsule. An Access Channel transmission shall be an integer number of Access Channel frames in length and shall not exceed 4 + MAX_CAP_SZ + PAM_SZ Access Channel frames in length.

On each Access Channel transmission, the mobile station shall transmit a preamble consisting of 96 zeros (see 6.1.3.2.2.1) starting at the beginning of the slot (plus PN randomization as specified in 6.6.3.1.1.2) and 1 + PAM_SZ Access Channel frames in length. The mobile station shall transmit an Access Channel message capsule immediately following the preamble.

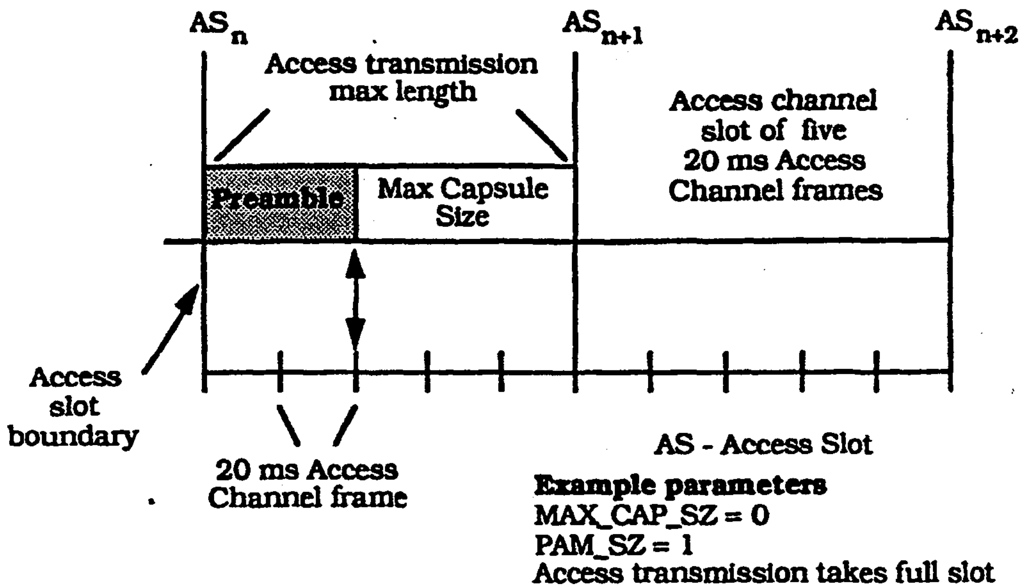

Figure 6.7.1.1-1. Example of Access Channel Slot Structure

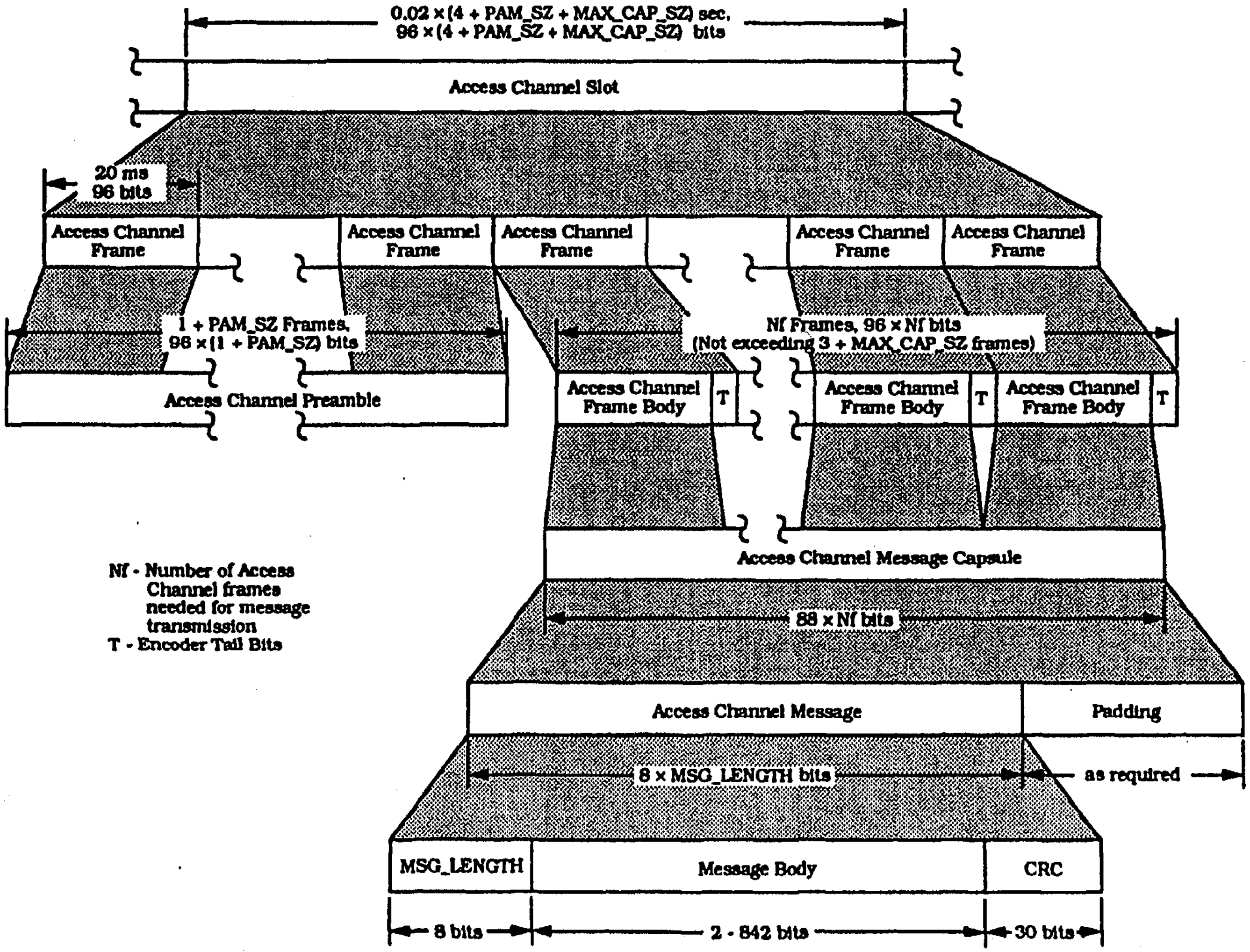

Figure 6.7.1.1-2. Access Channel Structure

6.7.1.2 Access Channel Message Structure

An Access Channel message capsule consists of an Access Channel message and padding, as shown in Figure 6.7.1.2-1. The length of the Access Channel message capsule shall be an integer number of Access Channel frames given by

$$CAP\_SZ = \left\lceil \frac{8 + \text{Message Body Length} + 30}{88} \right\rceil .$$

Each Access Channel message shall consist of a length field (MSG_LENGTH), a message body, and a CRC, in that order. The message body size shall be selected so that CAP_SZ does not exceed 3 + MAX_CAP_SZ. The mobile station shall transmit the Access Channel message immediately following the preamble.

The mobile station shall transmit padding consisting of zero or more '0' bits immediately following the Access Channel message. The length of the padding shall be such that

$$8 + \text{Message Body Length} + 30 + \text{Padding Length} = 88 \times CAP\_SZ.$$

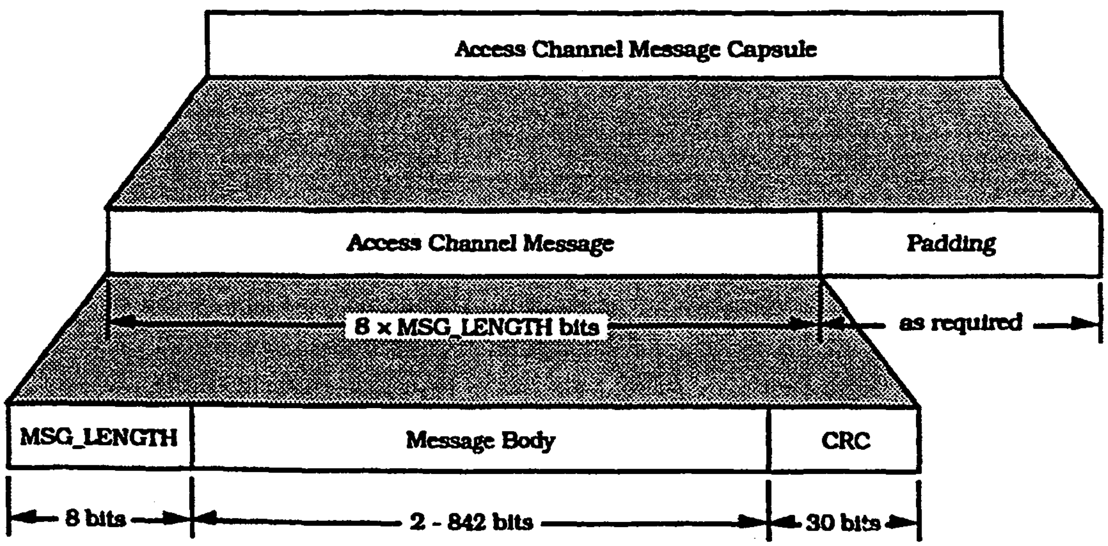

Figure 6.7.1.2-1. Access Channel Message Structure

6.7.1.2.1 Access Channel MSG_LENGTH Field

The mobile station shall set the MSG_LENGTH field of each Access Channel signaling message to the length of the message in octets, including the MSG_LENGTH field, the message body, and the CRC, but not including the preamble or the padding. The MSG_LENGTH field shall be 8 bits in length. Consistent with a maximum MAX_CAP_SZ value of 7, the mobile station shall limit the maximum Access Channel message length to 110 octets, or 880 bits. That is, the value of the MSG_LENGTH field shall not exceed 110.

6.7.1.2.2 Access Channel Message CRC

A 30-bit CRC shall be computed for each Access Channel signaling message. The CRC shall include the MSG_LENGTH field and the message body. The generator polynomial for the CRC shall be as follows:

$$g(x) = x^{30} + x^{29} + x^{21} + x^{20} + x^{15} + x^{13} + x^{12} + x^{11} + x^{8} + x^{7} + x^{6} + x^{2} + x + 1.$$

The CRC shall be the value computed by the following procedure and the logic shown in Figure 6.7.1.2.2-1:

- All shift register elements shall be initialized to logical one.[24]
- The switches shall be set in the up position.
- The information bit count k shall be defined as 8 + message body length in bits.
- The register shall be clocked k times, with the length and message body of the message as the k input bits.
- The switches shall be set in the down position.
- The register shall be clocked an additional 30 times.
- The 30 additional output bits shall be the CRC field.
- The bits shall be transmitted in the order in which they appear at the output of the CRC encoder.

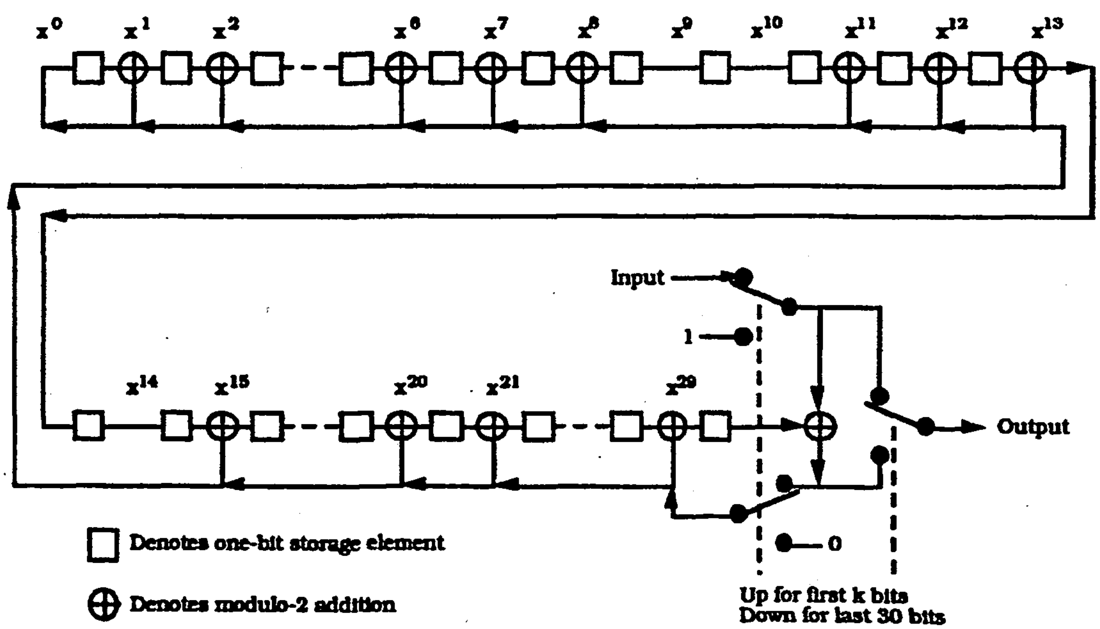

Figure 6.7.1.2.2-1. Access Channel CRC Calculation

[24] Initialization of the register to ones causes the CRC for all-zero data to be non-zero.

6.7.1.3 Access Channel Message Body Format

The messages sent on the Access Channel are summarized in Table 6.7.1.3-1.

Table 6.7.1.3-1. Access Channel Messages

Message Name	Message Type (binary)
Registration Message	00000001
Order Message	00000010
Data Burst Message	00000011
Origination Message	00000100
Page Response Message	00000101
Authentication Challenge Response Message	00000110

6.7.1.3.1 Common Fields

6.7.1.3.1.1 Common Layer 2 and Identification Fields

All Access Channel messages share the following eight fields:

ACK_SEQ - Acknowledgement sequence number.

The mobile station shall set this field to the value of the MSG_SEQ field from the most recently received Paging Channel message requiring acknowledgement. If no such message has been received, the mobile station shall set this field to '111'. See 6.6.2.1.2.

MSG_SEQ - Message sequence number.

The mobile station shall set this field to the message sequence number for this message. See 6.6.3.1.2.

ACK_REQ - Acknowledgement required indicator. This field indicates whether this message requires an acknowledgement. The mobile station shall set the ACK_REQ field of all messages sent on the Access Channel to '1'.

VALID_ACK - Valid acknowledgement indicator.

To acknowledge a Paging Channel message, the mobile station shall set this field to '1'. Otherwise, the mobile station shall set this field to '0'. See 6.6.2.1.2.

ACK_TYPE - Acknowledgement address type.

The mobile station shall set this field to the value of the ADDR_TYPE field, if present, from the most recently received Paging Channel message requiring acknowledgement. If the Paging Channel message contained no ADDR_TYPE field, or if no such message has been received, the mobile station shall set this field to '000'.

MSID_TYPE - Mobile station identifier field type.

The mobile station shall set this field to the value shown in Table 6.7.1.3.1.1-1 corresponding to the identifier type contained in the MSID field.

Table 6.7.1.3.1.1-1. Address Types

Description	MSID_TYPE (binary)	MSID_LEN (octets)
MIN and ESN	000	9
All other MSID_TYPE values are reserved		

MSID_LEN - Mobile station identifier field length.

The mobile station shall set this field to the number of octets in the MSID field.

MSID - Mobile station identifier.

The mobile station shall set this field to the mobile station identifier, using the identifier type specified in the MSID_TYPE field.

If MSID_TYPE is equal to '000', the MSID field shall consist of the following subfields:

Subfield	Length (bits)
MIN1	24
MIN2	10
ESN	32
RESERVED	6

MIN1 - First part of the mobile identification number (MIN).

The mobile station shall set this field to MIN1 (see 2.3.1).

MIN2 - Second part of the mobile identification number (MIN).

The mobile station shall set this field to MIN2 (see 2.3.1).

ESN - Mobile station's electronic serial number.

The mobile station shall set this field to its electronic serial number. See 2.3.2.

RESERVED - Reserved bits.

The mobile station shall set this field to '000000'.

6.7.1.3.1.2 Common Authentication Fields

Most Access Channel messages share the same four fields related to authentication:

AUTH_MODE - Authentication mode.

If authentication information is not available, or if the base station has indicated that authentication is not required (by setting the AUTH field in the *Access Parameters Message* to '00'), the mobile station shall set this field to '00'. If authentication is required by the base station and authentication information is available, the mobile station shall set this field to '01'. All other values are reserved.

AUTHR - Authentication data.

If the AUTH_MODE field is set to '01', the mobile station shall set this field as specified in 6.3.12.1. If the AUTH_MODE field is set to any other value, the mobile station shall omit this field.

RANDC - Random challenge value.

If the AUTH_MODE field is set to '01', the mobile station shall set this field as specified in 6.3.12.1. If the AUTH_MODE field is set to any other value, the mobile station shall omit this field.

COUNT - Call history parameter.

If the AUTH_MODE field is set to '01', the mobile station shall set this field to the current value of the $COUNT_{s\text{-}p}$ parameter. If the AUTH_MODE field is set to any other value, the mobile station shall omit this field.

6.7.1.3.2 Message Body Contents

The following sections specify the contents of the message body for each message that may be sent on the Access Channel.

6.7.1.3.2.1 Registration Message

When the mobile station sends a *Registration Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00000001')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
VALID_ACK	1
ACK_TYPE	3
MSID_TYPE	3
MSID_LEN	4
MSID	8 × MSID_LEN
AUTH_MODE	2
AUTHR	0 or 18
RANDC	0 or 8
COUNT	0 or 6
REG_TYPE	4
SLOT_CYCLE_INDEX	3
MOB_P_REV	8
SCM	8
MOB_TERM	1
RESERVED	6

MSG_TYPE - Message type.
The mobile station shall set this field to '00000001'.

ACK_SEQ - Acknowledgement sequence number.
See 6.7.1.3.1.1.

MSG_SEQ - Message sequence number.
See 6.7.1.3.1.1.

ACK_REQ - Acknowledgement required indicator.
See 6.7.1.3.1.1.

VALID_ACK	-	Valid acknowledgement indicator. See 6.7.1.3.1.1.
ACK_TYPE	-	Acknowledgement address type. See 6.7.1.3.1.1.
MSID_TYPE	-	Mobile station identifier field type. See 6.7.1.3.1.1.
MSID_LEN	-	Mobile station identifier field length. See 6.7.1.3.1.1.
MSID	-	Mobile station identifier. See 6.7.1.3.1.1.
AUTH_MODE	-	Authentication mode. See 6.7.1.3.1.2.
AUTHR	-	Authentication data. See 6.7.1.3.1.2.
RANDC	-	Random challenge value. See 6.7.1.3.1.2.
COUNT	-	Call history parameter. See 6.7.1.3.1.2.
REG_TYPE	-	Registration type. This field indicates which type of event generated the registration attempt. The mobile station shall set this field to the REG_TYPE value shown in Table 6.7.1.3.2.1-1 corresponding to the event that caused this registration to occur (see 6.6.5.1).

Table 6.7.1.3.2.1-1. Registration Type (REG_TYPE) Codes

REG_TYPE (binary)	Type of Registration
0000	Timer-based (see 6.6.5.1.3)
0001	Power-up (see 6.6.5.1.1)
0010	Zone-based (see 6.6.5.1.5)
0011	Power-down (see 6.6.5.1.2)
0100	Parameter-change (see 6.6.5.1.6)
0101	Ordered (see 6.6.5.1.7)
0110	Distance-based (see 6.6.5.1.4)
All other REG_TYPE values are reserved.	

SLOT_CYCLE_INDEX - Slot cycle index.

If the mobile station is configured for slotted mode operation, the mobile station shall set this field to the preferred slot cycle index, $SLOT\_CYCLE\_INDEX_p$ (see 6.6.2.1.1). Otherwise, the mobile station shall set this field to '000'.

MOB_P_REV - Protocol revision of the mobile station.

The mobile station shall set this field to '00000001'.

SCM - Station class mark.

The mobile station shall set this field to its station class mark. See 2.3.3.

MOB_TERM - Mobile terminated calls accepted indicator.

If the mobile station is configured to accept mobile terminated calls while operating with the current roaming status (see 6.6.5.3), the mobile station shall set this bit to '1'. Otherwise, the mobile station shall set this bit to '0'.

RESERVED - Reserved bits

The mobile station shall set this field to '000000'.

6.7.1.3.2.2 Order Message

When the mobile station sends an *Order Message* on the Access Channel, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00000010')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
VALID_ACK	1
ACK_TYPE	3
MSID_TYPE	3
MSID_LEN	4
MSID	8 × MSID_LEN
RESERVED	2
ORDER	6
ADD_RECORD_LEN	3
order-specific fields (if used)	8 × ADD_RECORD_LEN
RESERVED	5

MSG_TYPE - Message type.
The mobile station shall set this field to '00000010'.

ACK_SEQ - Acknowledgement sequence number.
See 6.7.1.3.1.1.

MSG_SEQ - Message sequence number.
See 6.7.1.3.1.1.

ACK_REQ - Acknowledgement required indicator.
See 6.7.1.3.1.1.

VALID_ACK - Valid acknowledgement indicator.
See 6.7.1.3.1.1.

ACK_TYPE - Acknowledgement address type.
See 6.7.1.3.1.1.

MSID_TYPE - Mobile station identifier field type.
See 6.7.1.3.1.1.

MSID_LEN - Mobile station identifier field length.

See 6.7.1.3.1.1.

MSID - Mobile station identifier.

See 6.7.1.3.1.1.

RESERVED - Reserved bits.

These bits take the place of the AUTH_MODE field.

The mobile station shall set this field to '00'.

ORDER - Order code.

The mobile station shall set this field to the ORDER code (see 6.7.3) for this type of *Order Message*.

ADD_RECORD_LEN - Additional record length.

The mobile station shall set this field to the number of octets in the order-specific fields included in this message.

order-specific fields - Order-specific fields.

The mobile station shall include order-specific fields as specified in 6.7.3.

RESERVED - Reserved bits.

The mobile station shall set this field to '00000'.

6.7.1.3.2.3 Data Burst Message

When the mobile station sends a *Data Burst Message* on the Access Channel, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00000011')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
VALID_ACK	1
ACK_TYPE	3
MSID_TYPE	3
MSID_LEN	4
MSID	8 × MSID_LEN
RESERVED	2
MSG_NUMBER	8
BURST_TYPE	6
NUM_MSGS	8
NUM_FIELDS	8
NUM_FIELDS occurrences of the following field:	
CHARi	8

MSG_TYPE - Message type.

The mobile station shall set this field to '00000011'.

ACK_SEQ - Acknowledgement sequence number.

See 6.7.1.3.1.1.

MSG_SEQ - Message sequence number.

See 6.7.1.3.1.1.

ACK_REQ - Acknowledgement required indicator.

See 6.7.1.3.1.1.

VALID_ACK - Valid acknowledgement indicator.

See 6.7.1.3.1.1.

ACK_TYPE - Acknowledgement address type.

See 6.7.1.3.1.1.

MSID_TYPE - Mobile station identifier field type.

See 6.7.1.3.1.1.

MSID_LEN - Mobile station identifier field length.

See 6.7.1.3.1.1.

MSID - Mobile station identifier.

See 6.7.1.3.1.1.

RESERVED - Reserved bits.

These bits take the place of the AUTH_MODE field.

The mobile station shall set this field to '00'.

MSG_NUMBER - Message number within the data burst stream.

The mobile station shall set this field to the number of this message within the data burst stream.

BURST_TYPE - Data burst type.

The mobile station shall set this field to the value shown in Table 6.7.1.3.2.3-1 for the type of this data burst.

Table 6.7.1.3.2.3-1. Burst Data Types

Value (binary)	Burst Data Type
000000	Unknown burst data type
All other burst data type codes are reserved.	

NUM_MSG - Number of messages in the data burst stream.

The mobile station shall set this field to the number of messages within this data burst stream.

NUM_FIELDS - Number of characters in this message.

The mobile station shall set this field to the number of CHARi fields included in this message.

CHARi - Character.

The mobile station shall include NUM_FIELDS occurrences of this field. The mobile station shall set these fields to the corresponding octet of the data burst stream.

6.7.1.3.2.4 Origination Message

When the mobile station sends an *Origination Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00000100')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
VALID_ACK	1
ACK_TYPE	3
MSID_TYPE	3
MSID_LEN	4
MSID	8 × MSID_LEN
AUTH_MODE	2
AUTHR	0 or 18
RANDC	0 or 8
COUNT	0 or 6
MOB_TERM	1
SLOT_CYCLE_INDEX	3
MOB_P_REV	8
SCM	8
REQUEST_MODE	3
SPECIAL_SERVICE	1
SERVICE_OPTION	0 or 16
PM	1
DIGIT_MODE	1
NUMBER_TYPE	0 or 3
NUMBER_PLAN	0 or 4

(continues on next page)

Field	Length (bits)
MORE_FIELDS	1
NUM_FIELDS	8
NUM_FIELDS occurrences of the following field:	
CHARi	4 or 8
RESERVED	0 - 7 (as needed)

MSG_TYPE - Message type.

The mobile station shall set this field to '00000100'.

ACK_SEQ - Acknowledgement sequence number.

See 6.7.1.3.1.1.

MSG_SEQ - Message sequence number.

See 6.7.1.3.1.1.

ACK_REQ - Acknowledgement required indicator.

See 6.7.1.3.1.1.

VALID_ACK - Valid acknowledgement indicator.

See 6.7.1.3.1.1.

ACK_TYPE - Acknowledgement address type.

See 6.7.1.3.1.1.

MSID_TYPE - Mobile station identifier field type.

See 6.7.1.3.1.1.

MSID_LEN - Mobile station identifier field length.

See 6.7.1.3.1.1.

MSID - Mobile station identifier.

See 6.7.1.3.1.1.

AUTH_MODE - Authentication mode.

See 6.7.1.3.1.2.

AUTHR - Authentication data.

See 6.7.1.3.1.2.

RANDC - Random challenge value.

See 6.7.1.3.1.2.

COUNT - Call history parameter.

See 6.7.1.3.1.2.

MOB_TERM - Mobile terminated calls accepted indicator.

If the mobile station is configured to accept mobile terminated calls while operating with the current roaming status (see 6.6.5.3), the mobile station shall set this bit to '1'. Otherwise, the mobile station shall set this bit to '0'.

SLOT_CYCLE_INDEX - Slot cycle index.

If the mobile station is configured for slotted mode operation, the mobile station shall set this field to the preferred slot cycle index, $SLOT\_CYCLE\_INDEX_p$ (see 6.6.2.1.1). Otherwise, the mobile station shall set this field to '000'.

MOB_P_REV - Protocol revision of the mobile station.

The mobile station shall set this field to '00000001'.

SCM - Station class mark.

The mobile station shall set this field to the station class mark of the mobile station. See 2.3.3.

REQUEST_MODE - Requested mode code. The mobile station shall set this field to the value shown in Table 6.7.1.3.2.4-1 corresponding to its current configuration.

Table 6.7.1.3.2.4-1. REQUEST_MODE Codes

Value (binary)	Requested Mode
001	CDMA only
010	Analog only
011	Either CDMA or analog
All other REQUEST_MODE codes are reserved.	

SPECIAL_SERVICE - Special service option indicator.

To request a special service option, the mobile station shall set this field to '1'. To request the default service option (Service Option 1), the mobile station shall set this field to '0'.

SERVICE_OPTION - Requested service option for this origination.

If the SPECIAL_SERVICE field is set to '1', the mobile station shall set this field to the value shown in TSB58 "Service Option Number Assignments for Wideband Spread Spectrum Digital Cellular System" corresponding to the requested service option. If the SPECIAL_SERVICE field is set to '0', the mobile station shall omit this field.

PM - Privacy mode indicator.

To request voice privacy, the mobile station shall set this field to '1'. Otherwise, the mobile station shall set this field to '0'.

DIGIT_MODE - Digit mode indicator.

This field indicates whether the dialed digits are 4-bit DTMF codes using the Unknown numbering plan, or 8-bit ASCII codes using a specified numbering plan.

To originate the call using the binary representation of DTMF digits, the mobile station shall set this field to '0'. To originate the call using ASCII characters, the mobile station shall set this field to '1'.

NUMBER_TYPE - Type of number.

If the DIGIT_MODE field is set to '1', the mobile station shall set this field to the NUMBER_TYPE value shown in Table 6.7.1.3.2.4-2 corresponding to the type of the number as defined in ANSI T1.607 §4.5.9. If the DIGIT_MODE field is set to '0', the mobile station shall omit this field.

Table 6.7.1.3.2.4-2. Number Types

Description	NUMBER_TYPE (binary)
Unknown	000
International number	001
National number	010
Network-specific number	011
Subscriber number	100
Reserved	101
Abbreviated number	110
Reserved for extension	111

NUMBER_PLAN - Numbering plan.

If the DIGIT_MODE field is set to '1', the mobile station shall set this field to the NUMBER_PLAN value shown in Table 6.7.1.3.2.4-3 corresponding to the requested numbering plan. If the DIGIT_MODE field is set to '0', the mobile station shall omit this field.

Table 6.7.1.3.2.4-3. Numbering Plan Identification (DIGIT_MODE = '1') (See ANSI T1.607 §4.5.9)

Description	NUMBER_PLAN (binary)
Unknown	0000
ISDN/Telephony numbering plan (CCITT E.164 and CCITT E.163)	0001
Data numbering plan (CCITT X.121)	0011
Telex numbering plan (CCITT F.69)	0100
Private numbering plan	1001
Reserved for extension	1111
All other NUMBER_PLAN codes are reserved.	

MORE_FIELDS - More dialed digits indicator.

This field indicates whether additional dialed digits will be sent in a later *Origination Continuation Message*.

If all dialed digits will fit in this message, the mobile station shall set this field to '0'. If not, the mobile station shall set this field to '1'.

NUM_FIELDS - Number of dialed digits in this message.

The mobile station shall set this field to the number of dialed digits included in this message.

CHARi - A dialed digit or character.

The mobile station shall include NUM_FIELDS occurrences of this field. If the DIGIT_MODE field is set to '0', the mobile station shall set each occurrence of this field to the code value shown in Table 6.7.1.3.2.4-4 corresponding to the dialed digit. If the DIGIT_MODE field is set to '1', the mobile station shall set each occurrence of this field to the ASCII representation corresponding to the dialed digit, as specified in ANSI X3.4, with the most significant bit set to '0'.

Table 6.7.1.3.2.4-4. Representation of DTMF Digits

Digit	Code (binary)	Digit	Code (binary)
1	0001	7	0111
2	0010	8	1000
3	0011	9	1001
4	0100	0	1010
5	0101	*	1011
6	0110	#	1100
All other codes are reserved.			

RESERVED - Reserved bits.

The mobile station shall add reserved bits as needed in order to make the length of the entire message equal to an integer number of octets. The mobile station shall set these bits to '0'.

6.7.1.3.2.5 Page Response Message

When the mobile station sends a *Page Response Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00000101')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
VALID_ACK	1
ACK_TYPE	3
MSID_TYPE	3
MSID_LEN	4
MSID	8 × MSID_LEN
AUTH_MODE	2
AUTHR	0 or 18
RANDC	0 or 8
COUNT	0 or 6
MOB_TERM	1
SLOT_CYCLE_INDEX	3
MOB_P_REV	8
SCM	8
REQUEST_MODE	3
SERVICE_OPTION	16
PM	1
RESERVED	6

MSG_TYPE - Message type.

The mobile station shall set this field to '00000101'.

ACK_SEQ - Acknowledgement sequence number.

See 6.7.1.3.1.1.

MSG_SEQ - Message sequence number.

See 6.7.1.3.1.1.

ACK_REQ - Acknowledgement required indicator.

See 6.7.1.3.1.1.

VALID_ACK - Valid acknowledgement indicator.

See 6.7.1.3.1.1.

ACK_TYPE - Acknowledgement address type.

See 6.7.1.3.1.1.

MSID_TYPE - Mobile station identifier field type.

See 6.7.1.3.1.1.

MSID_LEN - Mobile station identifier field length.

See 6.7.1.3.1.1.

MSID - Mobile station identifier.

See 6.7.1.3.1.1.

AUTH_MODE - Authentication mode.

See 6.7.1.3.1.2.

AUTHR - Authentication data.

See 6.7.1.3.1.2.

RANDC - Random challenge value.

See 6.7.1.3.1.2.

COUNT - Call history parameter.

See 6.7.1.3.1.2.

MOB_TERM - Mobile terminated calls accepted indicator.

If the mobile station is configured to accept mobile terminated calls while operating with the current roaming status (see 6.6.5.3), the mobile station shall set this bit to '1'. Otherwise, the mobile station shall set this bit to '0'.

SLOT_CYCLE_INDEX - Slot cycle index.

If the mobile station is configured for slotted mode operation, the mobile station shall set this field to the preferred slot cycle index, $SLOT\_CYCLE\_INDEX_p$ (see 6.6.2.1.1). Otherwise, the mobile station shall set this field to '000'.

MOB_P_REV - Protocol revision of the mobile station.

The mobile station shall set this field to '00000001'.

SCM - Station class mark.

The mobile station shall set this field to the station class mark of the mobile station. See 2.3.3.

REQUEST_MODE - Requested mode code. The mobile station shall set this field to the value shown in Table 6.7.1.3.2.4-1 corresponding to its current configuration.

SERVICE_OPTION - Service option.

If the mobile station accepts the service option specified in the *Page Message* or *Slotted Page Message*, it shall set this field to the service option number specified in that message if that message contained an explicit service option field, or to '0000000000000001' (the default service option number) if the *Page Message* or *Slotted Page Message* did not contain a service option field.

If the mobile station does not accept the service option specified in the *Page Message* or *Slotted Page Message* and has an alternative service option to request, it shall set this field to the service option code shown in TSB58 "Service Option Number Assignments for Wideband Spread Spectrum Digital Cellular System" corresponding to the alternative service option.

If the mobile station does not accept the service option specified in the *Page Message* or *Slotted Page Message* and does not have an alternative service option to request, the mobile station shall set this field to '0000000000000000' to reject the service option specified by the *Page Message* or *Slotted Page Message*.

PM - Privacy mode indicator.

To request voice privacy, the mobile station shall set this field to '1'. Otherwise, the mobile station shall set this field to '0'.

RESERVED - Reserved bits.

The mobile station shall set this field to '000000'.

6.7.1.3.2.6 Authentication Challenge Response Message

When the mobile station sends an *Authentication Challenge Response Message* on the Access Channel, it shall use the following fixed-length message format:

Field	Length (bits)
MSG_TYPE ('00000110')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
VALID_ACK	1
ACK_TYPE	3
MSID_TYPE	3
MSID_LEN	4
MSID	8 × MSID_LEN
RESERVED	2
AUTHU	18
RESERVED	4

MSG_TYPE - Message type.
The mobile station shall set this field to '00000110'.

ACK_SEQ - Acknowledgement sequence number.
See 6.7.1.3.1.1.

MSG_SEQ - Message sequence number.
See 6.7.1.3.1.1.

ACK_REQ - Acknowledgement required indicator.
See 6.7.1.3.1.1.

VALID_ACK - Valid acknowledgement indicator.
See 6.7.1.3.1.1.

ACK_TYPE - Acknowledgement address type.
See 6.7.1.3.1.1.

MSID_TYPE - Mobile station identifier field type.
See 6.7.1.3.1.1.

MSID_LEN	-	Mobile station identifier field length. See 6.7.1.3.1.1.
MSID	-	Mobile station identifier. See 6.7.1.3.1.1.
RESERVED	-	Reserved bits. These bits take the place of the AUTH_MODE field. The mobile station shall set this field to '00'.
AUTHU	-	Authentication challenge response. The mobile station shall set this field as specified in 6.3.12.1.5.
RESERVED	-	Reserved bits. The mobile station shall set this field to '0000'.

6.7.2 Reverse Traffic Channel

During Traffic Channel operation, the mobile station sends signaling messages to the base station using the Reverse Traffic Channel.

6.7.2.1 Reverse Traffic Channel Structure

When sending a Reverse Traffic Channel message, the mobile station shall send it as signaling traffic using the signaling traffic formats specified in 6.1.3.3.11. The mobile station may use one or more Reverse Traffic Channel frames to send the message.

The first signaling traffic bit in a Reverse Traffic Channel frame shall be a Start of Message (SOM) Bit. The mobile station shall set this bit to '1' if a Reverse Traffic Channel message begins in the frame, or to '0' if the frame contains bits of a Reverse Traffic Channel message that began in a previous frame. The mobile station shall use the remaining signaling traffic bits of the frame to send Reverse Traffic Channel message bits. If the frame used to send the last bits of a message contains any unused signaling traffic bits, the mobile station shall set each of these bits, referred to as padding bits, to '0'.

6.7.2.2 Reverse Traffic Channel Message Structure

A Reverse Traffic Channel message shall consist of a length field (MSG_LENGTH), a message body, and a CRC field, in that order (see Figure 6.7.2.2-1).

MSG_LENGTH	Message Body	CRC
8 bits	16 - 2016 bits	16 bits

Figure 6.7.2.2-1. Reverse Traffic Channel Message Structure

6.7.2.2.1 Reverse Traffic Channel Message MSG_LENGTH Field

The mobile station shall set the MSG_LENGTH field of a Reverse Traffic Channel message to the length, in octets, of the message, including the MSG_LENGTH field, the message body and the CRC field. The MSG_LENGTH field shall be 8 bits in length. The minimum value of the MSG_LENGTH field shall be 5.[25]

6.7.2.2.2 Reverse Traffic Channel Message CRC Field

The mobile station shall set the CRC field of a Reverse Traffic Channel message to the CRC computed for the message. The CRC computation shall include the MSG_LENGTH field and the message body. The CRC field shall be 16 bits in length.

[25] To accommodate the MSG_LENGTH field, the layer 2 fields present in the Message Body and the CRC field.

The generator polynomial for the CRC shall be the standard CRC-CCITT polynomial:

$$g(x) = x^{16} + x^{12} + x^5 + 1.$$

The CRC shall be equal to the value computed by the following procedure and the logic shown in Figure 6.7.2.2.2-1:

- All shift register elements shall be initialized to logical one.[26]
- The switches shall be set in the up position.
- The information bit count k shall be defined as 8 + message body length in bits.
- The register shall be clocked k times, with the length and message body of the message as the k input bits.
- The switches shall be set in the down position.
- The register shall be clocked an additional 16 times.
- The 16 additional output bits shall be the CRC field.
- The bits shall be transmitted in the order in which they appear at the output of the CRC encoder.

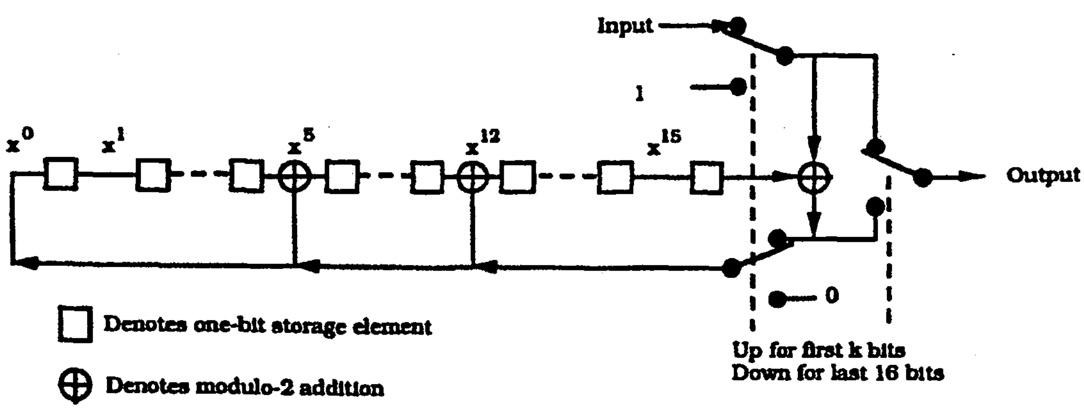

Figure 6.7.2.2.2-1. Reverse Traffic Channel Message CRC Calculation

[26] Initialization of the register to ones causes the CRC for all-zero data to be non-zero.

6.7.2.3 Reverse Traffic Channel Message Body Format

The Reverse Traffic Channel messages are summarized in Table 6.7.2.3-1.

Table 6.7.2.3-1. Reverse Traffic Channel Messages

Message Name	Message Type (binary)
Order Message	00000001
Authentication Challenge Response Message	00000010
Flash With Information Message	00000011
Data Burst Message	00000100
Pilot Strength Measurement Message	00000101
Power Measurement Report Message	00000110
Send Burst DTMF Message	00000111
Status Message	00001000
Origination Continuation Message	00001001
Handoff Completion Message	00001010
Parameters Response Message	00001011

6.7.2.3.1 Common Fields

6.7.2.3.1.1 Common Acknowledgement Fields

All Reverse Traffic Channel messages share the same three acknowledgement fields:

ACK_SEQ - Acknowledgement sequence number.

The mobile station shall set this field to the value of the MSG_SEQ field from the most recently received Forward Traffic Channel message requiring acknowledgement. If no such message has been received, the mobile station shall set this field to '111'. See 6.6.4.1.3.

MSG_SEQ - Message sequence number.

The mobile station shall set this field to the message sequence number for this message. See 6.6.4.1.3.

ACK_REQ - Acknowledgement required indicator.

This field indicates whether this message requires an acknowledgement.

To indicate that this message requires acknowledgement, the mobile station shall set this field to '1'. To indicate that this message does not require acknowledgement, the mobile station shall set this field to '0'.

6.7.2.3.1.2 Common Encryption Field

All Reverse Traffic Channel messages contain the following field:

ENCRYPTION - Message encryption indicator.

The mobile station shall set this field to the current message encryption mode, equal to the ENCRYPT_MODE field of the last received *Channel Assignment Message, Handoff Direction Message* or *Message Encryption Mode Order*. The value of this field and the encryption state of a message shall not change if the same message is retransmitted.

6.7.2.3.2 Message Body Contents

The following sections specify the contents of the message body for each message that may be sent on the Reverse Traffic Channel.

6.7.2.3.2.1 Order Message

When the mobile station sends an *Order Message* on the Reverse Traffic Channel, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00000001')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
ORDER	6
ADD_RECORD_LEN	3
Order-specific fields (if used)	8 × ADD_RECORD_LEN
RESERVED	6

MSG_TYPE - Message type.

The mobile station shall set this field to '00000001'.

ACK_SEQ - Acknowledgement sequence number.

See 6.7.2.3.1.1.

MSG_SEQ - Message sequence number.

See 6.7.2.3.1.1.

ACK_REQ - Acknowledgement required indicator.

See 6.7.2.3.1.1.

ENCRYPTION - Message encryption indicator.

See 6.7.2.3.1.2.

ORDER - Order code.

The mobile station shall set this field to the ORDER code. See 6.7.3.

ADD_RECORD_LEN - Additional record length.

The mobile station shall set this field to the number of octets in the order-specific fields included in this message.

Order-specific fields - Order-specific fields.

The mobile station shall include order-specific fields as specified in 6.7.3.

RESERVED - Reserved bits.

The mobile station shall set this field to '000000'.

6.7.2.3.2.2 Authentication Challenge Response Message

When the mobile station sends an *Authentication Challenge Response Message* on the Reverse Traffic Channel, it shall use the following fixed-length message format:

Field	Length (bits)
MSG_TYPE ('00000010')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
AUTHU	18
RESERVED	5

MSG_TYPE - Message type.

The mobile station shall set this field to '00000010'.

ACK_SEQ - Acknowledgement sequence number.

See 6.7.2.3.1.1.

MSG_SEQ - Message sequence number.

See 6.7.2.3.1.1.

ACK_REQ - Acknowledgement required indicator.

See 6.7.2.3.1.1.

ENCRYPTION - Message encryption indicator.

See 6.7.2.3.1.2.

AUTHU - Authentication challenge response.

The mobile station shall set this field as specified in 6.3.12.1.5.

RESERVED - Reserved bits.

The mobile station shall set this field to '00000'.

6.7.2.3.2.3 Flash With Information Message

When the mobile station sends a *Flash With Information Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00000011')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
Zero or more occurrences of the following record:	
RECORD_TYPE	8
RECORD_LEN	8
Type-specific fields	8 × RECORD_LEN
RESERVED	7

MSG_TYPE - Message type.
The mobile station shall set this field to '00000011'.

ACK_SEQ - Acknowledgement sequence number.
See 6.7.2.3.1.1.

MSG_SEQ - Message sequence number.
See 6.7.2.3.1.1.

ACK_REQ - Acknowledgement required indicator.
See 6.7.2.3.1.1.

ENCRYPTION - Message encryption indicator.
See 6.7.2.3.1.2.

The mobile station shall include one occurrence of the following record for each information record to be included:

RECORD_TYPE - Information record type.
The mobile station shall set this field to the record type code shown in Table 6.7.4-1 corresponding to the type of this information record.

RECORD_LEN - Information record length.

The mobile station shall set this field to the number of octets in the type-specific fields of this record.

Type-specific fields - Type-specific fields.

The mobile station shall set these fields as specified in 6.7.4 for this type of information record.

RESERVED - Reserved bits.

The mobile station shall set this field to '0000000'.

6.7.2.3.2.4 Data Burst Message

When the mobile station sends a *Data Burst Message* on the Reverse Traffic Channel, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00000100')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
MSG_NUMBER	8
BURST_TYPE	6
NUM_MSGS	8
NUM_FIELDS	8
NUM_FIELDS occurrences of the following field:	
CHARi	8
RESERVED	1

MSG_TYPE - Message type.

The mobile station shall set this field to '00000100'.

ACK_SEQ - Acknowledgement sequence number.

See 6.7.2.3.1.1.

MSG_SEQ - Message sequence number.

See 6.7.2.3.1.1.

ACK_REQ - Acknowledgement required indicator.

See 6.7.2.3.1.1.

ENCRYPTION - Message encryption indicator.

See 6.7.2.3.1.2.

MSG_NUMBER - Message number within the data burst stream.

The mobile station shall set this field to the number of this message within the data burst stream.

BURST_TYPE - Data burst type.

The mobile station shall set this field to the value shown in Table 6.7.1.3.2.3-1 for the type of this data burst.

NUM_MSGS - Number of messages in the data burst stream.

The mobile station shall set this field to the number of messages within this data burst stream.

NUM_FIELDS - Number of characters in this message.

The mobile station shall set this field to the number of CHARi fields included in this message.

CHARi - Character.

The mobile station shall include NUM_FIELDS occurrences of this field. The mobile station shall set these fields to the corresponding octet of the data burst stream.

RESERVED - Reserved bits.

The mobile station shall set this field to '0'.

6.7.2.3.2.5 Pilot Strength Measurement Message

When the mobile station sends a *Pilot Strength Measurement Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00000101')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
REF_PN	9
PILOT_STRENGTH	6
KEEP	1
Zero or more occurrences of the following record:	
PILOT_PN_PHASE	15
PILOT_STRENGTH	6
KEEP	1
RESERVED	0 - 7 (as needed)

MSG_TYPE - Message type.

The mobile station shall set this field to '00000101'.

ACK_SEQ - Acknowledgement sequence number.

See 6.7.2.3.1.1.

MSG_SEQ - Message sequence number.

See 6.7.2.3.1.1.

ACK_REQ - Acknowledgement required indicator.

See 6.7.2.3.1.1.

ENCRYPTION - Message encryption indicator.

See 6.7.2.3.1.2.

REF_PN - Time reference PN sequence offset.

The mobile station shall set this field to the PN sequence offset of the pilot used by the mobile station to derive its time reference, relative to the zero offset pilot PN sequence in units of 64 PN chips.

PILOT_STRENGTH - Pilot strength.

The mobile station shall set this field to

$$\lfloor -2 \times 10 \times \log_{10} PS \rfloor$$

where PS is the strength of the pilot used by the mobile station to derive its time reference (see 6.1.5.1), measured as specified in 6.6.6.2.2. If this value is less than 0, the mobile station shall set this field to '000000'. If this value is greater than '111111', the mobile station shall set this field to '111111'.

KEEP - Keep pilot indicator.

If the handoff drop timer (see 6.6.6.2.3) corresponding to the pilot used by the mobile station to derive its time reference (see 6.1.5.1) has expired, the mobile station shall set this field to '0'. Otherwise, the mobile station shall set this field to '1'.

The mobile station shall include one occurrence of the following three-field record for each pilot in the Active Set and for each pilot in the Candidate Set, other than the pilot identified by the REF_PN field.

PILOT_PN_PHASE - Pilot measured phase.

The mobile station shall set this field to the phase of the pilot PN sequence relative to the zero offset pilot PN sequence of this pilot, in units of one PN chip, as specified in 6.6.6.2.4.

PILOT_STRENGTH - Pilot strength.

The mobile station shall set this field to

$$\lfloor -2 \times 10 \times \log_{10} PS \rfloor$$

where PS is the strength of this pilot, measured as specified in 6.6.6.2.2. If this value is less than 0, the mobile station shall set this field to '000000'. If this value is greater than '111111', the mobile station shall set this field to '111111'.

KEEP - Keep pilot indicator.

If the handoff drop timer (see 6.6.6.2.3) corresponding to this pilot has expired, the mobile station shall set this field to '0'. Otherwise, the mobile station shall set this field to '1'.

RESERVED - Reserved bits.

The mobile station shall add reserved bits as needed in order to make the length of the entire message equal to an integer number of octets. The mobile station shall set these bits to '0'.

6.7.2.3.2.6 Power Measurement Report Message

When the mobile station sends a *Power Measurement Report Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00000110')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
ERRORS_DETECTED	5
PWR_MEAS_FRAMES	10
LAST_HDM_SEQ	2
NUM_PILOTS	4
NUM_PILOTS occurrences of the following field:	
PILOT_STRENGTH	6
RESERVED	0 - 7 (as needed)

MSG_TYPE - Message type.

The mobile station shall set this field to '00000110'.

ACK_SEQ - Acknowledgement sequence number.

See 6.7.2.3.1.1.

MSG_SEQ - Message sequence number.

See 6.7.2.3.1.1.

ACK_REQ - Acknowledgement required indicator.

See 6.7.2.3.1.1.

ENCRYPTION - Message encryption indicator.

See 6.7.2.3.1.2.

ERRORS_DETECTED - Number of frame errors detected.

If the number of bad frames (see 6.2.2.2) received in the measurement period is less than or equal to 31, the mobile station shall set this field to that number (BAD_FRAMES_s, see 6.6.4.1.1). If that number exceeds 31, the mobile station shall set this field to '11111'.

PWR_MEAS_FRAMES - Number of Forward Traffic Channel frames in the measurement period.

The mobile station shall set this field to the number of Forward Traffic Channel frames in the measurement period ($TOTAL\_FRAMES_s$, see 6.6.4.1.1).

LAST_HDM_SEQ - *Handoff Direction Message* sequence number.

If a *Handoff Direction Message* has been received during this call, the mobile station shall set this field to the value of the HDM_SEQ field from the *Handoff Direction Message* that determined the current Active Set. If no *Handoff Direction Message* has been received during this call, the mobile station shall set this field to '11'.

NUM_PILOTS - Number of pilots reported.

The mobile station shall set this field to the number of pilots in the current Active Set.

PILOT_STRENGTH - Pilot strength.

The mobile station shall include one occurrence of this field for each pilot in the Active Set. If the Active Set contains more than one pilot, the mobile station shall include the pilot strengths in the same order as in the Handoff Direction Message that determined the current Active Set.

The mobile station shall set each occurrence of this field to

$$\lfloor -2 \times 10 \times \log_{10} PS \rfloor$$

where PS is the strength of the pilot, measured as specified in 6.6.6.2.2. If this value is less than 0, the mobile station shall set this field to '000000'. If this value is greater than '111111', the mobile station shall set this field to '111111'.

RESERVED - Reserved bits.

The mobile station shall add reserved bits as needed in order to make the length of the entire message equal to an integer number of octets. The mobile station shall set these bits to '0'.

6.7.2.3.2.7 Send Burst DTMF Message

When the mobile station sends a *Send Burst DTMF Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00000111')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
NUM_DIGITS	8
DTMF_ON_LENGTH	3
DTMF_OFF_LENGTH	3
NUM_DIGITS occurrences of the following field:	
DIGITi	4
RESERVED	0 - 7 (as needed)

MSG_TYPE - Message type.

The mobile station shall set this field to '00000111'.

ACK_SEQ - Acknowledgement sequence number.

See 6.7.2.3.1.1.

MSG_SEQ - Message sequence number.

See 6.7.2.3.1.1.

ACK_REQ - Acknowledgement required indicator.

See 6.7.2.3.1.1.

ENCRYPTION - Message encryption indicator.

See 6.7.2.3.1.2.

NUM_DIGITS - Number of DTMF digits.

The mobile station shall set this field to the number of DTMF digits included in this message.

DTMF_ON_LENGTH - DTMF pulse width code.

The mobile station shall set this field to the DTMF_-ON_LENGTH value shown in Table 6.7.2.3.2.7-1 corresponding to the requested width of DTMF pulses to be generated by the base station.

Table 6.7.2.3.2.7-1. Recommended DTMF Pulse Width

DTMF_ON_LENGTH Field (binary)	Recommended Pulse Width
000	95 ms
001	150 ms
010	200 ms
011	250 ms
100	300 ms
101	350 ms
All other DTMF_ON_LENGTH codes are reserved.	

DTMF_OFF_LENGTH - DTMF interdigit interval code.

The mobile station shall set this field to the DTMF_OFF_LENGTH value shown in Table 6.7.2.3.2.7-2 corresponding to the requested minimum interval between DTMF pulses to be generated by the base station.

Table 6.7.2.3.2.7-2. Recommended Minimum Interdigit Interval

DTMF_OFF_LENGTH Field (binary)	Recommended Minimum Interdigit Interval
000	60 ms
001	100 ms
010	150 ms
011	200 ms
All other DTMF_OFF_LENGTH codes are reserved.	

DIGITi - DTMF digit.

The mobile station shall include one occurrence of this field for each DTMF digit to be generated by the base station. The mobile station shall set each occurrence of this field to the code value shown in Table 6.7.1.3.2.4-4 corresponding to the dialed digit.

RESERVED - Reserved bits.

The mobile station shall add reserved bits as needed in order to make the length of the entire message equal to an integer number of octets. The mobile station shall set these bits to '0'.

6.7.2.3.2.8 Status Message

When the mobile station sends a *Status Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00001000')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
RECORD_TYPE	8
RECORD_LEN	8
Type-specific fields	8 × RECORD_LEN
RESERVED	7

MSG_TYPE - Message type.

The mobile station shall set this field to '00001000'.

ACK_SEQ - Acknowledgement sequence number.

See 6.7.2.3.1.1.

MSG_SEQ - Message sequence number.

See 6.7.2.3.1.1.

ACK_REQ - Acknowledgement required indicator.

See 6.7.2.3.1.1.

ENCRYPTION - Message encryption indicator.

See 6.7.2.3.1.2.

RECORD_TYPE - Information record type.

The mobile station shall set this field to the record type value shown in Table 6.7.4-1 corresponding to the type of this information record.

RECORD_LEN - Information record length.

The mobile station shall set this field to the number of octets included in the type-specific fields of this information record.

Type-specific fields - Type-specific fields.

The mobile station shall set these fields as specified in 6.7.4 for this type of record.

RESERVED - Reserved bits.

The mobile station shall set this field to '0000000'.

6.7.2.3.2.9 Origination Continuation Message

When the mobile station sends an *Origination Continuation Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00001001')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
DIGIT_MODE	1
NUM_FIELDS	8
NUM_FIELDS occurrences of the following field:	
CHARi	4 or 8
RESERVED	0 - 7 (as needed)

MSG_TYPE - Message type.

The mobile station shall set this field to '00001001'.

ACK_SEQ - Acknowledgement sequence number.

See 6.7.2.3.1.1.

MSG_SEQ - Message sequence number.

See 6.7.2.3.1.1.

ACK_REQ - Acknowledgement required indicator.

See 6.7.2.3.1.1.

ENCRYPTION - Message encryption indicator.

See 6.7.2.3.1.2.

DIGIT_MODE - Digit mode indicator.

The mobile station shall set this field to the DIGIT_MODE value from the Access Channel *Origination Message* for which this message is a continuation.

NUM_FIELDS - Number of dialed digits in this message.

The mobile station shall set this field to the number of dialed digits included in this message.

CHARi - A dialed digit or character.

The mobile station shall include NUM_FIELDS occurrences of this field. The mobile station shall include occurrences of this field for all dialed digits after those sent in the Access Channel *Origination Message* of which this message is a continuation. If the DIGIT_MODE field is set to '0', the mobile station shall set each occurrence of this field to the code value shown in Table 6.7.1.3.2.4-4 corresponding to the dialed digit. If the DIGIT_MODE field is set to '1', the mobile station shall set each occurrence of this field to the ASCII representation corresponding to the dialed digit, as specified in ANSI X3.4, with the most significant bit set to '0'.

RESERVED - Reserved bits.

The mobile station shall add reserved bits as needed in order to make the length of the entire message equal to an integer number of octets. The mobile station shall set these bits to '0'.

6.7.2.3.2.10 Handoff Completion Message

When the mobile station sends a *Handoff Completion Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00001010')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
LAST_HDM_SEQ	2
One or more occurrences of the following field:	
PILOT_PN	9
RESERVED	0 - 7 (as needed)

MSG_TYPE - Message type.

The mobile station shall set this field to '00001010'.

ACK_SEQ - Acknowledgement sequence number.

See 6.7.2.3.1.1.

MSG_SEQ - Message sequence number.

See 6.7.2.3.1.1.

ACK_REQ - Acknowledgement required indicator.

See 6.7.2.3.1.1.

ENCRYPTION - Message encryption indicator.

See 6.7.2.3.1.2.

LAST_HDM_SEQ - *Handoff Direction Message* sequence number.

The mobile station shall set this field to the value of the HDM_SEQ field from the *Handoff Direction Message* that determined the current Active Set.

PILOT_PN - Pilot PN sequence offset.

The mobile station shall include one occurrence of this field for each pilot in the current Active Set. The mobile station shall set this field to the pilot PN sequence offset, relative to the zero offset pilot PN sequence in units of 64 PN chips, for this pilot. If the Active Set contains more than one pilot, the mobile station shall include the pilot offsets in the same order as in the Handoff Direction Message that determined the current Active Set.

RESERVED - Reserved bits.

The mobile station shall add reserved bits as needed in order to make the length of the entire message equal to an integer number of octets. The mobile station shall set these bits to '0'.

6.7.2.3.2.11 Parameters Response Message

When the mobile station sends a *Parameters Response Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00001011')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
One or more occurrences of the following record:	
PARAMETER_ID	16
PARAMETER_LEN	10
PARAMETER	PARAMETER_LEN
RESERVED	0 - 7 (as needed)

MSG_TYPE - Message type.

The mobile station shall set this field to '00001011'.

ACK_SEQ - Acknowledgement sequence number.

See 6.7.2.3.1.1.

MSG_SEQ - Message sequence number.

See 6.7.2.3.1.1.

ACK_REQ - Acknowledgement required indicator.

See 6.7.2.3.1.1.

ENCRYPTION - Message encryption indicator.

See 6.7.2.3.1.2.

The mobile station shall include one occurrence of the following three-field record for each occurrence of the PARAMETER_ID field in the Forward Traffic Channel *Retrieve Parameters Message* to which this message is a response. See Appendix E.

PARAMETER_ID - Parameter identification.

The mobile station shall set this field to the value of the PARAMETER_ID field for this parameter from the *Retrieve Parameters Message* to which this message is a response.

PARAMETER_LEN - Parameter length.

The mobile station shall set this field to the length shown in Table E-1 corresponding to this PARAMETER_ID.

If the mobile station is unable to return the value of this parameter, or if the parameter identification is unknown, the mobile station shall set this field to '0000000000'.

PARAMETER - Parameter value.

The mobile station shall set this field equal to the value of the parameter identified by PARAMETER in Appendix E.

If the mobile station is unable to return the value of this parameter, or if the parameter identification is unknown, the mobile station shall omit this field.

RESERVED - Reserved bits.

The mobile station shall add reserved bits as needed in order to make the length of the entire message equal to an integer number of octets. The mobile station shall set these bits to '0'.

6.7.3 Orders

Order Messages are sent by the mobile station on the Access Channel and on the Reverse Traffic Channel. The general format used on the Access Channel is defined in 6.7.1.3.2.2, and the general format used on the Reverse Traffic Channel is defined in 6.7.2.3.2.1. There are many specific types of *Order Messages*, as shown in Table 6.7.3-1.

The mobile station may send on the Access Channel any type of order shown in Table 6.7.3-1 with a 'Y' in the first column, but shall not send on the Access Channel any type of order with an 'N' in the first column. The mobile station may send on the Reverse Traffic Channel any type of order shown in Table 6.7.3-1 with a 'Y' in the second column, but shall not send on the Reverse Traffic Channel any type of order with an 'N' in the second column. The mobile station shall be capable of sending all types of orders shown in Table 6.7.3-1 with a 'Y' in the sixth column.

An order consists of a 6-bit order code and zero or more order-specific fields. The mobile station shall set the ORDER field in the *Order Message* to the order code shown in Table 6.7.3-1 corresponding to the type of order being sent.

If the order qualification code in the fourth column of Table 6.7.3-1 is '00000000' and there are no other additional fields as shown by an 'N' in the fifth column, the mobile station shall include no order qualification code or other order-specific fields in the *Order Message*. The order qualification code of such a message is implicitly '00000000'.

If the order qualification code is not '00000000' and there are no other additional fields as shown in Table 6.7.3-1 by an 'N' in the fifth column, the mobile station shall include the order qualification code as the only order-specific field in the *Order Message*.

If there are other additional fields as shown in Table 6.7.3-1 by a 'Y' in the fifth column, the mobile station shall include order-specific fields as specified in the corresponding subsection of this section.

Table 6.7.3-1. Order and Order Qualification Codes Used on the Reverse Traffic Channel and the Access Channel (Part 1 of 3)

Access Channel Order	Reverse Traffic Channel Order	Order Code, ORDER (binary)	Order Qualification Code, ORDQ (binary)	More Fields other than ORDQ	Support Req'd	Name/Function
Y	Y	000010	00000000	Y	Y	*Base Station Challenge Order* (see 6.7.3.1)
Y	Y	000011	00000000	N	Y	*SSD Update Confirmation Order*
Y	Y	000011	00000001	N	Y	*SSD Update Rejection Order*
N	Y	000101	0000nnnn	N	Y	*Parameter Update Confirmation Order* (where 'nnnn' is the Request Number)
N	Y	001011	00000000	N	N	*Request Analog Service Order*
Y	Y	010000	00000000	N	Y	*Mobile Station Acknowledgement Order*
N	Y	010011	00000000	Y	N	*Service Option Request Order* (see 6.7.3.2)
N	Y	010100	00000000	Y	Y	*Service Option Response Order* (see 6.7.3.3)
N	Y	010101	00000000	N	Y	*Release Order* (normal release)
N	Y	010101	00000001	N	Y	*Release Order* (with power-down indication)
N	Y	010111	00000000	N	N	*Long Code Transition Request Order* (request public)
N	Y	010111	00000001	N	N	*Long Code Transition Request Order* (request private)
N	Y	010111	00000010	N	Y	*Long Code Transition Response Order* (use public)
N	Y	010111	00000011	N	N	*Long Code Transition Response Order* (use private)
N	Y	011000	00000000	N	Y	*Connect Order*
N	Y	011001	0000nnnn	N	Y	*Continuous DTMF Tone Order* (where 'nnnn' is the tone per Table 6.7.1.3.2.4-4).

Table 6.7.3-1. Order and Order Qualification Codes Used on the Reverse Traffic Channel and the Access Channel (Part 2 of 3)

Access Channel Order	Reverse Traffic Channel Order	Order Code, ORDER (binary)	Order Qualification Code, ORDQ (binary)	More Fields other than ORDQ	Support Req'd	Name/Function
N	Y	011001	11111111	N	Y	*Continuous DTMF Tone Order* (Stop continuous DTMF tone)
N	Y	011101	nnnnnnnn	N	Y	*Service Option Control Order* (the specific control is designated by 'nnnnnnnn' as determined by each service option)
Y	Y	011110	nnnnnnnn	N	N	*Local Control Response Order* (specific response as designated by 'nnnnnnnn' as determined by each system)
Y	Y	011111	00000001	Y	Y	*Mobile Station Reject Order* (unspecified reason; see 6.7.3.4)
Y	Y	011111	00000010	Y	Y	*Mobile Station Reject Order* (message not accepted in this state; see 6.7.3.4)
Y	Y	011111	00000011	Y	Y	*Mobile Station Reject Order* (message structure not acceptable; see 6.7.3.4)
Y	Y	011111	00000100	Y	Y	*Mobile Station Reject Order* (message field not in valid range; see 6.7.3.4)
Y	Y	011111	00000101	Y	Y	*Mobile Station Reject Order* (message type or order code not understood; see 6.7.3.4)
Y	Y	011111	00000110	Y	Y	*Mobile Station Reject Order* (message requires a capability that is not supported by the mobile station; see 6.7.3.4)

Table 6.7.3-1. Order and Order Qualification Codes Used on the Reverse Traffic Channel and the Access Channel (Part 3 of 3)

Access Channel Order	Reverse Traffic Channel Order	Order Code, ORDER (binary)	Order Qualification Code, ORDQ (binary)	More Fields other than ORDQ	Support Req'd	Name/Function
Y	Y	011111	00000111	Y	Y	*Mobile Station Reject Order* (message cannot be handled by the current mobile station configuration; see 6.7.3.4)
All other codes are reserved.						

6.7.3.1 Base Station Challenge Order

When the mobile station sends a *Base Station Challenge Order*, it shall use the following fixed-length format for the order-specific fields:

Order-Specific Field	Length (bits)
ORDQ	8
RANDBS	32

ORDQ - Order qualification code.

The mobile station shall set this field to '00000000'.

RANDBS - Random challenge data.

The mobile station shall set this field as specified in 6.3.12.1.9.

6.7.3.2 Service Option Request Order

When the mobile station sends a *Service Option Request Order*, it shall use the following fixed-length format for the order-specific fields:

Order-Specific Field	Length (bits)
ORDQ	8
SERVICE_OPTION	16

ORDQ - Order qualification code.

The mobile station shall set this field to '00000000'.

SERVICE_OPTION - Service option.

The mobile station shall set this field to the service option code shown in TSB58 "Service Option Number Assignments for Wideband Spread Spectrum Digital Cellular System" corresponding to the requested or alternative service option.

6.7.3.3 Service Option Response Order

When the mobile station sends a *Service Option Response Order*, it shall use the following fixed-length format for the order-specific fields:

Order-Specific Field	Length (bits)
ORDQ	8
SERVICE_OPTION	16

ORDQ - Order qualification code.

The mobile station shall set this field to '00000000'.

SERVICE_OPTION - Service option.

The mobile station shall set this field to the service option code shown in TSB58 "Service Option Number Assignments for Wideband Spread Spectrum Digital Cellular System" corresponding to the accepted service option, or to '0000000000000000' to reject the proposed service option. See 6.6.4.1.2.2.1.

6.7.3.4 Mobile Station Reject Order

The *Mobile Station Reject Order* can be sent on either the Access Channel or the Reverse Traffic Channel. The mobile station shall use the following variable-length format for the order-specific fields:

Order-Specific Field	Length (bits)
ORDQ	8
REJECTED_TYPE	8

If the order is sent on the Access Channel and
REJECTED_TYPE is '00000111'
or if the order is sent on the Reverse Traffic Channel and
REJECTED_TYPE is '00000001'
the order-specific fields also include the following two fields:

REJECTED_ORDER	8
REJECTED_ORDQ	8

If the order is sent on the Reverse Traffic Channel and
REJECTED_TYPE is '00001011' or
REJECTED_TYPE is '00001100'
the order-specific fields also include the following field:

REJECTED_PARAM_ID	16

If the order is sent on the Access Channel and
REJECTED_TYPE is '00001100'
or if the order is sent on the Reverse Traffic Channel and
REJECTED_TYPE is '00000011' or
REJECTED_TYPE is '00001110'
the order-specific fields also include the following field:

REJECTED_RECORD	8

ORDQ - Order qualification code.

The mobile station shall set this field to the ORDQ value shown in Table 6.7.3-1 corresponding to the reason for rejecting the message.

REJECTED_TYPE - Message type of rejected message.

The mobile station shall set this field to the value of the MSG_TYPE field of the message being rejected.

REJECTED_ORDER - Order type of rejected message.

If the rejected message was an *Order Message*, the mobile station shall set this field to the value of the ORDER field in the rejected message; otherwise the mobile station shall omit this field.

REJECTED_ORDQ - Order qualification code of rejected message.

If the rejected message was an *Order Message* including an ORDQ field, the mobile station shall set this field to the value of the ORDQ field in the rejected message. If the rejected message was an *Order Message* not including an ORDQ field, the mobile station shall set this field to '00000000'; otherwise the mobile station shall omit this field.

REJECTED_PARAM_ID - Parameter identification of the rejected parameter.

If the rejected message was a *Retrieve Parameters Message* or a *Set Parameters Message*, the mobile station shall set this field to the PARAMETER_ID of the first parameter for which the requested operation could not be completed; otherwise the mobile station shall omit this field.

REJECTED_RECORD - Record type of the rejected information record.

If the rejected message was a *Feature Notification Message*, an *Alert With Information Message* or a *Flash With Information Message*, the mobile station shall set this field to the RECORD_TYPE field of the first information record that could not be accepted; otherwise the mobile station shall omit this field.

6.7.4 Reverse Traffic Channel Information Records

On the Reverse Traffic Channel, information records may be included in the *Flash with Information Message* or the *Status Message*. Table 6.7.4-1 lists the information record type values that may be used with each message type. The following sections describe the contents of each of the record types in detail.

Table 6.7.4-1. Information Record Types

Message Type	Information Record	Record Type (binary)
None	Reserved	00000001
Flash	Feature Indicator	00000010
Flash	Keypad Facility •	00000011
Flash	Called Party Number	00000100
Flash	Calling Party Number	00000101
Status	Identification	00000110
Status	Call Mode	00000111
Status	Terminal Information	00001000
Status	MIN Information	00001001
Status	Security Status	00001010
Flash	Connected Number	00001011
All other record type values are reserved.		

6.7.4.1 Feature Indicator

This information record allows the user to invoke supplementary services and features. The mobile station shall use the following fixed-length format for the type-specific fields:

Type-Specific Field	Length (bits)
FEATURE	4
RESERVED	4

FEATURE - Feature identifier.

This field identifies the supplementary service or feature to be invoked. Field values are for further study.

The mobile station shall set this field to the feature identifier.

RESERVED - Reserved bits.

The mobile station shall set this field to '0000'.

6.7.4.2 Keypad Facility

This information record allows the user to send characters entered via a keyboard or other such terminal. The mobile station shall use the following variable-length format for the type-specific fields:

Type-Specific Field	Length (bits)
One or more occurrences of the following field:	
CHARi	8

CHARi - Character.

The mobile station shall include one occurrence of this field for each character entered. The mobile station shall set each occurrence of this field to the ASCII representation corresponding to the character entered, as specified in ANSI X3.4, with the most significant bit set to '0'.

6.7.4.3 Called Party Number

This information record identifies the called party's number. The mobile station shall use the following variable-length format for the type-specific fields:

Type-Specific Field	Length (bits)
NUMBER_TYPE	3
NUMBER_PLAN	4
Zero or more occurrences of the following field:	
CHARi	8
RESERVED	1

NUMBER_TYPE - Type of number.

The mobile station shall set this field to the NUMBER_TYPE value shown in Table 6.7.1.3.2.4-2 corresponding to the type of the called number, as defined in ANSI T1.607 §4.5.9.

NUMBER_PLAN - Numbering plan.

The mobile station shall set this field to the NUMBER_PLAN value shown in Table 6.7.1.3.2.4-3 corresponding to the numbering plan used for the called number, as defined in ANSI T1.607 §4.5.9.

CHARi - Character.

The mobile stations shall include one occurrence of this field for each character in the called number. The mobile station shall set each occurrence of this field to the ASCII representation corresponding to the character, as specified in ANSI X3.4, with the most significant bit set to '0'.

RESERVED - Reserved bits.

The mobile station shall set this field to '0'.

6.7.4.4 Calling Party Number

This information record identifies the calling party's number. The mobile station shall use the following variable-length format for the type-specific fields:

Type-Specific Field	Length (bits)
NUMBER_TYPE	3
NUMBER_PLAN	4
PI	2
SI	2
Zero or more occurrences of the following field:	
CHARi	8
RESERVED	5

NUMBER_TYPE - Type of number.

The mobile station shall set this field to the NUMBER_TYPE value shown in Table 6.7.1.3.2.4-2 corresponding to the type of the calling number as defined in ANSI T1.607 §4.5.9.

NUMBER_PLAN - Numbering plan.

The mobile station shall set this field to the NUMBER_PLAN value shown in Table 6.7.1.3.2.4-3 corresponding to the numbering plan used for the calling number, as defined in ANSI T1.607 §4.5.9.

PI - Presentation indicator.

This field indicates whether or not the calling number should be displayed.

The mobile station shall set this field to the PI value shown in Table 6.7.4.4-1 corresponding to the presentation indicator as defined in ANSI T1.607 §4.5.9.

Table 6.7.4.4-1. Presentation Indicators

Description	PI (binary)
Presentation allowed	00
Presentation restricted	01
Number not available	10
Reserved	11

SI - Screening indicator.

This field indicates how the calling number was screened.

The mobile station shall set this field to the SI value shown in Table 6.7.4.4-2 corresponding to the screening indicator value as defined in ANSI T1.607 §4.5.9.

Table 6.7.4.4-2. Screening Indicators

Description	SI (binary)
User-provided, not screened	00
User-provided, verified and passed	01
User-provided, verified and failed	10
Network-provided	11

CHARi - Character.

The mobile stations shall include one occurrence of this field for each character in the calling number. The mobile station shall set each occurrence of this field to the ASCII representation corresponding to the character, as specified in ANSI X3.4, with the most significant bit set to '0'.

RESERVED - Reserved bits.

The mobile station shall set this field to '00000'.

6.7.4.5 Identification

This information record can be included in a *Status Message* to return the mobile station's ESN and MIN. The mobile station shall use the following fixed-length format for the type-specific fields:

Type-Specific Field	Length (bits)
MIN1	24
MIN2	10
ESN	32
MOB_TERM	1
RESERVED	5

MIN1 - First part of the mobile station identification number (MIN).

The mobile station shall set this field to MIN1 (see 2.3.1).

MIN2 - Second part of the mobile station identification number (MIN).

The mobile station shall set this field to MIN2 (see 2.3.1).

ESN - Mobile station's electronic serial number.

The mobile station shall set this field to its electronic serial number. See 2.3.2.

MOB_TERM - Mobile terminated calls accepted indicator.

If the mobile station is configured to accept mobile terminated calls while operating with the roaming status (see 6.6.5.3) as determined by the base station SID, NID pair specified in the *Status Request Order* (see 7.7.4.4), the mobile station shall set this bit to '1'. Otherwise, the mobile station shall set this bit to '0'.

RESERVED - Reserved bits.

The mobile station shall set this field to '00000'.

6.7.4.6 Call Mode

This information record can be included in a *Status Message* to return the mobile station's preferred call mode and call-related information. The mobile station shall use the following fixed-length format for the type-specific fields:

Type-Specific Field	Length (bits)
ORIG_MODE	1
PRI_SERVICE	16
SEC_SERVICE	16
RESERVED	7

ORIG_MODE - Origination mode indicator.

If the current call is a mobile-originated call, the mobile station shall set this field to '0'. If the current call is a mobile-terminated call, the mobile station shall set this field to '1'.

PRI_SERVICE - Primary service option.

The mobile station shall set this field to the value shown in TSB58 "Service Option Number Assignments for Wideband Spread Spectrum Digital Cellular System" corresponding to the current primary service option. If no primary service option is active, the mobile station shall set this field to '0000000000000000'.

SEC_SERVICE - Secondary service option.

The mobile station shall set this field to the value shown in TSB58 "Service Option Number Assignments for Wideband Spread Spectrum Digital Cellular System" corresponding to the current secondary service option. If no secondary service option is active, the mobile station shall set this field to '0000000000000000'.

RESERVED - Reserved bits.

The mobile station shall set this field to '0000000'.

6.7.4.7 Terminal Information

This information record can be included in a *Status Message* to return configuration information about the mobile station. The mobile station shall use the following variable-length format for the type-specific fields:

Type-Specific Field	Length (bits)
MOB_P_REV	8
MOB_MFG_CODE	8
MOB_MODEL	8
MOB_FIRM_REV	16
SCM	8
LOCAL_CTRL	1
SLOT_CYCLE_INDEX	3
One or more occurrences of the following field:	
SERVICE_OPTION	16
RESERVED	4

MOB_P_REV - Protocol revision of the mobile station.

The mobile station shall set this field to '00000001'.

MOB_MFG_CODE - Manufacturer code.

This field identifies the manufacturer of the mobile station.

The mobile station shall set this field to the manufacturer code assigned to its manufacturer.

MOB_MODEL - Model number.

This number is assigned by the manufacturer for a particular model.

The mobile station shall set this field to the model number assigned by the manufacturer for this mobile station.

MOB_FIRM_REV - Firmware revision number.

This number is assigned by the manufacturer for a particular firmware version.

The mobile station shall set this field to the revision number assigned by the manufacturer for the firmware version running in this mobile station.

SCM	-	Station class mark. The mobile station shall set this field to its station class mark. See 2.3.3.
LOCAL_CTRL	-	Local control indicator. If local control is enabled, the mobile station shall set this field to '1'. If local control is disabled, the mobile station shall set this field to '0'. See 2.6.1.2.2.
SLOT_CYCLE_INDEX	-	Slot cycle index. If the mobile station is configured for slotted mode operation, the mobile station shall set this field to the preferred slot cycle index, $SLOT\_CYCLE\_INDEX_p$ (see 6.6.2.1.1). Otherwise, the mobile station shall set this field to '000'.
SERVICE_OPTION	-	Supported service option. The mobile station shall include one occurrence of this field for each service option supported by the mobile station.
RESERVED	-	Reserved bits. The mobile station shall set this field to '0000'.

6.7.4.8 MIN Information

This information record can be included in a *Status Message* to return MIN-related configuration information about the mobile station. The mobile station shall use the following variable-length format for the type-specific fields:

Type-Specific Field	Length (bits)
ACCOLC	4
MOB_TERM_HOME	1
MOB_TERM_FOR_SID	1
MOB_TERM_FOR_NID	1
Zero or more occurrences of the following record:	
SID	15
NID	16
RESERVED	0-7 (as needed)

ACCOLC - Overload class.

The mobile station shall set this field to the access overload class assigned to the mobile station.

MOB_TERM_HOME - Home (non-roaming) registration enable indicator.

If the mobile station is configured to receive mobile station terminated calls when not roaming, the mobile station shall set this field to '1'. Otherwise, the mobile station shall set this field to '0'. See 6.6.5.3.

MOB_TERM_FOR_SID - Foreign SID roaming registration enable indicator.

If the mobile station is configured to receive mobile station terminated calls when it is a foreign SID roamer, the mobile station shall set this field to '1'. Otherwise, the mobile station shall set this field to '0'. See 6.6.5.3.

MOB_TERM_FOR_NID - Foreign NID roaming registration enable indicator.

If the mobile station is configured to receive mobile station terminated calls when it is a foreign NID roamer, the mobile station shall set this field to '1'. Otherwise, the mobile station shall set this field to '0'. See 6.6.5.3.

The mobile station shall include one occurrence of the following two-field record for each home (non-roaming) (SID, NID) pair:

SID - System identification.

The mobile station shall set this field to the SID value for this (SID, NID) pair.

NID - Network identification.

The mobile station shall set this field to the NID value for this (SID, NID) pair.

RESERVED - Reserved bits.

The mobile station shall add reserved bits as needed in order to make the length of the entire information record equal to an integer number of octets. The mobile station shall set these bits to '0'.

6.7.4.9 Security Status

This information record can be included in a *Status Message* to return the authentication, encryption, and voice privacy modes of the mobile station. The mobile station shall use the following fixed-length format for the type-specific fields:

Type-Specific Field	Length (bits)
AUTH_MODE	2
ENCRYPT_MODE	2
PRIVATE_LCM	1
RESERVED	3

AUTH_MODE - Authentication mode.

If the mobile station provided standard authentication information at the initiation of this call, the mobile station shall set this field to '01'. Otherwise, the mobile station shall set this field to '00'. All other values are reserved.

ENCRYPT_MODE - Message encryption mode.

The mobile station shall set this field to the value shown in Table 7.7.2.3.2.8-2 corresponding to the message encryption mode currently in use for this call.

PRIVATE_LCM - Private long code mask indicator.

If the mobile station is using the private long code mask for this call, the mobile station shall set this field to '1'. If the mobile station is using the public long code mask for this call, the mobile station shall set this field to '0'.

RESERVED - Reserved bits.

The mobile station shall set this field to '000'.

6.7.4.10 Connected Number

This information record identifies the responding party to a call. The mobile station shall use the following variable-length format for the type-specific fields:

Type-Specific Field	Length (bits)
NUMBER_TYPE	3
NUMBER_PLAN	4
PI	2
SI	2
Zero or more occurrences of the following field:	
CHARi	8
RESERVED	5

NUMBER_TYPE - Type of number.

The mobile station shall set this field to the NUMBER_TYPE value shown in Table 6.7.1.3.2.4-2 corresponding to the type of the connected number as defined in ANSI T1.607 §4.5.9.

NUMBER_PLAN - Numbering plan.

The mobile station shall set this field to the NUMBER_PLAN value shown in Table 6.7.1.3.2.4-3 corresponding to the numbering plan used for the connected number, as defined in ANSI T1.607 §4.5.9.

PI - Presentation indicator.

This field indicates whether or not the connected number should be displayed. The mobile station shall set this field to the PI value shown in Table 6.7.4.4-1 corresponding to the presentation indicator as defined in ANSI T1.607 §4.5.9.

SI - Screening indicator.

This field indicates how the connected number was screened. The mobile station shall set this field to the SI value shown in Table 6.7.4.4-2 corresponding to the screening indicator value as defined in ANSI T1.607 §4.5.9.

CHARi - Character.

The mobile station shall include one occurrence of this field for each character in the connected number. The mobile station shall set each occurrence of this field to the ASCII representation corresponding to the character, as specified in ANSI X3.4, with the most significant bit set to '0'.

RESERVED - Reserved bits.
The mobile station shall set this field to '00000'.

No text.

7 REQUIREMENTS FOR BASE STATION CDMA OPERATION

This section defines requirements that are specific to CDMA base station equipment and operation. See Section 3 and Section 5 for analog base station requirements.

7.1 Transmitter

7.1.1 Frequency Parameters

7.1.1.1 Channel Spacing and Designation

Channel spacing and designation for the base station transmissions shall be as specified in 2.1.1.1. The base station shall support CDMA operations on CDMA channel numbers as shown in Table 6.1.1.1-1.

The CDMA frequency assignment in MHz corresponding to the CDMA Channel number shown in Table 6.1.1.1-1 (expressed as N) is calculated as shown in Table 6.1.1.1-2.

The Primary CDMA Channel shall be channel number 283 for System A and channel number 384 for System B.

The Secondary CDMA Channel shall be channel number 691 for System A and channel number 777 for System B.

7.1.1.2 Frequency Tolerance

The base station transmit carrier frequency shall be maintained within $\pm 5 \times 10^{-8}$ of the CDMA frequency assignment.

7.1.2 Power Output Characteristics

Maximum effective radiated power (ERP) and antenna height above average terrain (HAAT) shall be coordinated locally on an ongoing basis.

7.1.3 Modulation Characteristics

7.1.3.1 Forward CDMA Channel Signals

The Forward CDMA Channel has the overall structure shown in Figure 7.1.3.1-1. The Forward CDMA Channel consists of the following code channels: the Pilot Channel, up to one Sync Channel, up to seven Paging Channels, and a number of Forward Traffic Channels. Each of these code channels is orthogonally spread by the appropriate Walsh function and is then spread by a quadrature pair of PN sequences at a fixed chip rate of 1.2288 Mcps (million chips/sec). Multiple Forward CDMA Channels may be used within a base station in a frequency division multiplexed manner.

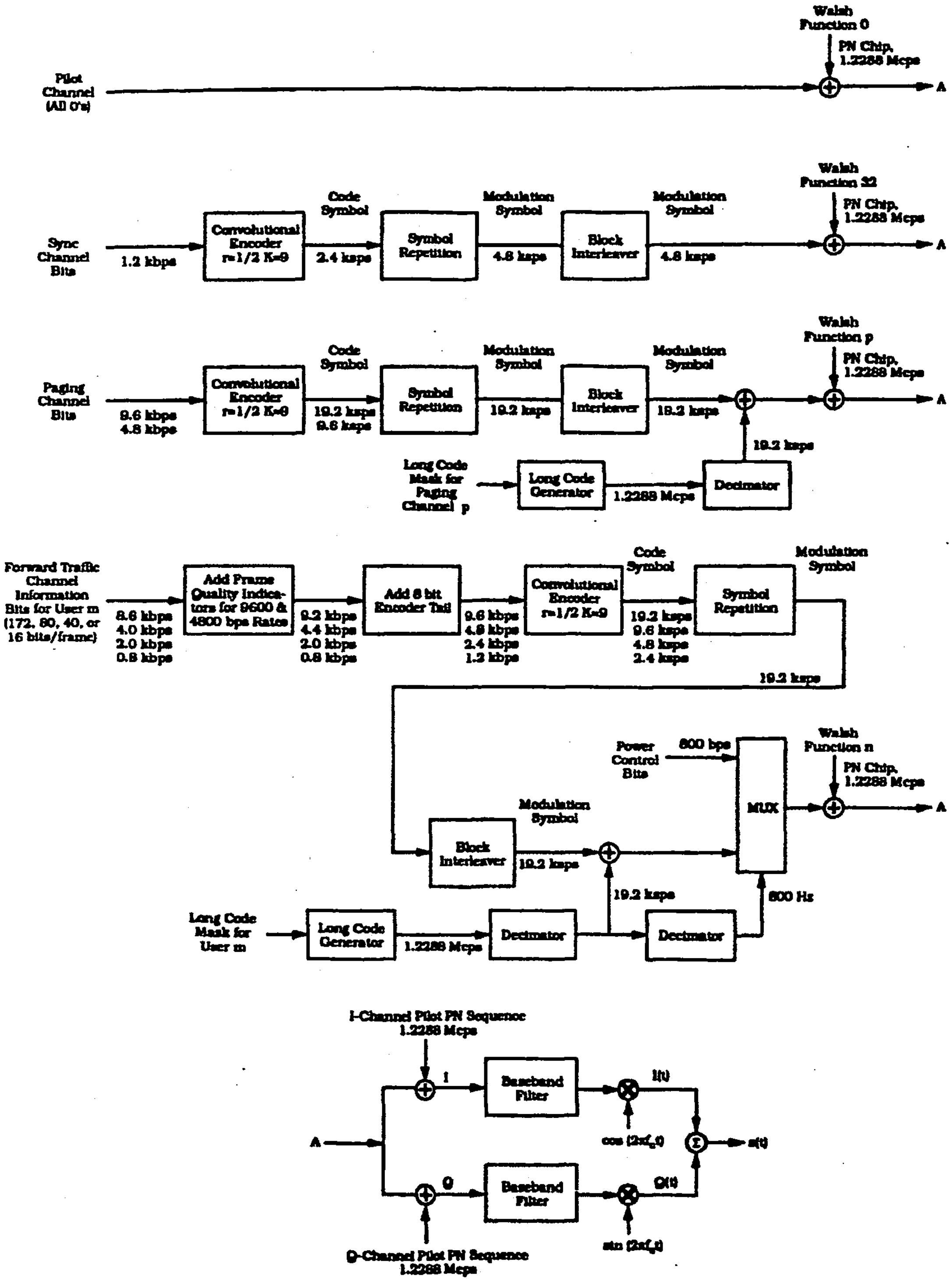

Figure 7.1.3.1-1. Forward CDMA Channel Structure

An example assignment of the code channels transmitted by a base station is shown in Figure 7.1.3.1-2. Out of the 64 code channels available for use, the example depicts the Pilot Channel (always required), one Sync Channel, seven Paging Channels (the maximum number allowed), and 55 Traffic Channels. Another possible configuration could replace all the Paging Channels and the Sync Channel one for one with Traffic Channels, for a maximum of one Pilot Channel, zero Paging Channels, zero Sync Channels, and 63 Traffic Channels.

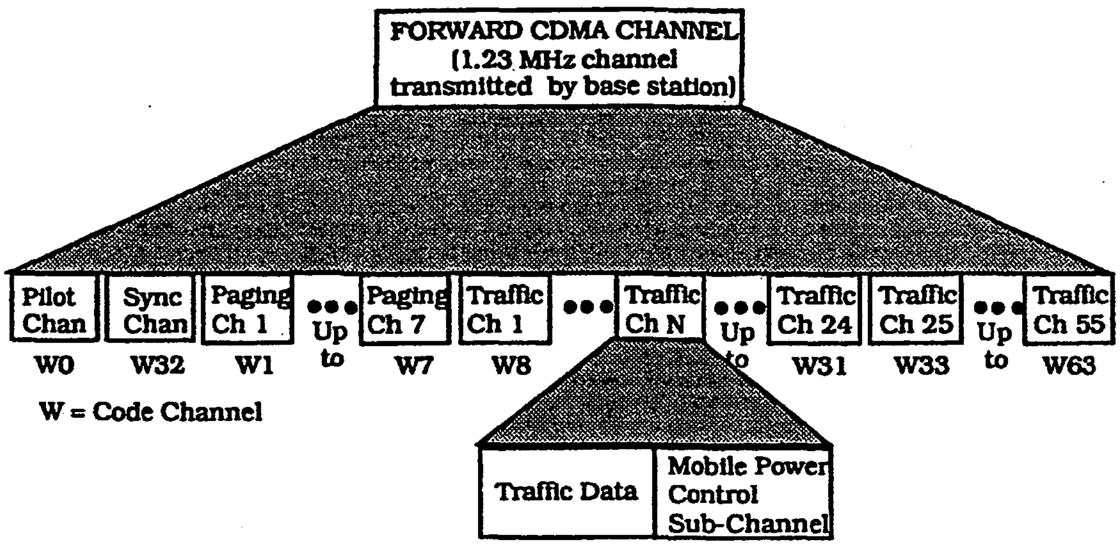

Figure 7.1.3.1-2. Example of a Forward CDMA Channel Transmitted by a Base Station

7.1.3.1.1 Modulation Parameters

The modulation parameters for the Forward CDMA Channel are as shown in Tables 7.1.3.1.1-1, 7.1.3.1.1-2, and 7.1.3.1.1-3.

Table 7.1.3.1.1-1. Sync Channel Modulation Parameters

	Data Rate (bps)	
Parameter	**1200**	**Units**
PN Chip Rate	1.2288	Mcps
Code Rate	1/2	bits/code symbol
Code Repetition	2	mod sym/code sym*
Modulation Symbol Rate	4,800	sps
PN Chips/Modulation Symbol	256	PN chips/mod sym
PN Chips/Bit	1024	PN chips/bit

*Each repetition of a code symbol is a modulation symbol.

Table 7.1.3.1.1-2. Paging Channel Modulation Parameters

	Data Rate (bps)		
Parameter	**9600**	**4800**	**Units**
PN Chip Rate	1.2288	1.2288	Mcps
Code Rate	1/2	1/2	bits/code symbol
Code Repetition	1	2	mod sym/code sym*
Modulation Symbol Rate	19,200	19,200	sps
PN Chips/Modulation Symbol	64	64	PN chips/mod sym
PN Chips/Bit	128	256	PN chips/bit

*Each repetition of a code symbol is a modulation symbol.

Table 7.1.3.1.1-3. Forward Traffic Channel Modulation Parameters

	Data Rate (bps)				
Parameter	**9600**	**4800**	**2400**	**1200**	**Units**
PN Chip Rate	1.2288	1.2288	1.2288	1.2288	Mcps
Code Rate	1/2	1/2	1/2	1/2	bits/code symbol
Code Repetition	1	2	4	8	mod sym/code sym*
Modulation Symbol Rate	19,200	19,200	19,200	19,200	sps
PN Chips/Modulation Symbol	64	64	64	64	PN chips/mod sym
PN Chips/Bit	128	256	512	1024	PN chips/bit

*Each repetition of a code symbol is a modulation symbol.

7.1.3.1.2 Data Rates

The Sync Channel shall operate at a fixed rate of 1200 bps. The Paging Channel shall support fixed data rate operation at 9600 or 4800 bps. The Forward Traffic Channel shall support variable data rate operation at 9600, 4800, 2400, and 1200 bps.

7.1.3.1.3 Convolutional Encoding

The Sync Channel, Paging Channel, and Forward Traffic Channel shall be convolutionally encoded prior to transmission. The convolutional code shall be rate 1/2, with a constraint length of 9. The generator functions of the code shall be g_0 equals 753 (octal) and g_1 equals 561 (octal). This is a rate 1/2 code generating two code symbols for each data bit input to the encoder. These code symbols shall be output so that the code symbol (c_0) encoded with generator function g_0 is output first, and the code symbol (c_1) encoded with generator function g_1 is output last. The state of the convolutional encoder, upon initialization, shall be the all-zero state. The first code symbol output after initialization shall be a code symbol encoded with generator function g_0.

Convolutional encoding involves the modulo-2 addition of selected taps of a serially time-delayed data sequence. The length of the data sequence delay is equal to K-1, where K is the constraint length of the code. Figure 7.1.3.1.3-1 illustrates the specific K equals 9, rate 1/2 convolutional encoder that is used for these channels.

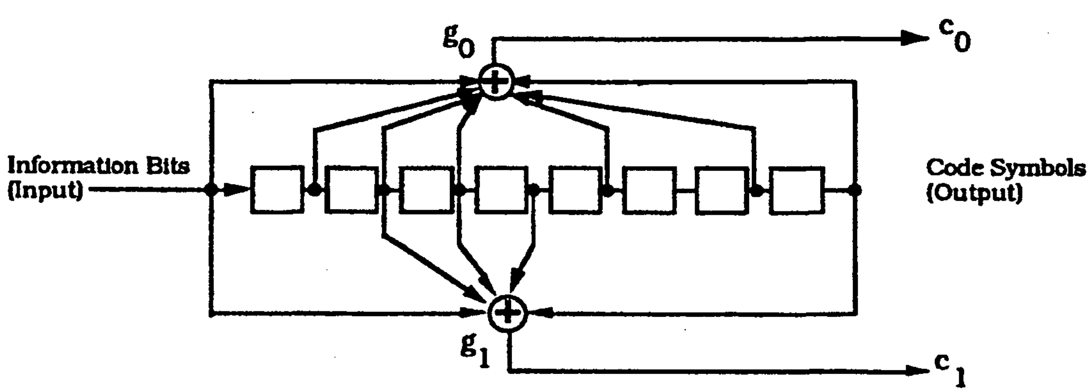

Figure 7.1.3.1.3-1. K = 9, Rate 1/2 Convolutional Encoder

7.1.3.1.4 Code Symbol Repetition

For the Sync Channel, each convolutionally encoded symbol shall be repeated 1 time (each symbol occurs 2 consecutive times) prior to block interleaving.

For the Paging and Forward Traffic Channels, each convolutionally encoded symbol shall be repeated prior to block interleaving whenever the information rate is lower than 9600 bps. Each code symbol at the 4800 bps rate shall be repeated 1 time (each symbol occurs 2 consecutive times). Each code symbol at the 2400 bps data rate shall be repeated 3 times (each symbol occurs 4 consecutive times). Each code symbol at the 1200 bps data rate shall be repeated 7 times (each symbol occurs 8 consecutive times). For all the data rates (9600, 4800, 2400, and 1200 bps) this results in a constant modulation symbol rate of 19200 modulation symbols per second.

7.1.3.1.5 Block Interleaving

All symbols after repetition on the Sync Channel, Paging Channel, and Forward Traffic Channel are block interleaved.

The Sync Channel shall use a block interleaver spanning 26.666... ms which is equivalent to 128 modulation symbols at the symbol rate of 4800 sps.[1]

The input (array write) symbol sequence to the Sync Channel interleaver is given in Table 7.1.3.1.5-1. The table is read down by columns from the left to the right. That is, the first input symbol (1) is at the top left, the second input symbol (1) is just below the first input symbol, and the 17th input symbol (9) is just to the right of the first input symbol. The output (array read) symbol sequence shall be as given in Table 7.1.3.1.5-2. The table is read the same way as Table 7.1.3.1.5-1. That is, the first output symbol (1) is at the top left, the second output symbol (33) is just below the first output symbol, and the 17th output symbol (3) is just to the right of the first output symbol.

The Forward Traffic and Paging Channels shall use the identical block interleaver spanning 20 ms equivalent to 384 modulation symbols at the modulation symbol rate of 19200 sps.

The input (array write) and output (array read) symbol sequence for the four data rates shall be as given in Tables 7.1.3.1.5-3 through 7.1.3.1.5-10. These tables are read down by columns from the left to the right as with the Sync Channel interleaver. In these tables, symbols with the same number denote repeated code symbols.

[1]The Sync Channel symbols are interleaved by a technique that is best described as a bit reversal method.

Table 7.1.3.1.5-1. Sync Channel Interleaver Input (Array Write Operation)

1	9	17	25	33	41	49	57
1	9	17	25	33	41	49	57
2	10	18	26	34	42	50	58
2	10	18	26	34	42	50	58
3	11	19	27	35	43	51	59
3	11	19	27	35	43	51	59
4	12	20	28	36	44	52	60
4	12	20	28	36	44	52	60
5	13	21	29	37	45	53	61
5	13	21	29	37	45	53	61
6	14	22	30	38	46	54	62
6	14	22	30	38	46	54	62
7	15	23	31	39	47	55	63
7	15	23	31	39	47	55	63
8	16	24	32	40	48	56	64
8	16	24	32	40	48	56	64

Table 7.1.3.1.5-2. Sync Channel Interleaver Output (Array Read Operation)

1	3	2	4	1	3	2	4
33	35	34	36	33	35	34	36
17	19	18	20	17	19	18	20
49	51	50	52	49	51	50	52
9	11	10	12	9	11	10	12
41	43	42	44	41	43	42	44
25	27	26	28	25	27	26	28
57	59	58	60	57	59	58	60
5	7	6	8	5	7	6	8
37	39	38	40	37	39	38	40
21	23	22	24	21	23	22	24
53	55	54	56	53	55	54	56
13	15	14	16	13	15	14	16
45	47	46	48	45	47	46	48
29	31	30	32	29	31	30	32
61	63	62	64	61	63	62	64

Table 7.1.3.1.5-3. Forward Traffic and Paging Channel Interleaver Input (Array Write Operation at 9600 bps)

1	25	49	73	97	121	145	169	193	217	241	265	289	313	337	361
2	26	50	74	98	122	146	170	194	218	242	266	290	314	338	362
3	27	51	75	99	123	147	171	195	219	243	267	291	315	339	363
4	28	52	76	100	124	148	172	196	220	244	268	292	316	340	364
5	29	53	77	101	125	149	173	197	221	245	269	293	317	341	365
6	30	54	78	102	126	150	174	198	222	246	270	294	318	342	366
7	31	55	79	103	127	151	175	199	223	247	271	295	319	343	367
8	32	56	80	104	128	152	176	200	224	248	272	296	320	344	368
9	33	57	81	105	129	153	177	201	225	249	273	297	321	345	369
10	34	58	82	106	130	154	178	202	226	250	274	298	322	346	370
11	35	59	83	107	131	155	179	203	227	251	275	299	323	347	371
12	36	60	84	108	132	156	180	204	228	252	276	300	324	348	372
13	37	61	85	109	133	157	181	205	229	253	277	301	325	349	373
14	38	62	86	110	134	158	182	206	230	254	278	302	326	350	374
15	39	63	87	111	135	159	183	207	231	255	279	303	327	351	375
16	40	64	88	112	136	160	184	208	232	256	280	304	328	352	376
17	41	65	89	113	137	161	185	209	233	257	281	305	329	353	377
18	42	66	90	114	138	162	186	210	234	258	282	306	330	354	378
19	43	67	91	115	139	163	187	211	235	259	283	307	331	355	379
20	44	68	92	116	140	164	188	212	236	260	284	308	332	356	380
21	45	69	93	117	141	165	189	213	237	261	285	309	333	357	381
22	46	70	94	118	142	166	190	214	238	262	286	310	334	358	382
23	47	71	95	119	143	167	191	215	239	263	287	311	335	359	383
24	48	72	96	120	144	168	192	216	240	264	288	312	336	360	384

Table 7.1.3.1.5-4. Forward Traffic and Paging Channel Interleaver Output (Array Read Operation at 9600 bps)

1	9	5	13	3	11	7	15	2	10	6	14	4	12	8	16
65	73	69	77	67	75	71	79	66	74	70	78	68	76	72	80
129	137	133	141	131	139	135	143	130	138	134	142	132	140	136	144
193	201	197	205	195	203	199	207	194	202	198	206	196	204	200	208
257	265	261	269	259	267	263	271	258	266	262	270	260	268	264	272
321	329	325	333	323	331	327	335	322	330	326	334	324	332	328	336
33	41	37	45	35	43	39	47	34	42	38	46	36	44	40	48
97	105	101	109	99	107	103	111	98	106	102	110	100	108	104	112
161	169	165	173	163	171	167	175	162	170	166	174	164	172	168	176
225	233	229	237	227	235	231	239	226	234	230	238	228	236	232	240
289	297	293	301	291	299	295	303	290	298	294	302	292	300	296	304
353	361	357	365	355	363	359	367	354	362	358	366	356	364	360	368
17	25	21	29	19	27	23	31	18	26	22	30	20	28	24	32
81	89	85	93	83	91	87	95	82	90	86	94	84	92	88	96
145	153	149	157	147	155	151	159	146	154	150	158	148	156	152	160
209	217	213	221	211	219	215	223	210	218	214	222	212	220	216	224
273	281	277	285	275	283	279	287	274	282	278	286	276	284	280	288
337	345	341	349	339	347	343	351	338	346	342	350	340	348	344	352
49	57	53	61	51	59	55	63	50	58	54	62	52	60	56	64
113	121	117	125	115	123	119	127	114	122	118	126	116	124	120	128
177	185	181	189	179	187	183	191	178	186	182	190	180	188	184	192
241	249	245	253	243	251	247	255	242	250	246	254	244	252	248	256
305	313	309	317	307	315	311	319	306	314	310	318	308	316	312	320
369	377	373	381	371	379	375	383	370	378	374	382	372	380	376	384

Table 7.1.3.1.5-5. Forward Traffic and Paging Channel Interleaver Input (Array Write Operation at 4800 bps)

1	13	25	37	49	61	73	85	97	109	121	133	145	157	169	181
1	13	25	37	49	61	73	85	97	109	121	133	145	157	169	181
2	14	26	38	50	62	74	86	98	110	122	134	146	158	170	182
2	14	26	38	50	62	74	86	98	110	122	134	146	158	170	182
3	15	27	39	51	63	75	87	99	111	123	135	147	159	171	183
3	15	27	39	51	63	75	87	99	111	123	135	147	159	171	183
4	16	28	40	52	64	76	88	100	112	124	136	148	160	172	184
4	16	28	40	52	64	76	88	100	112	124	136	148	160	172	184
5	17	29	41	53	65	77	89	101	113	125	137	149	161	173	185
5	17	29	41	53	65	77	89	101	113	125	137	149	161	173	185
6	18	30	42	54	66	78	90	102	114	126	138	150	162	174	186
6	18	30	42	54	66	78	90	102	114	126	138	150	162	174	186
7	19	31	43	55	67	79	91	103	115	127	139	151	163	175	187
7	19	31	43	55	67	79	91	103	115	127	139	151	163	175	187
8	20	32	44	56	68	80	92	104	116	128	140	152	164	176	188
8	20	32	44	56	68	80	92	104	116	128	140	152	164	176	188
9	21	33	45	57	69	81	93	105	117	129	141	153	165	177	189
9	21	33	45	57	69	81	93	105	117	129	141	153	165	177	189
10	22	34	46	58	70	82	94	106	118	130	142	154	166	178	190
10	22	34	46	58	70	82	94	106	118	130	142	154	166	178	190
11	23	35	47	59	71	83	95	107	119	131	143	155	167	179	191
11	23	35	47	59	71	83	95	107	119	131	143	155	167	179	191
12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192
12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192

Table 7.1.3.1.5-6. Forward Traffic and Paging Channel Interleaver Output (Array Read Operation at 4800 bps)

1	5	3	7	2	6	4	8	1	5	3	7	2	6	4	8
33	37	35	39	34	38	36	40	33	37	35	39	34	38	36	40
65	69	67	71	66	70	68	72	65	69	67	71	66	70	68	72
97	101	99	103	98	102	100	104	97	101	99	103	98	102	100	104
129	133	131	135	130	134	132	136	129	133	131	135	130	134	132	136
161	165	163	167	162	166	164	168	161	165	163	167	162	166	164	168
17	21	19	23	18	22	20	24	17	21	19	23	18	22	20	24
49	53	51	55	50	54	52	56	49	53	51	55	50	54	52	56
81	85	83	87	82	86	84	88	81	85	83	87	82	86	84	88
113	117	115	119	114	118	116	120	113	117	115	119	114	118	116	120
145	149	147	151	146	150	148	152	145	149	147	151	146	150	148	152
177	181	179	183	178	182	180	184	177	181	179	183	178	182	180	184
9	13	11	15	10	14	12	16	9	13	11	15	10	14	12	16
41	45	43	47	42	46	44	48	41	45	43	47	42	46	44	48
73	77	75	79	74	78	76	80	73	77	75	79	74	78	76	80
105	109	107	111	106	110	108	112	105	109	107	111	106	110	108	112
137	141	139	143	138	142	140	144	137	141	139	143	138	142	140	144
169	173	171	175	170	174	172	176	169	173	171	175	170	174	172	176
25	29	27	31	26	30	28	32	25	29	27	31	26	30	28	32
57	61	59	63	58	62	60	64	57	61	59	63	58	62	60	64
89	93	91	95	90	94	92	96	89	93	91	95	90	94	92	96
121	125	123	127	122	126	124	128	121	125	123	127	122	126	124	128
153	157	155	159	154	158	156	160	153	157	155	159	154	158	156	160
185	189	187	191	186	190	188	192	185	189	187	191	186	190	188	192

Table 7.1.3.1.5-7. Forward Traffic Channel Interleaver Input (Array Write Operation at 2400 bps)

1	7	13	19	25	31	37	43	49	55	61	67	73	79	85	91
1	7	13	19	25	31	37	43	49	55	61	67	73	79	85	91
1	7	13	19	25	31	37	43	49	55	61	67	73	79	85	91
1	7	13	19	25	31	37	43	49	55	61	67	73	79	85	91
2	8	14	20	26	32	38	44	50	56	62	68	74	80	86	92
2	8	14	20	26	32	38	44	50	56	62	68	74	80	86	92
2	8	14	20	26	32	38	44	50	56	62	68	74	80	86	92
2	8	14	20	26	32	38	44	50	56	62	68	74	80	86	92
3	9	15	21	27	33	39	45	51	57	63	69	75	81	87	93
3	9	15	21	27	33	39	45	51	57	63	69	75	81	87	93
3	9	15	21	27	33	39	45	51	57	63	69	75	81	87	93
3	9	15	21	27	33	39	45	51	57	63	69	75	81	87	93
4	10	16	22	28	34	40	46	52	58	64	70	76	82	88	94
4	10	16	22	28	34	40	46	52	58	64	70	76	82	88	94
4	10	16	22	28	34	40	46	52	58	64	70	76	82	88	94
4	10	16	22	28	34	40	46	52	58	64	70	76	82	88	94
5	11	17	23	29	35	41	47	53	59	65	71	77	83	89	95
5	11	17	23	29	35	41	47	53	59	65	71	77	83	89	95
5	11	17	23	29	35	41	47	53	59	65	71	77	83	89	95
5	11	17	23	29	35	41	47	53	59	65	71	77	83	89	95
6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96
6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96
6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96
6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96

Table 7.1.3.1.5-8. Forward Traffic Channel Interleaver Output (Array Read Operation at 2400 bps)

1	3	2	4	1	3	2	4	1	3	2	4	1	3	2	4
17	19	18	20	17	19	18	20	17	19	18	20	17	19	18	20
33	35	34	36	33	35	34	36	33	35	34	36	33	35	34	36
49	51	50	52	49	51	50	52	49	51	50	52	49	51	50	52
65	67	66	68	65	67	66	68	65	67	66	68	65	67	66	68
81	83	82	84	81	83	82	84	81	83	82	84	81	83	82	84
9	11	10	12	9	11	10	12	9	11	10	12	9	11	10	12
25	27	26	28	25	27	26	28	25	27	26	28	25	27	26	28
41	43	42	44	41	43	42	44	41	43	42	44	41	43	42	44
57	59	58	60	57	59	58	60	57	59	58	60	57	59	58	60
73	75	74	76	73	75	74	76	73	75	74	76	73	75	74	76
89	91	90	92	89	91	90	92	89	91	90	92	89	91	90	92
5	7	6	8	5	7	6	8	5	7	6	8	5	7	6	8
21	23	22	24	21	23	22	24	21	23	22	24	21	23	22	24
37	39	38	40	37	39	38	40	37	39	38	40	37	39	38	40
53	55	54	56	53	55	54	56	53	55	54	56	53	55	54	56
69	71	70	72	69	71	70	72	69	71	70	72	69	71	70	72
85	87	86	88	85	87	86	88	85	87	86	88	85	87	86	88
13	15	14	16	13	15	14	16	13	15	14	16	13	15	14	16
29	31	30	32	29	31	30	32	29	31	30	32	29	31	30	32
45	47	46	48	45	47	46	48	45	47	46	48	45	47	46	48
61	63	62	64	61	63	62	64	61	63	62	64	61	63	62	64
77	79	78	80	77	79	78	80	77	79	78	80	77	79	78	80
93	95	94	96	93	95	94	96	93	95	94	96	93	95	94	96

Table 7.1.3.1.5-9. Forward Traffic Channel Interleaver Input (Array Write Operation at 1200 bps)

1	4	7	10	13	16	19	22	25	28	31	34	37	40	43	46
1	4	7	10	13	16	19	22	25	28	31	34	37	40	43	46
1	4	7	10	13	16	19	22	25	28	31	34	37	40	43	46
1	4	7	10	13	16	19	22	25	28	31	34	37	40	43	46
1	4	7	10	13	16	19	22	25	28	31	34	37	40	43	46
1	4	7	10	13	16	19	22	25	28	31	34	37	40	43	46
1	4	7	10	13	16	19	22	25	28	31	34	37	40	43	46
1	4	7	10	13	16	19	22	25	28	31	34	37	40	43	46
2	5	8	11	14	17	20	23	26	29	32	35	38	41	44	47
2	5	8	11	14	17	20	23	26	29	32	35	38	41	44	47
2	5	8	11	14	17	20	23	26	29	32	35	38	41	44	47
2	5	8	11	14	17	20	23	26	29	32	35	38	41	44	47
2	5	8	11	14	17	20	23	26	29	32	35	38	41	44	47
2	5	8	11	14	17	20	23	26	29	32	35	38	41	44	47
2	5	8	11	14	17	20	23	26	29	32	35	38	41	44	47
2	5	8	11	14	17	20	23	26	29	32	35	38	41	44	47
3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48
3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48
3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48
3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48
3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48
3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48
3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48
3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48

Table 7.1.3.1.5-10. Forward Traffic Channel Interleaver Output (Array Read Operation at 1200 bps)

1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
9	10	9	10	9	10	9	10	9	10	9	10	9	10	9	10
17	18	17	18	17	18	17	18	17	18	17	18	17	18	17	18
25	26	25	26	25	26	25	26	25	26	25	26	25	26	25	26
33	34	33	34	33	34	33	34	33	34	33	34	33	34	33	34
41	42	41	42	41	42	41	42	41	42	41	42	41	42	41	42
5	6	5	6	5	6	5	6	5	6	5	6	5	6	5	6
13	14	13	14	13	14	13	14	13	14	13	14	13	14	13	14
21	22	21	22	21	22	21	22	21	22	21	22	21	22	21	22
29	30	29	30	29	30	29	30	29	30	29	30	29	30	29	30
37	38	37	38	37	38	37	38	37	38	37	38	37	38	37	38
45	46	45	46	45	46	45	46	45	46	45	46	45	46	45	46
3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4
11	12	11	12	11	12	11	12	11	12	11	12	11	12	11	12
19	20	19	20	19	20	19	20	19	20	19	20	19	20	19	20
27	28	27	28	27	28	27	28	27	28	27	28	27	28	27	28
35	36	35	36	35	36	35	36	35	36	35	36	35	36	35	36
43	44	43	44	43	44	43	44	43	44	43	44	43	44	43	44
7	8	7	8	7	8	7	8	7	8	7	8	7	8	7	8
15	16	15	16	15	16	15	16	15	16	15	16	15	16	15	16
23	24	23	24	23	24	23	24	23	24	23	24	23	24	23	24
31	32	31	32	31	32	31	32	31	32	31	32	31	32	31	32
39	40	39	40	39	40	39	40	39	40	39	40	39	40	39	40
47	48	47	48	47	48	47	48	47	48	47	48	47	48	47	48

7.1.3.1.6 Data Scrambling

Data scrambling applies to the Paging and Forward Traffic Channels. Data scrambling is performed on the modulation symbols output from the block interleaver at the 19,200 sps rate.

The data scrambling shall be accomplished by performing the modulo-2 addition of the interleaver output symbol with the binary value of the long code PN chip that is valid at the start of the transmission period for that symbol as shown in Figure 7.1.3.1.6-1. This PN sequence shall be the equivalent of the long code operating at 1.2288 MHz clock rate where only the first output of every 64 is used for the data scrambling (i.e., at a 19200 sps rate). The long code may be generated as described in 6.1.3.1.8. The long code masks to be used for the Paging and Forward Traffic Channels are specified in 7.1.3.4.6 and 7.1.3.5.6, respectively.

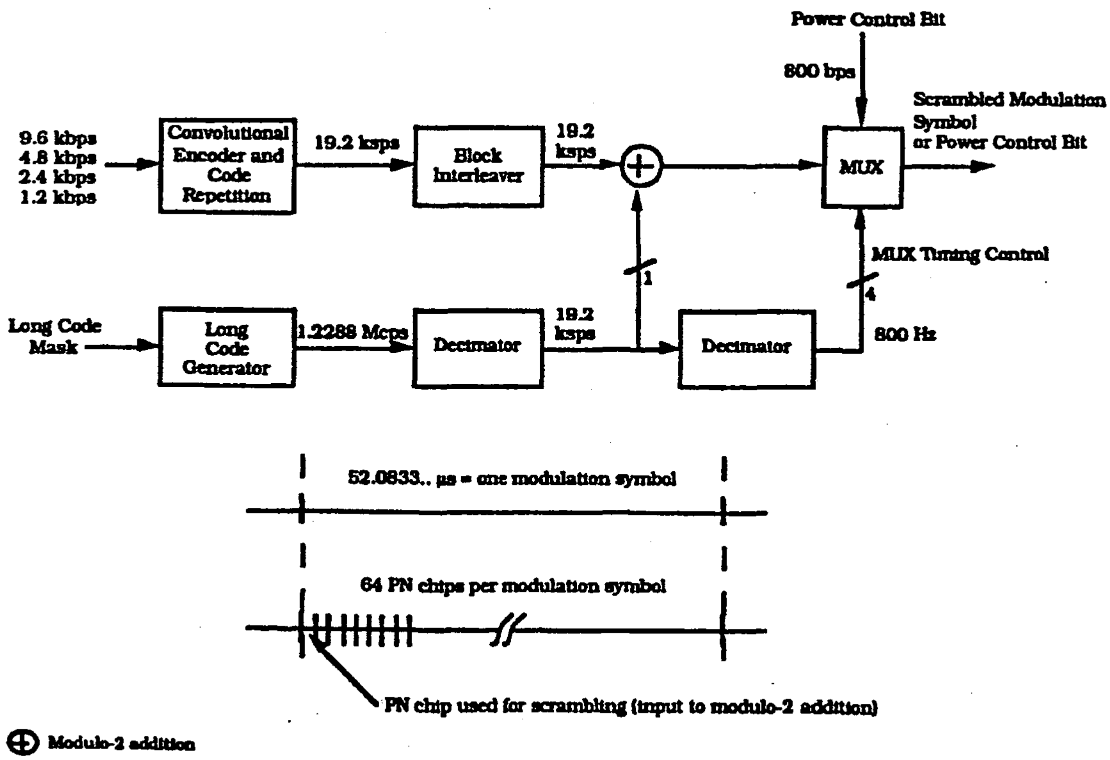

Figure 7.1.3.1.6-1. Data Scrambler Function and Timing

7.1.3.1.7 Power Control Subchannel

A power control subchannel is continuously transmitted on the Forward Traffic Channel. The sub-channel shall transmit at a rate of one bit ('0' or '1') every 1.25 ms (i.e., 800 bps). A '0' bit shall indicate to the mobile station to increase the mean output power level and a '1' bit shall indicate to the mobile station to decrease the mean output power level. The amount that the mobile station increases and decreases its power for every power control bit is specified in 6.1.2.3.2.

The base station Reverse Traffic Channel receiver shall estimate the received signal strength of the particular mobile station it is assigned to over a 1.25 ms period, equivalent to 6 modulation symbols. The base station receiver shall use the estimate to determine the value of the power control bit ('0' or '1'). The base station shall transmit the power control bit on the corresponding Forward Traffic Channel using the puncturing technique described below. The transmission of the power control bit shall occur on the Forward Traffic Channel in the second power control group following the corresponding Reverse Traffic Channel power control group in which the signal strength was estimated.[2]

The length of one power control bit shall correspond exactly to two modulation symbols of the Forward Traffic Channel (i.e., 104.166... μs). Each power control bit shall replace two consecutive Forward Traffic Channel modulation symbols[3] and shall be transmitted with energy not less than E_b, namely the energy per information bit of the Forward Traffic Channel, as shown in Figure 7.1.3.1.7-1.

The power control bits shall be inserted into the Forward Traffic Channel data stream after the data scrambling.

There are 16 possible starting positions for the power control bit as shown in Figure 7.1.3.1.7-2. Each position corresponds to one of the first 16 modulation symbols (numbered 0 through 15) of a 1.25 ms period. In each 1.25 ms period, a total of 24 bits from the long code are used for scrambling. These bits are numbered 0 through 23, where bit 0 is the first to be used and bit 23 the last in each 1.25 ms period.

The 4-bit binary number with values 0 through 15 formed by scrambling bits 23, 22, 21, and 20 shall be used to determine the position of the power control bit as shown in Figure 7.1.3.1.7-2. Bit 20 shall be the least significant bit, and bit 23 shall be the most significant bit. In the example of Figure 7.1.3.1.7-2, the values of bits 23, 22, 21, and 20 are '1011' (11 decimal), and the power control bit starting position is the eleventh. Figure 7.1.3.1.6-1 shows the relationship between the scrambled modulation symbols (at 19200 sps) and the punctured power control subchannel (at 800 bps).

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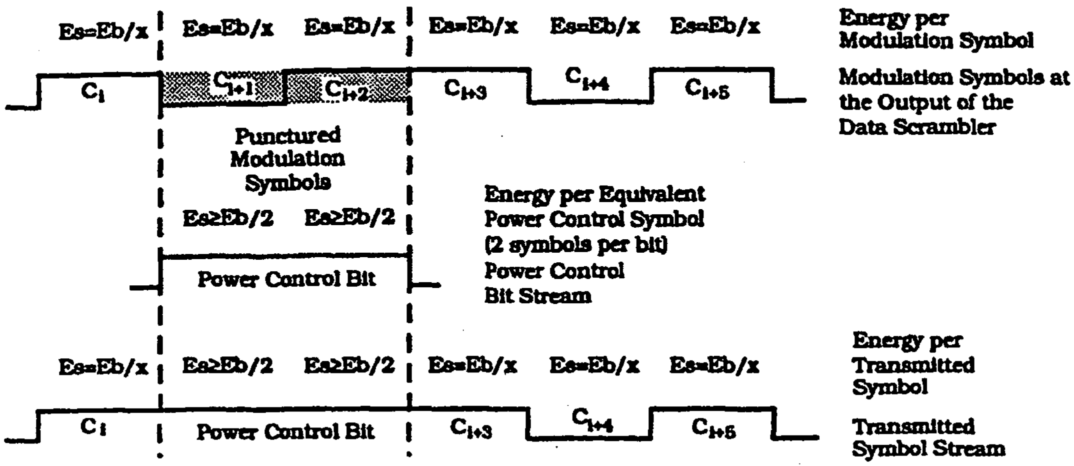
[2]For instance, as shown in Figure 7.1.3.1.7-2, the signal is received on the Reverse Traffic Channel in power control group number 5, and the corresponding power control bit is transmitted on the Forward Traffic Channel during power control group number 5 + 2 = 7.

[3] This technique is commonly known as symbol puncturing. In this case, the punctured modulation symbols are replaced by the power control bits.



Where x Is Given by:

Transmit Rate	Value of x
9600 bps	2
4800 bps	4
2400 bps	8
1200 bps	16

All unpunctured modulation symbols in a frame are transmitted at the same power level. Modulation symbols in adjacent frames may be sent at different power levels.

Figure 7.1.3.1.7-1. Power Control Sub-Channel Structure and Puncturing

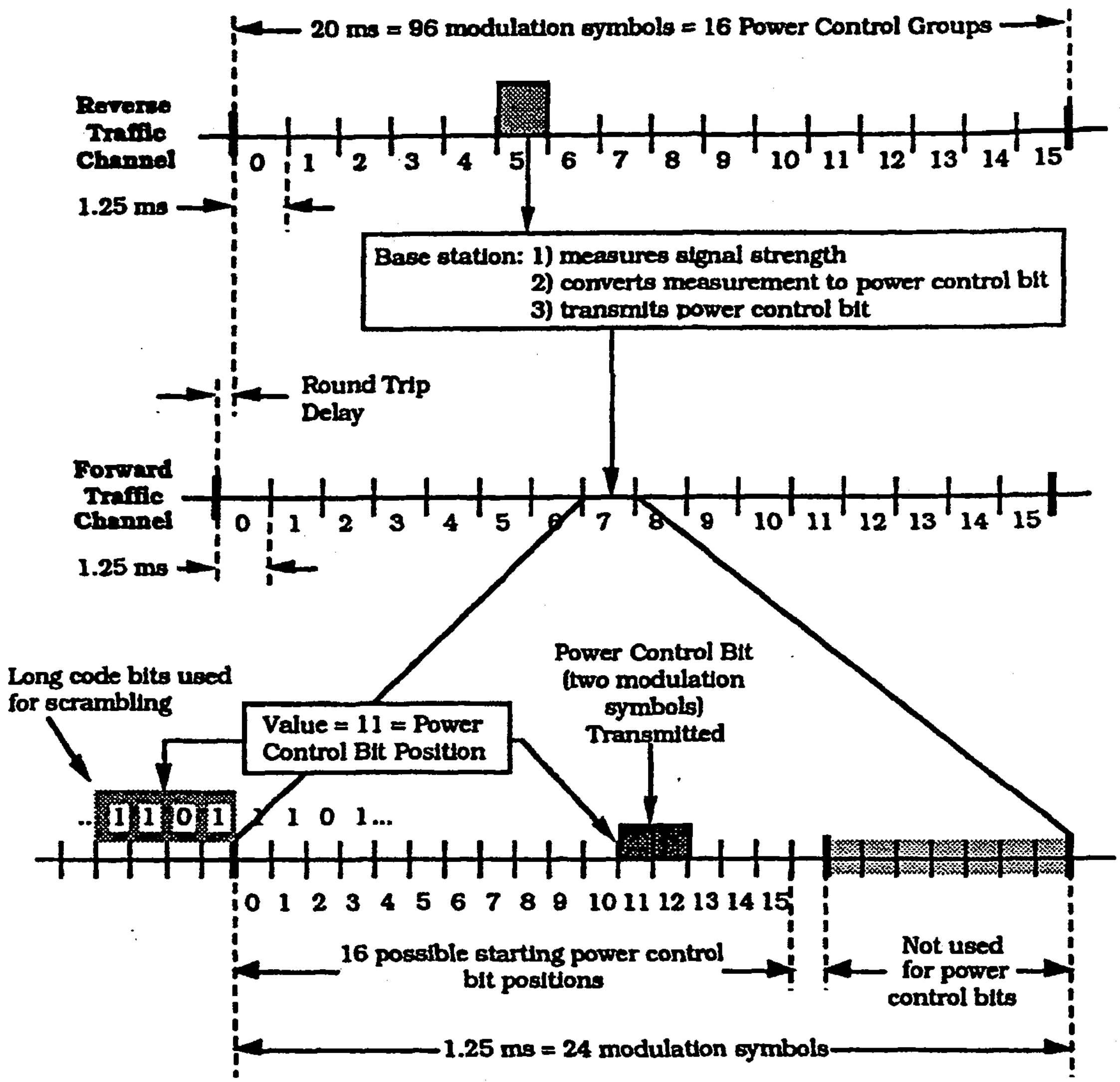


Figure 7.1.3.1.7-2. Randomization of Power Control Bit Positions

7.1.3.1.8 Orthogonal Spreading

Each code channel transmitted on the Forward CDMA Channel shall be spread with a Walsh function at a fixed chip rate of 1.2288 Mcps to provide orthogonal channelization among all code channels on a given Forward CDMA Channel. One of sixty-four time-orthogonal Walsh functions, as defined in Table 7.1.3.1.8-1, shall be used. A code channel that is spread using Walsh function n shall be assigned to code channel number n (n = 0 to 63). Walsh function time alignment shall be such that the first Walsh chip, designated by 0 in the column headings of Table 7.1.3.1.8-1, begins at the even second time marks referenced to base station transmission time (see 7.1.5). The Walsh function spreading sequence shall repeat with a period of 52.083... μs (= 64/1.2288 Mcps) which is equal to the duration of one Forward Traffic Channel modulation symbol.

Code channel number zero shall always be assigned to the Pilot Channel. If the Sync Channel is present, it shall be assigned code channel number 32. If Paging Channels are present, they shall be assigned to code channel numbers one through seven (inclusive) in sequence. The remaining code channels are available for assignment to the Forward Traffic Channels.

Table 7.1.3.1.8-1. 64-ary Walsh Functions

Walsh Chip within a Walsh Function

Walsh Function Index

	0 1 2 3	4 5 6 7	8 9 10 11	12 13 14 15	16 17 18 19	20 21 22 23	24 25 26 27	28 29 30 31	32 33 34 35	36 37 38 39	40 41 42 43	44 45 46 47	48 49 50 51	52 53 54 55	56 57 58 59	60 61 62 63
0	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
1	0101	0101	0101	0101	0101	0101	0101	0101	0101	0101	0101	0101	0101	0101	0101	0101
2	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011
3	0110	0110	0110	0110	0110	0110	0110	0110	0110	0110	0110	0110	0110	0110	0110	0110
4	0000	1111	0000	1111	0000	1111	0000	1111	0000	1111	0000	1111	0000	1111	0000	1111
5	0101	1010	0101	1010	0101	1010	0101	1010	0101	1010	0101	1010	0101	1010	0101	1010
6	0011	1100	0011	1100	0011	1100	0011	1100	0011	1100	0011	1100	0011	1100	0011	1100
7	0110	1001	0110	1001	0110	1001	0110	1001	0110	1001	0110	1001	0110	1001	0110	1001
8	0000	0000	1111	1111	0000	0000	1111	1111	0000	0000	1111	1111	0000	0000	1111	1111
9	0101	0101	1010	1010	0101	0101	1010	1010	0101	0101	1010	1010	0101	0101	1010	1010
10	0011	0011	1100	1100	0011	0011	1100	1100	0011	0011	1100	1100	0011	0011	1100	1100
11	0110	0110	1001	1001	0110	0110	1001	1001	0110	0110	1001	1001	0110	0110	1001	1001
12	0000	1111	1111	0000	0000	1111	1111	0000	0000	1111	1111	0000	0000	1111	1111	0000
13	0101	1010	1010	0101	0101	1010	1010	0101	0101	1010	1010	0101	0101	1010	1010	0101
14	0011	1100	1100	0011	0011	1100	1100	0011	0011	1100	1100	0011	0011	1100	1100	0011
15	0110	1001	1001	0110	0110	1001	1001	0110	0110	1001	1001	0110	0110	1001	1001	0110
16	0000	0000	0000	0000	1111	1111	1111	1111	0000	0000	0000	0000	1111	1111	1111	1111
17	0101	0101	0101	0101	1010	1010	1010	1010	0101	0101	0101	0101	1010	1010	1010	1010
18	0011	0011	0011	0011	1100	1100	1100	1100	0011	0011	0011	0011	1100	1100	1100	1100
19	0110	0110	0110	0110	1001	1001	1001	1001	0110	0110	0110	0110	1001	1001	1001	1001
20	0000	1111	0000	1111	1111	0000	1111	0000	0000	1111	0000	1111	1111	0000	1111	0000
21	0101	1010	0101	1010	1010	0101	1010	0101	0101	1010	0101	1010	1010	0101	1010	0101
22	0011	1100	0011	1100	1100	0011	1100	0011	0011	1100	0011	1100	1100	0011	1100	0011
23	0110	1001	0110	1001	1001	0110	1001	0110	0110	1001	0110	1001	1001	0110	1001	0110
24	0000	0000	1111	1111	1111	1111	0000	0000	0000	0000	1111	1111	1111	1111	0000	0000
25	0101	0101	1010	1010	1010	1010	0101	0101	0101	0101	1010	1010	1010	1010	0101	0101
26	0011	0011	1100	1100	1100	1100	0011	0011	0011	0011	1100	1100	1100	1100	0011	0011
27	0110	0110	1001	1001	1001	1001	0110	0110	0110	0110	1001	1001	1001	1001	0110	0110
28	0000	1111	1111	0000	1111	0000	0000	1111	0000	1111	1111	0000	1111	0000	0000	1111
29	0101	1010	1010	0101	1010	0101	0101	1010	0101	1010	1010	0101	1010	0101	0101	1010
30	0011	1100	1100	0011	1100	0011	0011	1100	0011	1100	1100	0011	1100	0011	0011	1100
31	0110	1001	1001	0110	1001	0110	0110	1001	0110	1001	1001	0110	1001	0110	0110	1001
32	0000	0000	0000	0000	0000	0000	0000	0000	1111	1111	1111	1111	1111	1111	1111	1111
33	0101	0101	0101	0101	0101	0101	0101	0101	1010	1010	1010	1010	1010	1010	1010	1010
34	0011	0011	0011	0011	0011	0011	0011	0011	1100	1100	1100	1100	1100	1100	1100	1100
35	0110	0110	0110	0110	0110	0110	0110	0110	1001	1001	1001	1001	1001	1001	1001	1001
36	0000	1111	0000	1111	0000	1111	0000	1111	1111	0000	1111	0000	1111	0000	1111	0000
37	0101	1010	0101	1010	0101	1010	0101	1010	1010	0101	1010	0101	1010	0101	1010	0101
38	0011	1100	0011	1100	0011	1100	0011	1100	1100	0011	1100	0011	1100	0011	1100	0011
39	0110	1001	0110	1001	0110	1001	0110	1001	1001	0110	1001	0110	1001	0110	1001	0110
40	0000	0000	1111	1111	0000	0000	1111	1111	1111	1111	0000	0000	1111	1111	0000	0000
41	0101	0101	1010	1010	0101	0101	1010	1010	1010	1010	0101	0101	1010	1010	0101	0101
42	0011	0011	1100	1100	0011	0011	1100	1100	1100	1100	0011	0011	1100	1100	0011	0011
43	0110	0110	1001	1001	0110	0110	1001	1001	1001	1001	0110	0110	1001	1001	0110	0110
44	0000	1111	1111	0000	0000	1111	1111	0000	1111	0000	0000	1111	1111	0000	0000	1111
45	0101	1010	1010	0101	0101	1010	1010	0101	1010	0101	0101	1010	1010	0101	0101	1010
46	0011	1100	1100	0011	0011	1100	1100	0011	1100	0011	0011	1100	1100	0011	0011	1100
47	0110	1001	1001	0110	0110	1001	1001	0110	1001	0110	0110	1001	1001	0110	0110	1001
48	0000	0000	0000	0000	1111	1111	1111	1111	1111	1111	1111	1111	0000	0000	0000	0000
49	0101	0101	0101	0101	1010	1010	1010	1010	1010	1010	1010	1010	0101	0101	0101	0101
50	0011	0011	0011	0011	1100	1100	1100	1100	1100	1100	1100	1100	0011	0011	0011	0011
51	0110	0110	0110	0110	1001	1001	1001	1001	1001	1001	1001	1001	0110	0110	0110	0110
52	0000	1111	0000	1111	1111	0000	1111	0000	1111	0000	1111	0000	0000	1111	0000	1111
53	0101	1010	0101	1010	1010	0101	1010	0101	1010	0101	1010	0101	0101	1010	0101	1010
54	0011	1100	0011	1100	1100	0011	1100	0011	1100	0011	1100	0011	0011	1100	0011	1100
55	0110	1001	0110	1001	1001	0110	1001	0110	1001	0110	1001	0110	0110	1001	0110	1001
56	0000	0000	1111	1111	1111	1111	0000	0000	1111	1111	0000	0000	0000	0000	1111	1111
57	0101	0101	1010	1010	1010	1010	0101	0101	1010	1010	0101	0101	0101	0101	1010	1010
58	0011	0011	1100	1100	1100	1100	0011	0011	1100	1100	0011	0011	0011	0011	1100	1100
59	0110	0110	1001	1001	1001	1001	0110	0110	1001	1001	0110	0110	0110	0110	1001	1001
60	0000	1111	1111	0000	1111	0000	0000	1111	1111	0000	0000	1111	0000	1111	1111	0000
61	0101	1010	1010	0101	1010	0101	0101	1010	1010	0101	0101	1010	0101	1010	1010	0101
62	0011	1100	1100	0011	1100	0011	0011	1100	1100	0011	0011	1100	0011	1100	1100	0011
63	0110	1001	1001	0110	1001	0110	0110	1001	1001	0110	0110	1001	0110	1001	1001	0110

7.1.3.1.9 Quadrature Spreading

Following the orthogonal spreading, each code channel is spread in quadrature as shown in Figure 7.1.3.1-1. The spreading sequence shall be a quadrature sequence of length 2^{15} (i.e., 32768 PN chips in length). This sequence is called the pilot PN sequence and shall be based on the following characteristic polynomials:

$$P_I(x) = x^{15} + x^{13} + x^9 + x^8 + x^7 + x^5 + 1$$

(for the in-phase (I) sequence)

and

$$P_Q(x) = x^{15} + x^{12} + x^{11} + x^{10} + x^6 + x^5 + x^4 + x^3 + 1$$

(for the quadrature (Q) phase sequence).

The maximum length linear feedback shift register sequence {i(n)} and {q(n)} based on the above polynomials are of length $2^{15} - 1$ and can be generated by the following linear recursions:

$$i(n) = i(n-15) \oplus i(n-10) \oplus i(n-8) \oplus i(n-7) \oplus i(n-6) \oplus i(n-2)$$

(based on $P_I(x)$ as the characteristic polynomial)

and

$$q(n) = q(n-15) \oplus q(n-12) \oplus q(n-11) \oplus q(n-10) \oplus q(n-9) \oplus q(n-5) \oplus q(n-4) \oplus q(n-3)$$

(based on $P_Q(x)$ as the characteristic polynomial),

where i(n) and q(n) are binary-valued ('0' and '1') and the additions are modulo-2. In order to obtain the I and Q pilot PN sequences (of period 2^{15}), a '0' is inserted in {i(n)} and {q(n)} after 14 consecutive '0' outputs (this occurs only once in each period). Therefore, the pilot PN sequences have one run of 15 consecutive '0' outputs instead of 14.

The chip rate for the pilot PN sequence shall be 1.2288 Mcps. The pilot PN sequence period is 32768/1228800 = 26.666... ms, and exactly 75 pilot PN sequence repetitions occur every 2 seconds. The pilot PN sequence offset shall be as specified in 7.1.3.2.1.

After baseband filtering, the binary ('0's and '1's) I and Q at the output of the quadrature spreading (shown in Figure 7.1.3.1-1) shall be mapped into phase according to Table 7.1.3.1.9-1.

Table 7.1.3.1.9-1. Forward CDMA Channel I and Q Mapping

I	Q	Phase
0	0	$\pi/4$
1	0	$3\pi/4$
1	1	$-3\pi/4$
0	1	$-\pi/4$

The resulting signal constellation and phase transitions are shown in Figure 7.1.3.1.9-1.

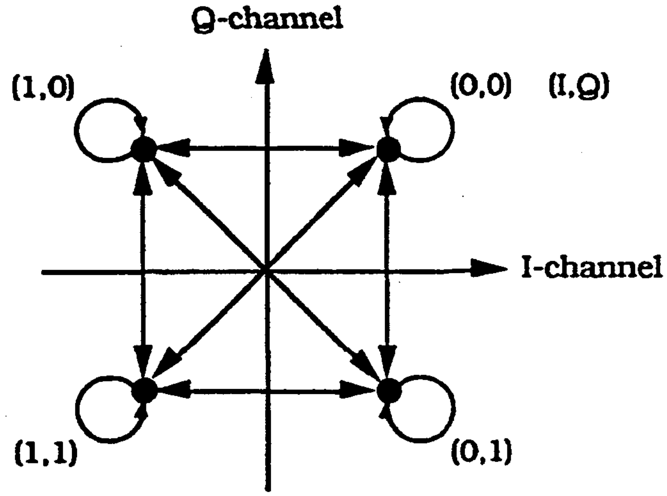


Figure 7.1.3.1.9-1. Forward CDMA Channel Signal Constellation and Phase Transition

7.1.3.1.10 Filtering

7.1.3.1.10.1 Baseband Filtering

Following the spreading operation, the I and Q impulses are applied to the inputs of the I and Q baseband filters as shown in Figure 7.1.3.1-1. The baseband filters shall have a frequency response S(f) that satisfies the limits given in Figure 7.1.3.1.10.1-1. Specifically, the normalized frequency response of the filter shall be contained within $\pm\delta_1$ in the passband $0 \le f \le f_p$ and shall be less than or equal to $-\delta_2$ in the stopband $f \ge f_s$. The numerical values for the parameters are δ_1 = 1.5 dB, δ_2 = 40 dB, f_p = 590 kHz, and f_s = 740 kHz.

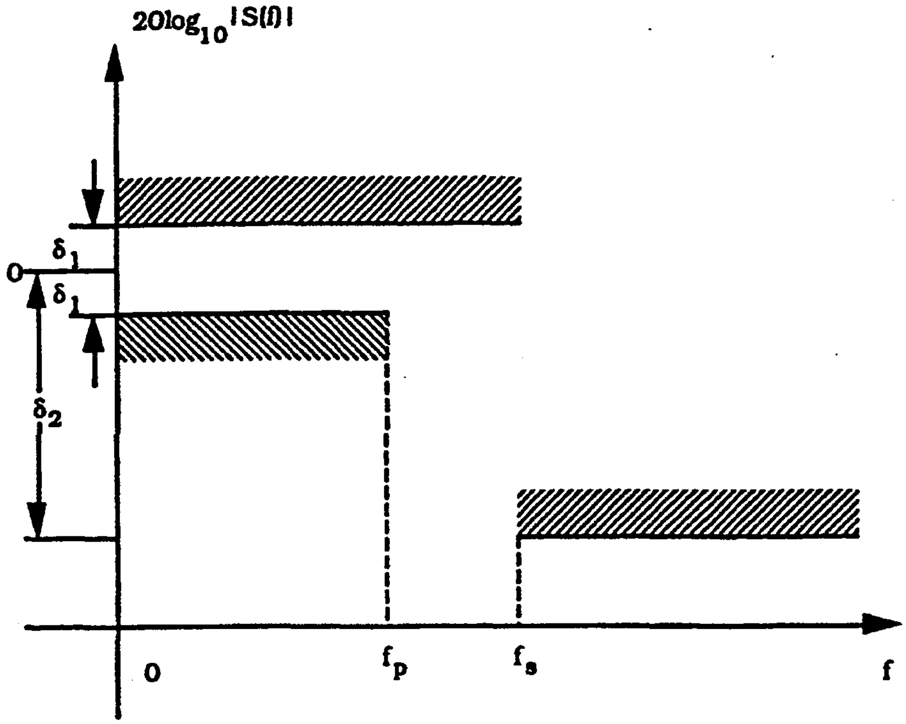


Figure 7.1.3.1.10.1-1. Baseband Filters Frequency Response Limits

Let s(t) be the impulse response of the baseband filter. Then s(t) shall satisfy the following equation:

$$\text{Mean Squared Error} = \sum_{k=0}^{\infty} [\alpha s(kT_s - \tau) - h(k)]^2 \le 0.03,$$

where the constants α and τ are used to minimize the mean squared error. The constant T_s is equal to 203.451... ns, which equals one quarter of a PN chip. The values of the coefficients h(k), for $k < 48$, are given in Table 7.1.3.1.10.1-1; $h(k) = 0$ for $k \ge 48$. Note that h(k) equals h(47 - k).

Table 7.1.3.1.10.1-1. Coefficients h(k)

k	h(k)
0, 47	-0.025288315
1, 46	-0.034167931
2, 45	-0.035752323
3, 44	-0.016733702
4, 43	0.021602514
5, 42	0.064938487
6, 41	0.091002137
7, 40	0.081894974
8, 39	0.037071157
9, 38	-0.021998074
10, 37	-0.060716277
11, 36	-0.051178658
12, 35	0.007874526
13, 34	0.084368728
14, 33	0.126869306
15, 32	0.094528345
16, 31	-0.012839661
17, 30	-0.143477028
18, 29	-0.211829088
19, 28	-0.140513128
20, 27	0.094601918
21, 26	0.441387140
22, 25	0.785875640
23, 24	1.0

7.1.3.1.10.2 Phase Characteristics

The base station shall provide phase equalization for the transmit signal path.[4] The equalizing filter shall be designed to provide the equivalent baseband transfer function

$$H(\omega) = K\frac{\omega^2 + j\alpha\omega\omega_0 - \omega_0^2}{\omega^2 - j\alpha\omega\omega_0 - \omega_0^2},$$

where K is an arbitrary gain, j equals $\sqrt{-1}$, α equals 1.36, and ω_0 equals $2\pi \times 3.15 \times 10^5$. The equalizing filter implementation shall be equivalent to applying baseband filters with this transfer function individually to the baseband I and Q waveforms.

The overall base station transmitter analog filter response (including the equalizing filter) shall be such that, for a cascaded filter consisting of the overall base station filter and a filter with a transfer function that is the inverse of the equalization filter specified above, the mean squared phase error from the best fit linear phase response, integrated over the frequency range 1 kHz $\leq |f - f_c| \leq$ 630 kHz, shall be no greater than 0.01 squared radians. For purposes of this requirement, "overall" shall mean from the I and Q baseband filter inputs (see 7.1.3.1.10.1) to the RF output of the transmitter.

7.1.3.2 Pilot Channel

A Pilot Channel is transmitted at all times by the base station on each active Forward CDMA Channel. The Pilot Channel is an unmodulated spread spectrum signal that is used for synchronization by a mobile station operating within the coverage area of the base station.

7.1.3.2.1 Pilot PN Sequence Offset

Each base station shall use a time offset of the pilot PN sequence to identify a Forward CDMA Channel. Time offsets may be reused within a CDMA cellular system.

Distinct Pilot Channels shall be identified by an offset index (0 through 511 inclusive). This offset index specifies the offset value from the zero offset pilot PN sequence. The zero offset pilot PN sequence shall be such that the start of the sequence shall be output at the beginning of every even second in time, referenced to base station transmission time (see 7.1.5). The start of the zero offset pilot PN sequence for either the I or Q sequence shall be defined as the state of the sequence for which the previous 15 outputs were '0' (see Figure 1.2-1).

Five hundred twelve unique values are possible for the pilot PN sequence offset. The offset (in chips) for a given pilot PN sequence from the zero shift pilot PN sequence equals the index value multiplied by 64. For example, if the pilot PN sequence offset index is 15, the pilot PN sequence offset will be 15 × 64 = 960 PN chips. In this case the pilot PN sequence will start 781.25 µs after the start of every even second of time, referenced to base station transmission time. The pilot PN sequence offset is illustrated in Figure 7.1.3.2.1-1. The same pilot PN sequence offset shall be used on all CDMA frequency assignments for a given base station.

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[4] This equalization simplifies the design of the mobile station receive filters.

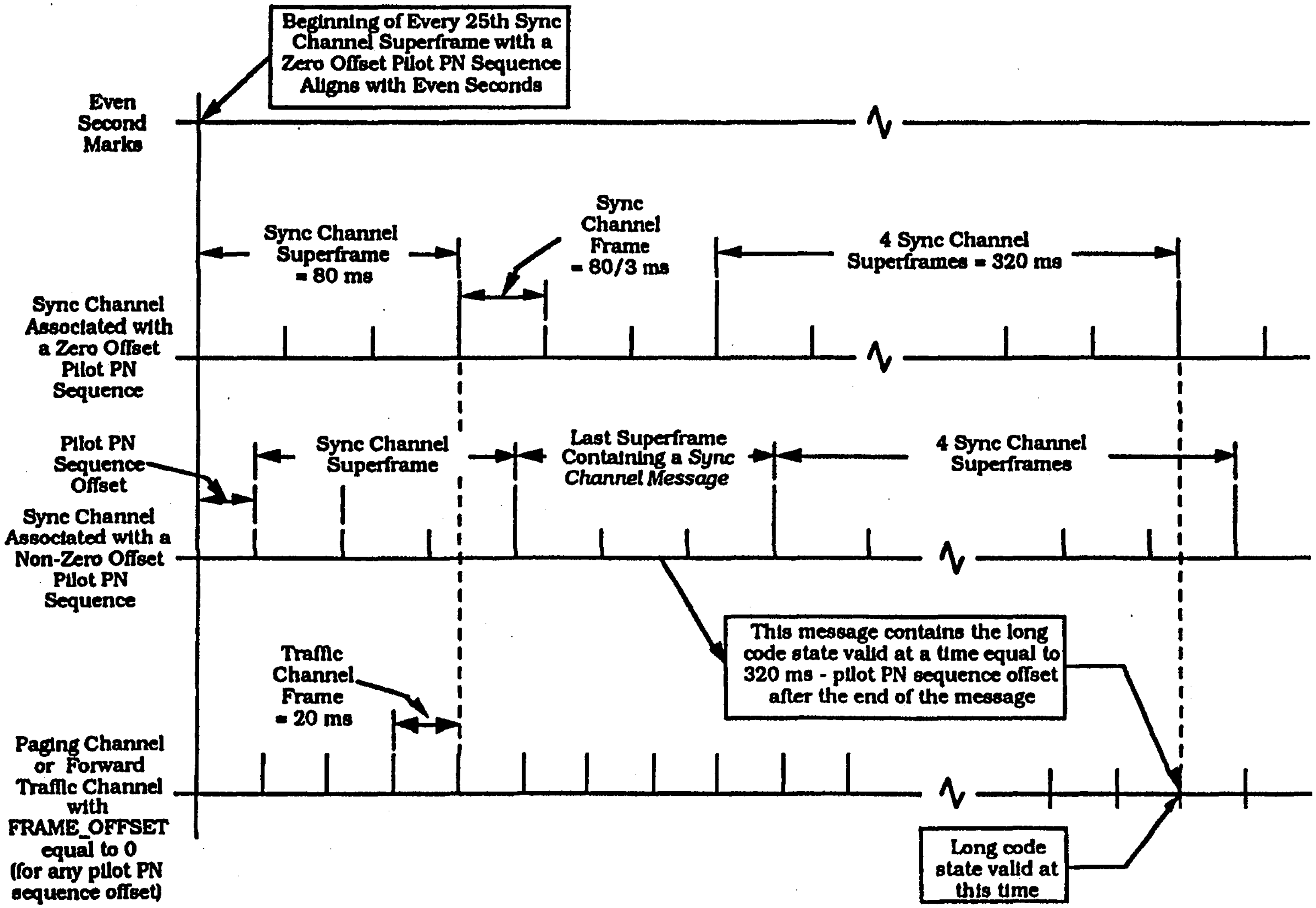


Figure 7.1.3.2.1-1. Forward CDMA Channel Pilot PN Sequence Offset

7.1.3.2.2 Pilot Channel Orthogonal Spreading

Prior to transmission, the pilot channel shall be spread with Walsh function zero as specified in 7.1.3.1.8.

7.1.3.2.3 Pilot Channel Quadrature Spreading

The Pilot Channel shall be PN spread as specified in 7.1.3.1.9.

7.1.3.2.4 Pilot Channel Filtering

Filtering for the Pilot Channel shall be as specified in 7.1.3.1.10.

7.1.3.3 Sync Channel

The Sync Channel is an encoded, interleaved, spread, and modulated spread spectrum signal that is used by mobile stations operating within the coverage area of the base station to acquire initial time synchronization.

7.1.3.3.1 Sync Channel Time Alignment and Modulation Rates

The bit rate for the Sync Channel is 1200 bps. A Sync Channel frame is 26.666... ms in duration. The I and Q channel pilot PN sequences for the Sync Channel use the same pilot PN sequence offset as the Pilot Channel for a given base station.

Once the mobile station achieves pilot PN sequence synchronization by acquiring the Pilot Channel, the synchronization for the Sync Channel is immediately known. This is because the Sync Channel (and all other channels) are spread with the same pilot PN sequence, and because the frame and interleaver timing on the Sync Channel are aligned with the pilot PN sequence.

The start of the interleaver block and frame of the Sync Channel shall align with the start of the pilot PN sequence being used to spread the Forward CDMA Channel (see Figure 7.1.3.2.1-1). See Table 7.1.3.1.1-1 for a summary of Sync Channel modulation parameters.

7.1.3.3.2 Sync Channel Structure

A Sync Channel superframe is formed by three Sync Channel frames (i.e., 80 ms) as shown in Figure 7.1.3.2.1-1. Messages transmitted on the Sync Channel begin only at the start of a Sync Channel superframe.

When using the zero-offset Pilot PN sequence, Sync Channel superframes begin at the even-second time mark referenced to base station transmission time (see 7.1.5) or at the start of any third Sync Channel frame after that. When using a Pilot PN sequence other than the zero-offset sequence, the Sync Channel superframe shall begin at the even second time mark plus the pilot PN offset value in time.

7.1.3.3.3 Sync Channel Convolutional Encoding

The Sync Channel data shall be convolutionally encoded prior to transmission as specified in 7.1.3.1.3. The state of the Sync Channel convolutional encoder shall not be reset between Sync Channel frames.

7.1.3.3.4 Sync Channel Code Symbol Repetition

The Sync Channel code symbols shall be repeated as specified in 7.1.3.1.4.

7.1.3.3.5 Sync Channel Interleaving

The modulation symbols on the Sync Channel shall be interleaved as specified in 7.1.3.1.5 with the following exception: since the Sync Channel is not convolutionally encoded by blocks (the state of the encoder is not reset after initialization), the last eight bits of a Sync Channel frame influence symbols in the successive interleaver block.

The interleaver block shall align with the Sync Channel frame, such that the first bit of the frame influences the first 36 (numbered 1 1 2 2 . . . 18 18) modulation symbols input into the interleaver block.

7.1.3.3.6 Sync Channel Data Scrambling

The Sync Channel data shall not be scrambled.

7.1.3.3.7 Sync Channel Power Control Subchannel

The base station shall not insert a power control subchannel on the Sync Channel.

7.1.3.3.8 Sync Channel Orthogonal Spreading

Prior to transmission, the Sync Channel shall be spread with Walsh function 32 as specified in 7.1.3.1.8.

7.1.3.3.9 Sync Channel Quadrature Spreading

The Sync Channel shall be PN spread as specified in 7.1.3.1.9.

7.1.3.3.10 Sync Channel Filtering

Filtering for the Sync Channel shall be as specified in 7.1.3.1.10.

7.1.3.4 Paging Channel

The Paging Channel is an encoded, interleaved, spread, and modulated spread spectrum signal that is used by mobile stations operating within the coverage area of the base station. The base station uses Paging Channel to transmit system overhead information and mobile station specific messages.

The Primary Paging Channel shall be Paging Channel number 1.

7.1.3.4.1 Paging Channel Time Alignment and Modulation Rates

The Paging Channel shall transmit information at a fixed data rate of 9600 or 4800 bps. The 2400 and 1200 bps data rates are not supported on the Paging Channel. All Paging Channels in a given system (i.e., with the same SID) should transmit information at the same data rate. The Paging Channel frame is 20 ms in duration.

The I and Q channel pilot PN sequences for the Paging Channel use the same pilot PN sequence offset as the Pilot Channel for a given base station.

The start of the interleaver block and frame of the Paging Channel shall align with the start of the zero-offset pilot PN sequence at every even second time mark (see Figure 7.1.3.2.1-1). The first Paging Channel frame shall occur at the start of base station transmission time (see 7.1.5). See Table 7.1.3.1.1-2 for a summary of Paging Channel modulation parameters.

7.1.3.4.2 Paging Channel Structure

The Paging Channel shall be divided into Paging Channel slots that are each 80 ms in duration as shown in the example in Figure 6.6.2.1.1.1-1.

7.1.3.4.3 Paging Channel Convolutional Encoding

The Paging Channel data shall be convolutionally encoded prior to transmission as specified in 7.1.3.1.3. The state of the Paging Channel convolutional encoder shall not be reset between Paging Channel frames.

7.1.3.4.4 Paging Channel Code Symbol Repetition

The Paging Channel code symbols shall be repeated as specified in 7.1.3.1.4.

7.1.3.4.5 Paging Channel Interleaving

The modulation symbols on the Paging Channel shall be interleaved as specified in 7.1.3.1.5. The interleaver block shall align with the Paging Channel frame. The alignment shall be such that the first bit of the frame influences the first 18 (for 9600 bps) or 36 (for 4800 bps) modulation symbols input into the interleaver.

Since the Paging Channel is not convolutionally encoded by blocks, the last 8 bits of a Paging Channel frame influence symbols in the successive interleaver block.

7.1.3.4.6 Paging Channel Data Scrambling

The Paging Channel data shall be scrambled as specified in 7.1.3.1.6 utilizing the Paging Channel long code mask as shown in Figure 7.1.3.4.6-1.

41 … 29	28 … 24	23 … 21	20 … 9	8 … 0
1100011001101	00000	PCN	000000000000	PILOT_PN

PCN - Paging Channel Number
PILOT_PN - Pilot PN sequence offset index for the Forward CDMA Channel

Figure 7.1.3.4.6-1. Paging Channel Long Code Mask

7.1.3.4.7 Paging Channel Power Control Subchannel

The base station shall not insert a power control subchannel on the Paging Channel.

7.1.3.4.8 Paging Channel Orthogonal Spreading

Prior to transmission, the Paging Channel shall be spread by a Walsh function, with index equal to the Paging Channel number, as specified in 7.1.3.1.8.

7.1.3.4.9 Paging Channel Quadrature Spreading

The Paging Channel shall be PN spread as specified in 7.1.3.1.9.

7.1.3.4.10 Paging Channel Filtering

Filtering for the Paging Channel shall be as specified in 7.1.3.1.10.

7.1.3.5 Forward Traffic Channel

The Forward Traffic Channel is used for the transmission of user and signaling information to a specific mobile station during a call. The maximum number of Forward Traffic Channels that can be simultaneously supported by a given Forward CDMA Channel is equal to 63 minus the number of Paging Channels and Sync Channels operating on the same Forward CDMA Channel.

7.1.3.5.1 Forward Traffic Channel Time Alignment and Modulation Rates

The base station shall transmit information on the Forward Traffic Channel at variable data rates of 9600, 4800, 2400, and 1200 bps. The Forward Traffic Channel frame shall be 20 ms in duration. The data rate shall be selected on a frame-by-frame (i.e., 20 ms) basis. Although the data rate may vary on a frame-by-frame basis, the modulation symbol rate is kept constant by code repetition at 19,200 symbols per second (sps).

The I and Q channel pilot PN sequences for the Forward Traffic Channel use the same pilot PN sequence offset as the Pilot Channel for a given base station.

The modulation symbols that are transmitted at the lower data rates shall be transmitted using lower energy. Specifically, the energy per modulation symbol (E_s) for the supported data rates should be as in Table 7.1.3.5.1-1 where E_b is the energy per information bit. Note that all symbols in an interleaver block are from the same frame. Thus they are all transmitted at the same energy. The transmit power of the power control bits shall be as specified in 7.1.3.1.7.

Table 7.1.3.5.1-1. Transmitted Symbol Energy Versus Data Rate

Data Rate (bps)	Energy per Modulation Symbol
9600	$E_s = E_b/2$
4800	$E_s = E_b/4$
2400	$E_s = E_b/8$
1200	$E_s = E_b/16$

A base station may implement staggered Forward Traffic Channel frames. The time offset is specified by the FRAME_OFFSET parameter (see the *Channel Assignment Message* in 7.7.2.3.2.8).[5] A zero-offset Forward Traffic Channel frame shall be such that every 100th frame shall align with the even-second time mark referenced to base station transmission time (see 7.1.5). A staggered frame shall begin 1.25 × FRAME_OFFSET ms later than the zero-offset Traffic Channel frame. The Forward Traffic Channel block interleaver shall always be aligned with the Forward Traffic Channel frame.

7.1.3.5.2 Forward Traffic Channel Frame Structure

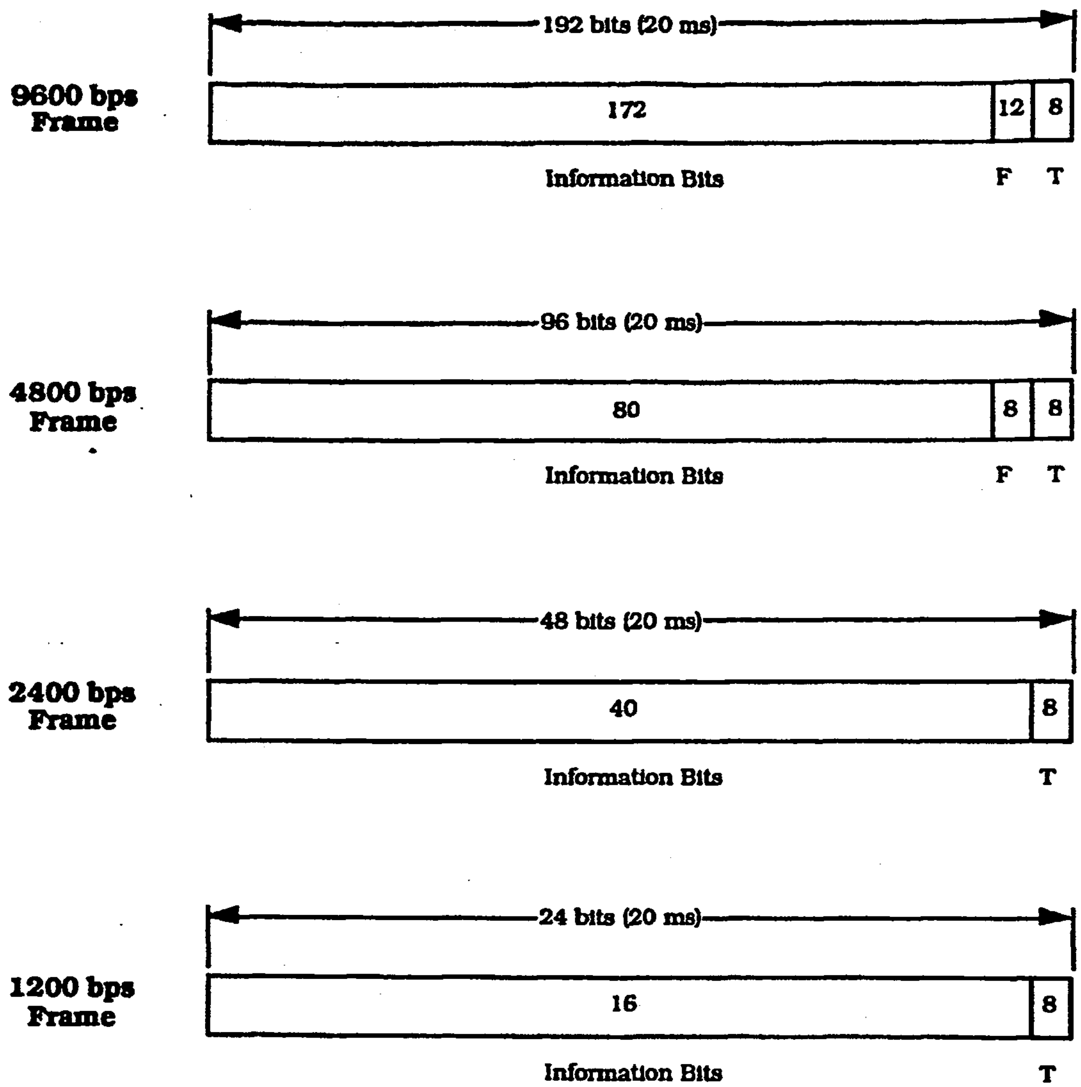
Forward Traffic Channel frames sent at the 9600 bps transmission rate shall consist of 192 bits. These 192 bits shall be composed of 172 information bits followed by 12 frame quality indicator (CRC) bits and eight Encoder Tail Bits as shown in Figure 7.1.3.5.2-1.

Forward Traffic Channel frames sent at the 4800 bps transmission rate shall consist of 96 bits. These 96 bits shall be composed of 80 information bits followed by eight frame quality indicator (CRC) bits and eight Encoder Tail Bits as shown in Figure 7.1.3.5.2-1.

Forward Traffic Channel frames sent at the 2400 bps transmission rate shall consist of 48 bits. These 48 bits shall be composed of 40 information bits followed by eight Encoder Tail Bits as shown in Figure 7.1.3.5.2-1.

Forward Traffic Channel frames sent at the 1200 bps transmission rate shall consist of 24 bits. These 24 bits shall be composed of 16 information bits followed by eight Encoder Tail Bits as shown in Figure 7.1.3.5.2-1.

[5]The Forward Traffic Channel time offset is the same as the Reverse Traffic Channel time offset.



Notation

F - Frame Quality Indicator (CRC)
T - Encoder Tail Bits

Figure 7.1.3.5.2-1. Forward Traffic Channel Frame Structure

7.1.3.5.2.1 Forward Traffic Channel Frame Quality Indicator

Each 9600 bps and 4800 bps frame shall include a frame quality indicator. This frame quality indicator is a CRC.[6] No frame quality indicator is used for the 2400 bps and 1200 bps transmission rates.

For both the 9600 bps and 4800 bps rates, the frame quality indicator (CRC) shall be calculated on all bits within the frame, except the frame quality indicator itself and the Encoder Tail Bits. The 9600 bps transmission rate shall use a 12-bit frame quality indicator. The generator polynomial for this frame quality indicator shall be as follows:

$$g(x) = x^{12} + x^{11} + x^{10} + x^{9} + x^{8} + x^{4} + x + 1.$$

The 4800 bps transmission rate shall use an 8-bit frame quality indicator. The generator polynomial for this frame quality indicator shall be as follows:

$$g(x) = x^{8} + x^{7} + x^{4} + x^{3} + x + 1.$$

The frame quality indicators shall be computed according to the following procedure using the logic shown in Figures 7.1.3.5.2.1-1 and 7.1.3.5.2.1-2:

- Initially, all shift register elements shall be set to logical one and the switches shall be set in the up position.
- The register shall be clocked 172 times (for 192-bit frame) or 80 times (for 96-bit frame) with the information bits as input.
- The switches shall be set in the down position, and the register shall be clocked an additional 12 times (for 192-bit frame) or 8 times (for 96-bit frame). The 12 or 8 additional output bits shall be the frame quality indicator bits.
- The bits shall be transmitted in the order calculated.

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[6]The frame quality indicator supports two functions at the receiver. The first function is to determine whether the frame is in error. The second function is to assist in the determination of the data rate of the received frame. Other parameters may be needed for rate determination in addition to the frame quality indicator, such as symbol error rate evaluated at the four data rates.

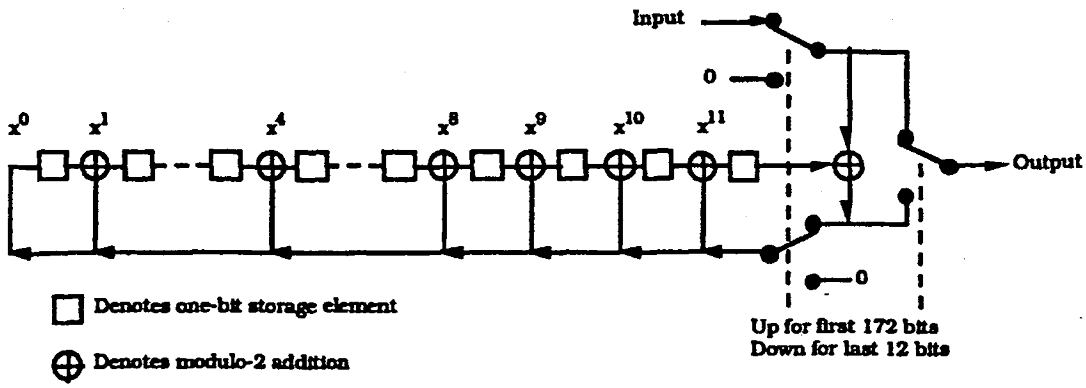

Figure 7.1.3.5.2.1-1. Forward Traffic Channel Frame Quality Indicator Calculation at the 9600 bps Rate

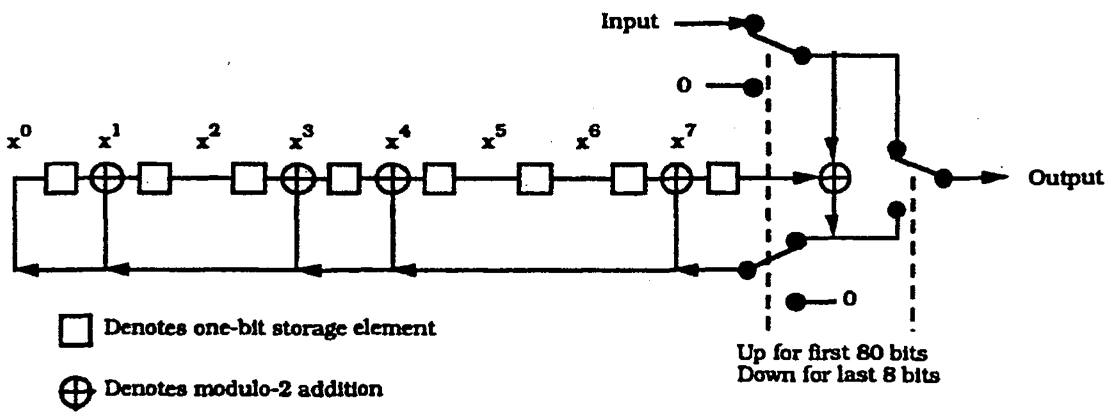

Figure 7.1.3.5.2.1-2. Forward Traffic Channel Frame Quality Indicator Calculation at the 4800 bps Rate

7.1.3.5.2.2 Forward Traffic Channel Encoder Tail Bits

The last eight bits of each Forward Traffic Channel frame are called the Encoder Tail Bits. These eight bits shall be set to '0'.

7.1.3.5.2.3 Reserved

7.1.3.5.2.4 Null Traffic Channel Data

Null Traffic Channel data shall consist of frames of 16 ones followed by 8 zeros (the Encoder Tail Bits) sent at the 1200 bps rate.

The base station transmits null Traffic Channel data when no service option is active. Null Traffic Channel data serves as a "keep-alive" operation so that the mobile station can maintain connectivity with the base station.

7.1.3.5.3 Forward Traffic Channel Convolutional Encoding

The Forward Traffic Channel data shall be convolutionally encoded prior to transmission as specified in 7.1.3.1.3.

When generating Forward Traffic Channel data, the encoder shall be initialized to the all zero state at the end of each 20 ms frame.

7.1.3.5.4 Forward Traffic Channel Code Symbol Repetition

The Forward Traffic Channel code symbols shall be repeated as specified in 7.1.3.1.4.

7.1.3.5.5 Forward Traffic Channel Interleaving

The modulation symbols on the Forward Traffic Channel shall be interleaved as specified in 7.1.3.1.5. The interleaver block shall align with the Traffic Channel frame. The alignment shall be such that the first bit of the frame influences the first 18 (for 9600 bps), 36 (for 4800 bps), 72 (for 2400 bps) or 144 (for 1200 bps) modulation symbols input into the interleaver.[7]

7.1.3.5.6 Forward Traffic Channel Data Scrambling

The Forward Traffic Channel data shall be scrambled as specified in 7.1.3.1.6. The public long code mask shall be as shown in Figure 7.1.3.5.6-1. The permutation of the ESN bits in the public long code mask shall be as specified in 6.1.3.1.8. The generation of the private long code mask shall be as specified in Appendix A.

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[7] Since the Forward Traffic Channel is convolutionally encoded by blocks (the state of the encoder is reset at the end of each frame), all bits of one Forward Traffic Channel frame influence symbols in only one interleaver block.

41 32	31 0
1100011000	Permuted ESN

Figure 7.1.3.5.6-1. Forward Traffic Channel Public Long Code Mask

7.1.3.5.7 Forward Traffic Channel Power Control Subchannel

The base station shall insert on every Forward Traffic Channel a power control subchannel as specified in 7.1.3.1.7.

7.1.3.5.8 Forward Traffic Channel Orthogonal Spreading

Prior to transmission, the Forward Traffic Channel shall be spread with a Walsh function as specified in 7.1.3.1.8.

7.1.3.5.9 Forward Traffic Channel Quadrature Spreading

The Forward Traffic Channel shall be PN spread as specified in 7.1.3.1.9.

7.1.3.5.10 Forward Traffic Channel Filtering

Filtering for the Forward Traffic Channel shall be as specified in 7.1.3.1.10.

7.1.3.5.11 Multiplex Option Information

Multiplex Option 1 is also referred to as the default multiplex option.[8] It provides for the transmission of primary traffic and signaling or secondary traffic. Signaling traffic may be transmitted via blank-and-burst with the signaling traffic using all of the frame or via dim-and-burst with the primary traffic and signaling traffic sharing the frame. Multiplex Option 1 also supports the transmission of secondary traffic. When primary traffic is active, secondary traffic is transmitted via dim-and-burst with the primary traffic and secondary traffic sharing the frame. When primary traffic is not active, secondary traffic is transmitted via blank-and-burst with the secondary traffic using all of the frame. The information bit structures for primary and signaling traffic are specified in 7.1.3.5.11.1. The information bit structures for secondary traffic are specified in 7.1.3.5.11.2. Table 7.1.3.5.11-1 shows the information bit structures supported by Multiplex Option 1.

The base station shall support Multiplex Option 1. The base station shall support the transmission of primary traffic and signaling traffic using the information bit structures specified in 7.1.3.5.11.1. The base station may support secondary traffic, and if so, the base station shall also use the information bit structures specified in 7.1.3.5.11.2. Procedures for support of secondary traffic data are for further study.

Other multiplex options are for further study.

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[8]The multiplex option is the same on both the Forward Traffic Channel and the Reverse Traffic Channel.

Table 7.1.3.5.11-1. Forward Traffic Channel Information Bits for Multiplex Option 1

Transmit Rate (bits/sec)	Format Bits: Mixed Mode (MM)	Format Bits: Traffic Type (TT)	Format Bits: Traffic Mode (TM)	Primary Traffic bits/frame	Signaling Traffic bits/frame	Secondary Traffic bits/frame
9600	'0'	–	–	171	0	0
	'1'	'0'	'00'	80	88	0
	'1'	'0'	'01'	40	128	0
	'1'	'0'	'10'	16	152	0
	'1'	'0'	'11'	0	168	0
*	'1'	'1'	'00'	80	0	88
*	'1'	'1'	'01'	40	0	128
*	'1'	'1'	'10'	16	0	152
*	'1'	'1'	'11'	0	0	168
4800	–	–	–	80	0	0
2400	–	–	–	40	0	0
1200	–	–	–	16	0	0

Note: Secondary traffic structures, marked with *, are optional.

7.1.3.5.11.1 Primary and Signaling Traffic with Multiplex Option 1

The base station shall support the information bit structures described in Table 7.1.3.5.11-1 and Figure 7.1.3.5.11.1-1.

9600 bps Primary Traffic Only (172 bits)

1	171
MM =0	Primary Traffic

Dim and Burst with Rate 1/2 Primary and Signaling Traffic (172 bits)

1	1	2	80	88
MM =1	TT =0	TM =00	Primary Traffic	Signaling Traffic

Dim and Burst with Rate 1/4 Primary and Signaling Traffic (172 bits)

1	1	2	40	128
MM =1	TT =0	TM =01	Primary Traffic	Signaling Traffic

Dim and Burst with Rate 1/8 Primary and Signaling Traffic (172 bits)

1	1	2	16	152
MM =1	TT =0	TM =10	Primary Traffic	Signaling Traffic

Blank and Burst with Signaling Traffic Only (172 bits)

1	1	2	168
MM =1	TT =0	TM =11	Signaling Traffic

Notation

MM - Mixed Mode Bit
- 0 - Primary Traffic Only
- 1 - Primary Traffic and/or Signaling Traffic or Secondary Traffic

TT - Traffic Type Bit
- 0 - Signaling Traffic
- 1 - Secondary Traffic

TM - Traffic Mode Bits
- 00 - 80 Primary Traffic Bits and either 88 Signaling Traffic or 88 Secondary Traffic Bits
- 01 - 40 Primary Traffic Bits and either 128 Signaling Traffic Bits or 128 Secondary Traffic Bits
- 10 - 16 Primary Traffic Bits and either 152 Signaling Traffic Bits or 152 Secondary Traffic Bits
- 11 - 168 Signaling Traffic Bits or 168 Secondary Traffic Bits

Figure 7.1.3.5.11.1-1. Information Bits for Primary Traffic and Signaling Traffic (Part 1 of 2)

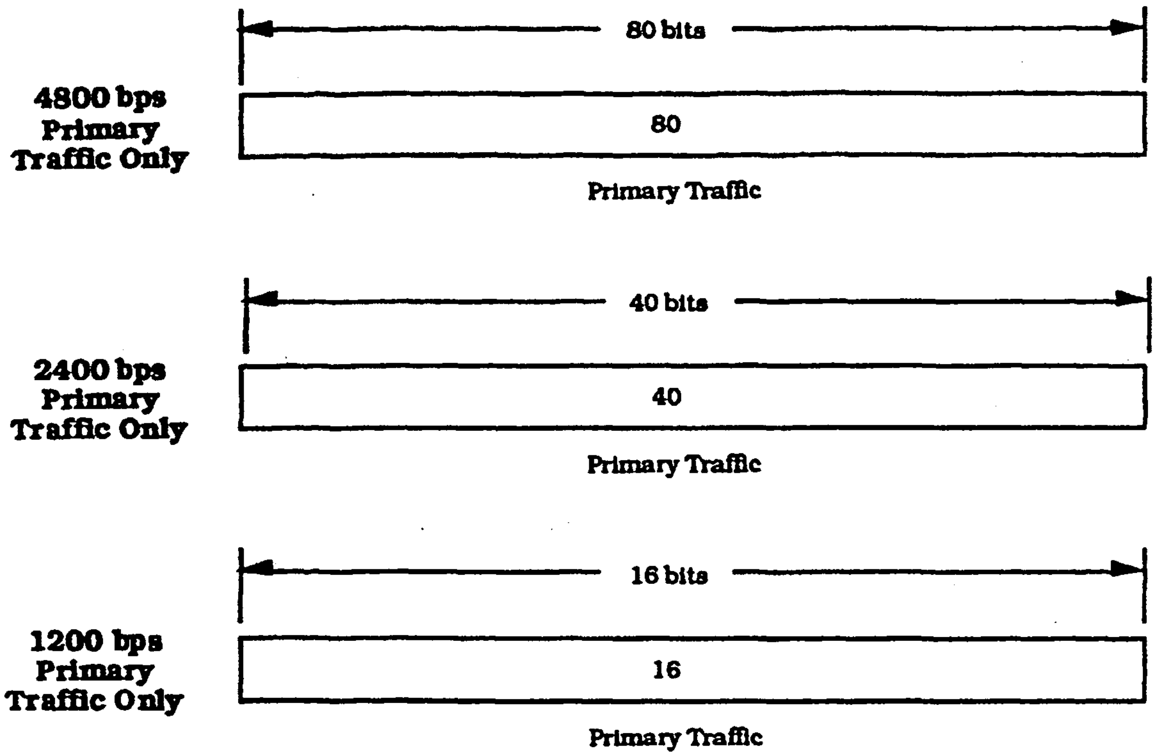
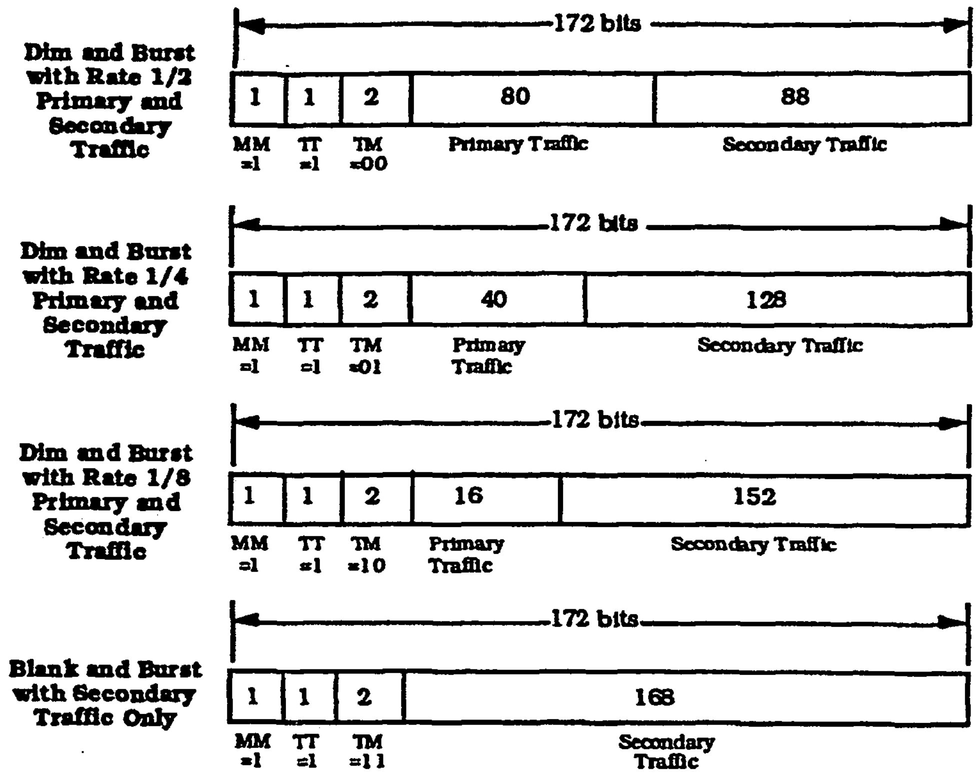


Figure 7.1.3.5.11.1-1. Information Bits for Primary Traffic and Signaling Traffic (Part 2 of 2)

7.1.3.5.11.2 Secondary Traffic with Multiplex Option 1

If the base station supports secondary traffic, the base station shall use the information bit structures described in Table 7.1.3.5.11-1 and Figure 7.1.3.5.11.2-1.



Notation

MM - Mixed Mode Bit
- 0 - Primary Traffic Only
- 1 - Primary Traffic and/or Signaling Traffic or Secondary Traffic

TT - Traffic Type Bit
- 0 - Signaling Traffic
- 1 - Secondary Traffic

TM - Traffic Mode Bits
- 00 - 80 Primary Traffic Bits and either 88 Signaling Traffic or 88 Secondary Traffic Bits
- 01 - 40 Primary Traffic Bits and either 128 Signaling Traffic Bits or 128 Secondary Traffic Bits
- 10 - 16 Primary Traffic Bits and either 152 Signaling Traffic Bits or 152 Secondary Traffic Bits
- 11 - 168 Signaling Traffic Bits or 168 Secondary Traffic Bits

Figure 7.1.3.5.11.2-1. Information Bits for Secondary Traffic

7.1.3.5.11.3 Use of Various Information Bit Formats for Multiplex Option 1

When neither a primary traffic service option nor a secondary traffic service option is active, the base station shall transmit signaling traffic using only blank-and-burst frames. When not transmitting signaling traffic, the base station shall transmit only null Traffic Channel data frames.

When a primary traffic service option is active and a secondary traffic service option is not active, the base station shall use the information formats specified in 7.1.3.5.11.1. The base station shall not transmit null Traffic Channel data. The base station should use the dim-and-burst information formats specified in 7.1.3.5.11.1 for signaling traffic.

When a primary traffic service option is not active and a secondary traffic service option is active, the base station shall use the information formats specified in 7.1.3.5.11.2 to transmit secondary traffic. The base station shall use the blank-and-burst format specified in 7.1.3.5.11.1 for signaling traffic. The base station shall transmit null Traffic Channel data when neither secondary traffic nor signaling traffic is to be sent.

When both a primary traffic service option and a secondary traffic service option are active, the base station shall use the information formats specified in 7.1.3.5.11.1 and 7.1.3.5.11.2. The base station shall not transmit null Traffic Channel data. The base station should use the dim-and-burst information formats specified in 7.1.3.5.11.1 for signaling traffic.

7.1.3.5.11.4 Control of Service Options for Multiplex Option 1

Multiplex Option 1 controls the number of bits that the service option supplies for a frame (see IS-96 "Speech Service Option Standard for Wideband Spread Spectrum Digital Cellular System").

The base station shall use the following rules when a primary traffic service option is active: If signaling traffic is to be transmitted in a frame, Multiplex Option 1 shall either restrict the primary traffic service option to generate zero bits (for a blank-and-burst frame) or to generate less than 171 bits (for a dim-and-burst frame). If secondary traffic is to be transmitted in a frame, Multiplex Option 1 may restrict the primary traffic service option to generate less than 171 bits but shall allow the primary traffic service option to generate at least 16 bits. In all other cases, Multiplex Option 1 should allow the primary traffic service option to generate either 16, 40, 80, or 171 bits for a frame.

7.1.4 Limitations on Emissions

7.1.4.1 Bandwidth Occupied

Modulation products in a bandwidth of 30 kHz centered ±750 kHz from the CDMA Channel center frequency shall be at least 45 dB below the mean output power level.

7.1.4.2 Conducted Spurious Emissions

7.1.4.2.1 Suppression Inside Cellular Band

For all frequencies within the cellular base station's transmit band between 869 and 894 MHz which are also within the specific bands allocated to the operator's system (see Table 6.1.1.1-1), the total spurious emissions in any 30 kHz band shall be attenuated below the mean output power level in accordance with the following schedule:

(a) for offset frequencies greater than 750 kHz from the CDMA Channel center frequency, at least 45 dB.

(b) for offset frequencies greater than 1.98 MHz from the CDMA Channel center frequency, at least 60 dB.

For all frequencies not within the specific bands allocated to the operator's system (see Table 6.1.1.1-1), the total spurious emissions in any 30 kHz band shall not exceed a level of 60 dB below the mean output power level or -13 dBm, whichever is smaller.

7.1.4.2.2 Suppression Outside Cellular Band

Current FCC rules shall apply.

7.1.4.3 Radiated Spurious Emissions

Radiated spurious emissions (from sources other than the antenna connector) shall meet the levels corresponding to the conducted spurious requirements listed in 7.1.4.2.

7.1.4.4 Intermodulation

Radiated products from co-located transmitters shall not exceed FCC spurious and harmonic level requirements that would apply to any of the transmitters operated separately.

7.1.5 Synchronization, Timing, and Phase

7.1.5.1 Timing Reference Source

Each base station shall use a time base reference from which all time critical CDMA transmissions, including pilot PN sequences, frames, and Walsh functions, shall be derived. The time base reference shall be time-aligned to CDMA System Time, as described in 1.2. Reliable external means should be provided at each base station to synchronize each base station's time base reference to CDMA System Time. Each base station should use a frequency reference of sufficient accuracy to maintain time alignment to CDMA System Time. In the event that the external source of System Time is lost,[9] the system shall

[9]These guidelines on time keeping requirements reflect the fact that the amount of time error between base stations that can be tolerated in a CDMA network is not a hard limit. Each mobile station can search an ever increasing time window as directed by the base stations. However, increasing this window gradually degrades performance since wider windows require a longer time for the mobile stations to search out and locate the various arrivals from all base stations that may be in view. An

maintain the base station transmit time within the tolerance specified in 7.1.5.2 for a period of time within the tolerance specified in IS-97 "Recommended Minimum Performance Standards for Base Stations Supporting Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations."

7.1.5.2 Base Station Transmission Time

All base stations should radiate the pilot PN sequence within ±3 μs of CDMA System Time and shall radiate the pilot PN sequence within ±10 μs of CDMA System Time. All CDMA Channels radiated by a base station shall be within ±1 μs of each other.

Time measurements are made at the base station antenna connector.

The rate of change for timing corrections shall not exceed 1/8 PN chip (101.725 ns) per 200 ms.

7.1.5.3 Pilot to Walsh Cover Time Tolerance

The time error between the pilot PN sequence and all Walsh cover sequences sharing a common Forward CDMA Channel shall be less than ±50 ns.

7.1.5.4 Pilot to Walsh Cover Phase Tolerance

The phase difference between the RF carrier of the Pilot Channel and the RF carrier of any other code channels on the same forward CDMA Channel emitted by the base station shall not exceed 0.05 radian.

7.1.6 Transmitter Performance Requirements

System performance is predicated on transmitters meeting the requirements set forth in IS-97 "Recommended Minimum Performance Standards for Base Stations Supporting Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations."

7.2 Receiver

7.2.1 Frequency Parameters

7.2.1.1 Channel Spacing and Designation

Channel spacing and designations for the base station reception shall be as specified in 2.1.1.1.

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eventual limit on time errors occurs since pilot addresses are derived as 64 chip time shifts of a length 32768 chip sequence. In a very extreme case where the maximum number of 512 sequences were assigned to base stations, these address sequences would be 64 chips apart. In this situation it is possible that large time errors between base station transmissions would be confused with path-delayed arrivals from a given base station.

7.2.2 Demodulation Characteristics

The base station demodulation process shall perform complementary operations to the mobile station modulation process on the Reverse CDMA Channel (see 6.1.3).

The base station receiver shall support the closed loop power control sub-channel as specified in section 7.1.3.1.7.

The Reverse Traffic Channel frame is described in 6.1.3.3.2. A base station may implement staggered Reverse Traffic Channel frames as described in 6.1.3.3.1.

7.2.3 Limitations on Emissions

Current FCC rules shall apply.

7.2.4 Receiver Performance Requirements

System performance is predicated on receivers meeting the requirements set forth in IS-97 "Recommended Minimum Performance Standards for Base Stations Supporting Wideband Spread Spectrum Cellular Mobile Stations."

7.3 Security and Identification

7.3.1 Authentication

The base station may be equipped with a database that includes unique mobile station authentication keys and/or shared secret data for each registered mobile station in the system. This database is used for authentication of mobile stations that are equipped for authentication operation.

If the base station supports mobile station authentication, it shall provide the following capabilities: The base station shall send and receive authentication messages and perform the authentication calculations described in 6.3.12.1. The base station shall set the RAND parameter of the *Access Parameters Message* to the same value transmitted on the forward analog control channel (see 2.3.12.1.2).

7.3.2 Encryption

If the base station supports mobile station authentication (see 7.3.1), it may also support message encryption by providing the capability to send encryption control messages and to perform the operations of encryption and decryption as specified in 6.3.12.2.

7.3.3 Voice Privacy

If the base station supports mobile station authentication (see 7.3.1), it may also support voice privacy using the private long code mask, as specified in 6.3.12.3.

7.4 Supervision

7.4.1 Access Channel

The base station shall continually monitor each active Access Channel. The base station should provide control in cases of overload by using the *Access Parameters Message*.

The base station shall check the CRC of all received Access Channel messages (see 6.7.1.2.2). The base station shall consider any message with a CRC that checks to be valid. The base station shall ignore any message which is not valid.

7.4.2 Reverse Traffic Channel

The base station shall continually monitor each active Reverse Traffic Channel to determine if the call is active. If the base station detects that the call is no longer active, the base station shall declare loss of Reverse Traffic Channel continuity (see 7.6.4).

The base station shall check the CRC of all received Reverse Traffic Channel messages (see 6.7.2.2.2). The base station shall consider any message with a CRC that checks to be valid. The base station shall ignore any message which is not valid.

7.5 Malfunction Detection

Reserved.

7.6 Call Processing

This section describes base station call processing. It contains frequent references to the messages that flow between the base station and the mobile station. While reading this section, it may be helpful to refer to the message formats (see 6.7 and 7.7), and to the call flow examples (see Appendix B).

The values for the time and numeric constants used in this section (e.g., T_{1b} and N_{4m}) are specified in Appendix D.

Base station call processing consists of the following types of processing:

- *Pilot and Sync Channel Processing* - During *Pilot and Sync Channel Processing*, the base station transmits the Pilot Channel and Sync Channel which the mobile station uses to acquire and synchronize to the CDMA system while the mobile station is in the *Mobile Station Initialization State*.
- *Paging Channel Processing* - During *Paging Channel Processing*, the base station transmits the Paging Channel which the mobile station monitors to receive messages while the mobile station is in the *Mobile Station Idle State* and the *System Access State*.
- *Access Channel Processing* - During *Access Channel Processing*, the base station monitors the Access Channel to receive messages which the mobile station sends while the mobile station is in the *System Access State*.
- *Traffic Channel Processing* - During *Traffic Channel Processing*, the base station uses the Forward and Reverse Traffic Channels to communicate with the mobile station while the mobile station is in the *Mobile Station Control on the Traffic Channel State*.

7.6.1 Pilot and Sync Channel Processing

During *Pilot and Sync Channel Processing*, the base station transmits the Pilot and Sync Channels which the mobile station uses to acquire and synchronize to the CDMA system while the mobile station is in the *Mobile Station Initialization State*.

7.6.1.1 Primary and Secondary CDMA Channels

The Primary and Secondary CDMA Channels are the CDMA Channels on which the mobile station attempts to acquire the CDMA system (see 7.1.1.1).

The base station shall support the Primary CDMA Channel, or the Secondary CDMA Channel, or both. The base station may support additional CDMA Channels.

7.6.1.2 Pilot Channel Operation

The Pilot Channel (see 7.1.3.2) is a reference channel which the mobile station uses for acquisition, timing, and as a phase reference for coherent demodulation.

The base station shall continually transmit a Pilot Channel for every CDMA Channel supported by the base station.

7.6.1.3 Sync Channel Operation

The Sync Channel (see 7.1.3.3) provides the mobile station with system configuration and timing information.

The base station shall transmit at most one Sync Channel for each supported CDMA Channel. If the base station supports the Primary CDMA Channel, the base station shall transmit a Sync Channel on the Primary CDMA Channel. If the base station does not support the Primary CDMA Channel, the base station shall transmit a Sync Channel on the Secondary CDMA Channel.

The base station shall continually send the *Sync Channel Message* on each Sync Channel that the base station transmits.

7.6.2 Paging Channel Processing

During *Paging Channel Processing*, the base station transmits the Paging Channel (see 7.1.3.4) which the mobile station monitors to receive messages while the mobile station is in the *Mobile Station Idle State* and the *System Access State*.

The base station may transmit up to seven Paging Channels on each supported CDMA Channel. For each supported CDMA Channel for which the base station transmits a Sync Channel, the base station shall transmit at least one Paging Channel.

For each Paging Channel that the base station transmits, the base station shall continually send valid Paging Channel messages (see 7.7.2), which may include the *Null Message*.

The base station shall not send any message which ends in a Paging Channel slot other than the Paging Channel slot in which the message begins, or the Paging Channel slot following the Paging Channel slot in which the message begins.

7.6.2.1 Paging Channel Procedures

7.6.2.1.1 CDMA Channel Determination

To determine the mobile station's assigned CDMA Channel, the base station shall use the hash function specified in 6.6.7.1 with the following inputs:

- Mobile station's MIN.
- Number of CDMA Channels on which the base station transmits Paging Channels.

7.6.2.1.2 Paging Channel Determination

To determine the mobile station's assigned Paging Channel, the base station shall use the hash function specified in 6.6.7.1 with the following inputs:

- Mobile station's MIN.
- Number of Paging Channels which the base station transmits on the mobile station's assigned CDMA Channel.

7.6.2.1.3 Paging Slot Determination

To determine the assigned Paging Channel slots for a mobile station with a given slot cycle index, the base station shall select a number PGSLOT using the hash function specified in 6.6.7.1 with the following inputs:

- Mobile station's MIN.
- Maximum number of Paging Channel slots (2048).

The assigned Paging Channel slots for the mobile station are those slots for which

$$(\lfloor t/4 \rfloor - \mathrm{PGSLOT}) \bmod (16 \times T) = 0,$$

where t is the System Time in frames, and T is the slot cycle length in units of 1.28 seconds given by

$$T = 2^i,$$

where i is the slot cycle index.

7.6.2.1.4 Message Transmission and Acknowledgement Procedures

The Paging Channel acknowledgement procedures facilitate the reliable exchange of messages between the base station and the mobile station on the Paging Channel and Access Channel (see 7.6.3.1.1). The base station uses the fields ACK_TYPE (acknowledgement address type), ACK_SEQ (acknowledgement sequence number), MSG_SEQ (message sequence number), ACK_REQ (acknowledgement required), and VALID_ACK (valid acknowledgement) to support this mechanism. These fields are referred to as layer 2 fields, and the acknowledgement procedures are referred to as layer 2 procedures. All other message fields and the processing thereof are referred to as pertaining to layer 3. (See Appendix C for further discussion of layering.)

Paging Channel messages can be directed (addressed) either to a specific mobile station, by means of the ADDRESS field, or to a specific MIN (*Page Message* and *Slotted Page Message* only). Since MINs can be active in more than one mobile station, separate acknowledgement and message sequence numbering procedures are used for each type of message address.[10]

The base station shall set the ACK_SEQ and VALID_ACK fields of all Paging Channel messages as specified in 7.6.3.1.1.

The base station shall maintain independent message numbering sequences (MSG_SEQ) on the Paging Channel for each message address type (i.e., for each allowed value of the ADDR_TYPE field) and for each address. The records of the *Page Message* and *Slotted Page Message* shall be considered to be addressed by MIN (as if ADDR_TYPE were equal to '000').

For each message address type, separate message numbering sequences shall be maintained for messages requiring acknowledgement and for messages not requiring acknowledgment. Each base station may maintain the sequence numbers independently of

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[10] Individual systems may or may not allow these capabilities. The management of these capabilities is a function of the base station and system operator.

other base stations. For each new message sent to a message address, the base station shall increment the appropriate MSG_SEQ value, modulo 8.

The base station shall wait at least T_{4m} seconds after transmitting a MSG_SEQ number in a message sent to a message address before using the same MSG_SEQ number in a different message (see Figure 7.6.2.1.4-1).

The base station may send a message several times to increase the probability of message reception. The base station shall complete all retransmissions of the same message within T_{4m} seconds after the first transmission, as shown in Figure 7.6.2.1.4-1. If the base station sends a message with the same contents more than T_{4m} seconds after the first transmission, it shall use a different message sequence number.

A message received on the Access Channel contains an acknowledgement if the VALID_ACK field is '1'. When the base station receives a message with VALID_ACK set to '1', it shall use the received ACK_TYPE, ACK_SEQ and mobile station identification fields to determine the message that is being acknowledged. The base station should not retransmit a message requiring acknowledgement after it has received an acknowledgement of the message.

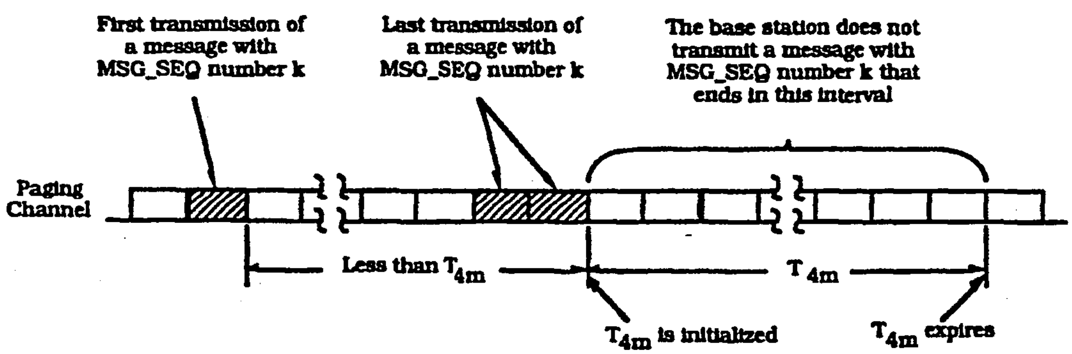

Figure 7.6.2.1.4-1. MSG_SEQ Reuse

7.6.2.2 Overhead Information

The base station sends overhead messages to provide the mobile station with the information it needs to operate with the base station.

The base station shall maintain a configuration sequence number (CONFIG_SEQ), and shall increment CONFIG_SEQ modulo 64 whenever the base station modifies the *System Parameters Message*, the *Neighbor List Message*, or the *CDMA Channel List Message*.

The base station shall maintain an access configuration sequence number (ACC_CONFIG_SEQ), and shall increment ACC_CONFIG_SEQ modulo 64 whenever the base station modifies the *Access Parameters Message*.

On each of the Paging Channels the base station transmits, the base station shall send each of the following system overhead messages at least once per T_{1b} seconds:

1. *Access Parameters Message*
2. *CDMA Channel List Message*

3. *Neighbor List Message*

4. *System Parameters Message*

7.6.2.3 Mobile Station Directed Messages

The base station shall use the following rules for selecting the Paging Channel slot in which to send a message to a mobile station:

- If the base station is able to determine that the mobile station is operating in the non-slotted mode, the base station may send the message to the mobile station in any Paging Channel slot.
- If the base station is able to determine that the mobile station is operating in the slotted mode and is able to determine the mobile station's slot cycle index (see 6.6.2.1.1.3), the base station shall send the message, at least once, as follows:
  1. The base shall send the message in an assigned Paging Channel slot for the mobile station (see 7.6.2.1.3); and
  2. The base station shall not send the message after the last *Slotted Page Message* sent in that Paging Channel slot.
- If the base station is not able to determine whether the mobile station is operating in the non-slotted mode, or the base station is not able to determine the mobile station's slot cycle index, the base station shall assume that the mobile station is operating in the slotted mode with a slot cycle index which is the smaller of MAX_SLOT_CYCLE_INDEX and 1. The base station shall send the message, at least once, as follows:
  1. The base shall send the message in an assigned Paging Channel slot for the mobile station (see 7.6.2.1.3); and
  2. The base station shall not send the message after the last *Slotted Page Message* (the *Slotted Page Message* having the MORE_PAGES bit set equal to '0') sent in that Paging Channel slot.

The base station shall send at least one *Slotted Page Message* in each Paging Channel slot (see 7.7.2.1.1). The base station should send messages directed to mobile stations operating in the slotted mode as the first messages in the slot.

The base station may send the following messages directed to a mobile station on the Paging Channel. If the base station sends a message, the base station shall comply with the specified requirements for sending the message, if any.

1. *Abbreviated Alert Order*
2. *Audit Order*
3. *Authentication Challenge Message*
4. *Base Station Acknowledgement Order*
5. *Base Station Challenge Confirmation Order*
6. *Channel Assignment Message*

7. *Data Burst Message*
8. *Feature Notification Message*
9. *Intercept Order*
10. *Local Control Order*
11. *Lock Until Power-Cycled Order*
12. *Maintenance Required Order*
13. *Page Message*: The base station shall include both MIN1 and MIN2 fields in the message when paging either a foreign SID roamer or a foreign NID roamer (see 6.6.5.3).
14. *Registration Accepted Order*
15. *Registration Rejected Order*
16. *Registration Request Order*
17. *Release Order*
18. *Reorder Order*
19. *Slotted Page Message*: The base station shall include both MIN1 and MIN2 fields in the message when paging either a foreign SID roamer or a foreign NID roamer (see 6.6.5.3).
20. *SSD Update Message*
21. *Unlock Order*

7.6.3 Access Channel Processing

During *Access Channel Processing*, the base station monitors the Access Channel to receive messages which the mobile station sends while the mobile station is in the *System Access State*.

Each Access Channel is associated with a Paging Channel. Up to 32 Access Channels can be associated with a Paging Channel. The number of Access Channels associated with a particular Paging Channel is specified in the *Access Parameters Message* sent on that Paging Channel.

The base station shall continually monitor all Access Channels associated with each Paging Channel that the base station transmits.

7.6.3.1 Access Channel Procedures

7.6.3.1.1 Message Reception and Acknowledgement Procedures

The Access Channel acknowledgement procedures facilitate the reliable exchange of messages between the base station and the mobile station on the Paging Channel (see 7.6.2.1.4) and Access Channel. The base station uses the fields ACK_TYPE (acknowledgement address type), ACK_SEQ (acknowledgement sequence number), MSG_SEQ (message sequence number), ACK_REQ (acknowledgement required), and

VALID_ACK (valid acknowledgement) to support this mechanism. These fields are referred to as layer 2 fields, and the acknowledgement procedures are referred to as layer 2 procedures. All other message fields and the processing thereof are referred to as pertaining to layer 3. (See Appendix C for further discussion of layering.)

A message received on the Access Channel requires acknowledgement if the ACK_REQ field is set to '1'. In this specification, all messages sent on the Access Channel require acknowledgement. All messages sent on the Access Channel contain identification data for the mobile station sending the message, and are acknowledged by Paging Channel messages.

The base station acknowledges a received message by transmitting a message on the Paging Channel with the ACK_SEQ field set equal to the MSG_SEQ field of the received message, and with the VALID_ACK field set to '1'. A message transmitted with the ACK_SEQ and VALID_ACK fields set in this manner is referred to as including an acknowledgement of the received message.

After receiving a message requiring acknowledgement from a mobile station on the Access Channel, the base station shall transmit a message directed to that mobile station, including acknowledgement, on the corresponding Paging Channel. The acknowledgement shall be transmitted within ACC_TMO × 80 ms after receiving the message, where ACC_TMO is the value sent in the *Access Parameters Message* on the mobile station's assigned Paging Channel.

When a received message requires acknowledgement and no message directed to the mobile station is available within ACC_TMO × 80 ms after the message is received, the base station shall transmit a *Base Station Acknowledgement Order* directed to the mobile station, including the acknowledgement.

Whenever a message requiring acknowledgement is received from a mobile station, the base station shall set the ACK_SEQ field in subsequent Paging Channel messages directed to that mobile station, to the MSG_SEQ specified in the received message. The VALID_ACK field shall be set to '1' for the first message with this value of ACK_SEQ sent to the mobile station on the Paging Channel. For all Paging Channel messages after the first, directed to the same mobile station and containing the same ACK_SEQ field value:

- The base station may set VALID_ACK to '1' if the message is sent within T_{4m} seconds after the first message (see Figure 7.6.2.1.4-1).
- The base station shall set VALID_ACK field to '0' if the message is sent more than T_{4m} seconds after the first message.

If the base station performs duplicate message detection using Access Channel message sequence numbers, it should use the following procedures. The base station should store, for each mobile station that is active on the Access Channel, a received status indicator for each possible value of the Access Channel message MSG_SEQ field (MSG_SEQ_RCVD[n], where n is 0 through 7).

The base station should consider a mobile station active on the Access Channel when it receives an Access Channel message from the mobile station. The base station should consider the mobile station inactive on the Access Channel if:

- It has received no message from the mobile station within a time period to be selected by the base station manufacturer; or
- The mobile station has been assigned to a Traffic Channel; or
- The mobile station has been assigned to the analog system; or
- The base station has received a power-down registration from the mobile station.

When the base station receives an Access Channel message from an inactive mobile station, it should set MSG_SEQ_RCVD[n] to NO for all values of n from 0 to 7. The base station should then consider the mobile station active on the Access Channel.

For each active mobile station, the base station should perform the following procedures:

- When a message requiring acknowledgement is received (including a message received while the mobile station was inactive), with message sequence number MSG_SEQ, and MSG_SEQ_RCVD[MSG_SEQ] is equal to NO, the base station should process the message as a new message. The base station should set MSG_SEQ_RCVD[MSG_SEQ] to YES, and should set MSG_SEQ_RCVD[(MSG_SEQ + 2) modulo 8] to NO.
- When a message requiring acknowledgement is received, with message sequence number MSG_SEQ, and MSG_SEQ_RCVD[MSG_SEQ] is equal to YES, the base station shall acknowledge the message as specified earlier in this section but should not perform any further processing of the message.

7.6.3.2 Reserved

7.6.3.3 Response to *Page Response Message*

If the base station receives a *Page Response Message*, the base station should send a *Channel Assignment Message* or a *Release Order*. The base station may also start authentication procedures (see 6.3.12).

If the base station sends a *Channel Assignment Message*, the base station shall perform the following:

- If the *Channel Assignment Message* directs the mobile station to a Traffic Channel, the base station shall begin *Traffic Channel Processing* (see 7.6.4) for the mobile station.
- If the *Channel Assignment Message* directs the mobile station to an analog voice channel, the base station shall follow the procedure described in 3.6.4.

7.6.3.4 Response to Orders

No requirements.

7.6.3.5 Response to *Origination Message*

If the base station receives an *Origination Message*, the base station should send a *Channel Assignment Message*, an *Intercept Order*, a *Reorder Order*, or a *Release Order*. The base station may also commence authentication procedures (see 6.3.12).

If the base station sends a *Channel Assignment Message*, the base station shall perform the following:

- If the *Channel Assignment Message* directs the mobile station to a Traffic Channel, the base station shall begin *Traffic Channel Processing* (see 7.6.4) for the mobile station.
- If the *Channel Assignment Message* directs the mobile station to an analog voice channel, the base station shall follow the procedure described in 3.6.4.

The base station shall not set $RESPOND_r$ equal to '0' when ASSIGN_MODE = '001' or ASSIGN_MODE = '010'.

7.6.3.6 Response to *Registration Message*

If the base station receives a *Registration Message*, the base station may send a *Registration Accepted Order* or a *Registration Rejected Order*. The base station may also start authentication procedures (see 6.3.12).

7.6.3.7 Response to *Data Burst Message*

No requirements.

7.6.4 Traffic Channel Processing

During *Traffic Channel Processing*, the base station uses the Forward and Reverse Traffic Channels to communicate with the mobile station while the mobile station is in the *Mobile Station Control on the Traffic Channel State*.

Traffic Channel processing consists of the following substates:

- *Traffic Channel Initialization Substate* - In this substate, the base station begins transmitting on the Forward Traffic Channel and receiving on the Reverse Traffic Channel.
- *Waiting for Order Substate* - In this substate, the base station sends the *Alert With Information Message* to the mobile station.
- *Waiting for Answer Substate* - In this substate, the base station waits for the *Connect Order* from the mobile station.
- *Conversation Substate* - In this substate, the base station exchanges primary traffic bits with the mobile station's primary service option application.
- *Release Substate* - In this substate, the base station disconnects the call.

7.6.4.1 Special Functions and Actions

The base station performs the following special functions and actions in one or more of the Traffic Channel processing substates.

7.6.4.1.1 Forward Traffic Channel Power Control

When the base station enables Forward Traffic Channel power control, the mobile station reports frame error rate statistics to the base station using the *Power Measurement Report Message*.

The base station may enable Forward Traffic Channel power control using the *System Parameters Message* sent on the Paging Channel and the *Power Control Parameters Message* sent on the Forward Traffic Channel. The base station may enable periodic reporting which causes the mobile station to report frame error rate statistics at specified intervals. The base station may also enable threshold reporting which causes the mobile station to report frame error rate statistics when the frame error rate reaches a specified threshold.[11]

The base station may use the reported frame error rate statistics to adjust the transmit power of the Forward Traffic Channel.

7.6.4.1.2 Service Options

7.6.4.1.2.1 Overview

During Traffic Channel operation, the base station and mobile station may support primary traffic services. Each such service, referred to as a service option, has a set of requirements that govern the way in which the primary traffic bits (see 7.1.3.5.11 and 6.1.3.3.11) from forward and reverse Traffic Channel frames are processed by the base station and mobile station. Service Option 1, for example, defines the requirements for a 2-way, variable rate speech service.

Either the base station or mobile station can request a service option. The base station can request a particular service option when paging the mobile station or during Traffic Channel operation. If the requested service option is acceptable to the mobile station, the base station and mobile station begin using the new service option. If the base station requests a service option that is not acceptable to the mobile station, the mobile station can reject the requested service option or request an alternative service option. If the mobile station requests an alternative service option, the base station can accept or reject the mobile station's alternative service option, or request another service option. This process, called service option negotiation, ends when the base station and mobile station find a mutually acceptable service option, or when the base station rejects a service option request from the mobile station or the mobile station rejects a service option request from the base station.

The base station and mobile station use the *Service Option Request Order* either to request a service option or suggest an alternative service option, and the *Service Option Response Order* to accept or reject a service option request. In addition, the base station can request a service option in the *Page Message* or the *Slotted Page Message*, and the mobile station can request a service option in the *Origination Message* or the *Page Response Message*. The

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[11]Both periodic and threshold reporting may be enabled simultaneously, either one of them may be enabled, or both forms of reporting may be disabled at any given time.

base station and mobile station use the *Service Option Control Order* to invoke service option specific functions.

The base station uses a variable (SO_REQ) to record the number of the service option for which the base station has sent an outstanding request in a *Service Option Request Order*. SO_REQ is set to a special value, NULL, when the base station does not have an outstanding service option request. The base station uses another variable (SO_CUR) to record the number of the service option which is currently active. SO_CUR is set to NULL when there is no active service option.

7.6.4.1.2.2 Requirements

7.6.4.1.2.2.1 Processing Service Option Requests

When processing a service option request in an *Origination Message*, a *Page Response Message*, or a *Service Option Request Order*, the base station shall perform the following:

- If the base station accepts the requested service option, the base station shall set SO_REQ to NULL and shall send a *Service Option Response Order* accepting the requested service option within T_{4b} seconds. The base station shall begin using the requested service option in accordance with the requirements for the requested service option. The base station shall set SO_CUR to the requested service option number when the service option becomes active.

- If the base station does not accept the requested service option and has an alternative service option to request, the base station shall set SO_REQ to the alternative service option number and shall send a *Service Option Request Order* requesting the alternative service option within T_{4b} seconds.

- If the base station does not accept the requested service option and does not have an alternative service option to request, the base station shall set SO_REQ to NULL and shall send a *Service Option Response Order* to reject the request within T_{4b} seconds. The base station shall continue to process primary traffic as it did prior to receiving the *Service Option Request Order* and shall remain in the current state.

7.6.4.1.2.2.2 Processing the *Service Option Response Order*

When the base station receives a *Service Option Response Order*, it shall perform the following:

- If the service option number specified in the order is equal to SO_REQ, the base station shall set SO_REQ to NULL and shall begin using the specified service option in accordance with the requirements for the service option. The base station shall set SO_CUR to the specified service option number when the service option becomes active.

- If the order indicates a service option rejection, the base station shall set SO_REQ to NULL. The base station shall continue to process primary traffic as it did prior to receiving the *Service Option Response Order* and shall remain in the current state.

- If the order does not indicate a service option rejection and the service option specified in the order is not equal to SO_REQ, the base station shall set SO_REQ to

NULL, should send a *Release Order* (ORDQ = '00000010'), and should enter the *Release Substate*.

7.6.4.1.2.2.3 Processing the Received *Service Option Control Order*

If there is an active service option (SO_CUR is not equal to NULL), the base station shall process the received *Service Option Control Order* in accordance with the requirements for the active service option.

7.6.4.1.2.2.4 Service Option Request Initialization

To perform service option request initialization, the base station shall set SO_REQ to the specified service option number.

7.6.4.1.3 Acknowledgement Procedures

The acknowledgement procedures facilitate the reliable exchange of messages between the mobile station and the base station. The base station uses the fields ACK_SEQ (acknowledgement sequence number), MSG_SEQ (message sequence number) and ACK_REQ (acknowledgement required) to detect duplicate messages and provide a reference for acknowledgements. These message fields are referred to as layer 2 fields, and the acknowledgement procedures are referred to as layer 2 procedures. All other message fields are referred to as layer 3 fields, and the processing of layer 3 fields is referred to as layer 3 processing. (See Appendix C for further discussion of layering.)

On both the Reverse Traffic Channel and the Forward Traffic Channel, the procedure for messages requiring acknowledgement is a selective repeat scheme in which a message is retransmitted only if an acknowledgement for it is not received.

7.6.4.1.3.1 Messages Requiring Acknowledgement

A Traffic Channel message requires acknowledgement when the ACK_REQ field is set to '1'.

7.6.4.1.3.1.1 Transmitting Messages and Receiving Acknowledgements

The Layer 2 protocol does not guarantee delivery of messages in any order. If the base station requires that the mobile station receive a set of messages in a certain order, the base station must wait for an acknowledgement to each message before transmitting the next message in the set. For messages requiring acknowledgement whose relative ordering is not important, the base station may transmit up to four such messages before receiving an acknowledgement for the first message.

The base station shall store a message sequence number for messages requiring acknowledgement (MSG_SEQ_ACK). The base station shall store an acknowledgement status indicator for each possible value of the Forward Traffic Channel message MSG_SEQ field (ACK_WAITING[n], where n is 0 through 7). The base station shall not send a new message requiring acknowledgement when ACK_WAITING[(MSG_SEQ_ACK + 4) modulo 8] is equal to YES.

The base station shall perform the following procedures:

- When the base station receives a message on the Reverse Traffic Channel, with acknowledgement sequence number ACK_SEQ, it shall set ACK_WAITING[ACK_SEQ] to NO.
- When the base station sends a new message requiring acknowledgement on the Forward Traffic Channel, it shall set ACK_WAITING[MSG_SEQ_ACK] to YES and shall set the MSG_SEQ field of the message to MSG_SEQ_ACK. The base station shall then increment MSG_SEQ_ACK, modulo 8.

The base station shall not retransmit a message for which it has received an acknowledgement.

If the base station does not receive an acknowledgement after transmitting the message, the base station shall retransmit the message. If the base station retransmits a message, the base station shall use the same MSG_SEQ number for the retransmission.

The base station shall store a retransmission counter (RETRY_COUNT) for each transmitted message requiring acknowledgement. The base station shall set RETRY_COUNT to zero prior to the first transmission of the message. After each transmission of the message, the base station shall increment RETRY_COUNT if no acknowledgement is received. The base station shall not exceed a maximum number of retransmissions, to be selected by the base station manufacturer. When RETRY_COUNT is equal to the maximum number of retransmissions, the base station shall declare an acknowledgement failure.

7.6.4.1.3.1.2 Receiving Messages and Returning Acknowledgements

Messages received on the Reverse Traffic Channel contain MSG_SEQ fields that are incremented by the same rules as messages transmitted on the Forward Traffic Channel. Separate sequence numbers are maintained for Reverse Traffic Channel Messages that require acknowledgement and for messages that do not require acknowledgement.

The base station acknowledges a received message by transmitting a message with the ACK_SEQ field set equal to the MSG_SEQ field of the received message. A message transmitted with the ACK_SEQ field set in this manner is referred to as including an acknowledgement of the received message.

Whenever a message requiring acknowledgement is received, the base station shall set the ACK_SEQ field of subsequent Forward Traffic Channel messages to the MSG_SEQ field of the received message. If no message has been received, the base station shall set this field to '111'.

After receiving a message requiring acknowledgement, the base station shall transmit a message including an acknowledgement within T_{1m} seconds as shown in Figure 6.6.4.1.3.1.1-1.

When a received message requires acknowledgement and no message is available within T_{1m} seconds after the message is received, the base station shall transmit a *Base Station Acknowledgement Order* including the acknowledgement.

For duplicate message detection, the base station shall store a received status indicator for each possible value of the Reverse Traffic Channel message MSG_SEQ field (MSG_SEQ_RCVD[n], where n is 0 through 7). The base station shall perform the following procedures:

- When a message requiring acknowledgement is received with message sequence number MSG_SEQ, and MSG_SEQ_RCVD[MSG_SEQ] is equal to NO, the base station shall process the message as a new message. The base station shall then set MSG_SEQ_RCVD[MSG_SEQ] to YES, and shall set MSG_SEQ_RCVD[(MSG_SEQ + 4) modulo 8] to NO.

- When a message requiring acknowledgement is received with message sequence number MSG_SEQ, and MSG_SEQ_RCVD[MSG_SEQ] is equal to YES, the base station shall acknowledge the message but shall not perform any further processing of the message.

7.6.4.1.3.2 Messages not Requiring Acknowledgement

A Traffic Channel message does not require acknowledgement when the ACK_REQ field is set to '0'.

The base station shall store a message sequence number for messages not requiring acknowledgement (MSG_SEQ_NOACK). For each new message sent that does not require acknowledgement, the base station shall set the MSG_SEQ field of the message to MSG_SEQ_NOACK and shall then increment MSG_SEQ_NOACK, modulo 8.

If the base station transmits the same message not requiring acknowledgement more than once, it shall use the same MSG_SEQ number for all transmissions. The base station shall complete all retransmissions of the same message within T_{3m} seconds after the first transmission, as shown in Figure 7.6.4.1.3.2-1. The base station shall wait at least T_{3m} seconds after the last transmission of a message not requiring acknowledgement before transmitting another message not requiring acknowledgement that has the same MSG_SEQ number, as shown in Figure 7.6.4.1.3.2-1.[12]

[12]This is necessary because it is possible that the mobile station receives only the last transmission.

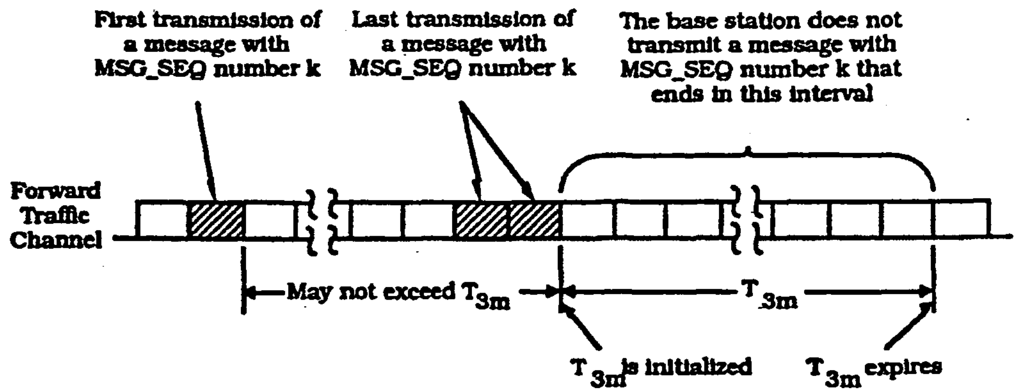

Figure 7.6.4.1.3.2-1. Time Requirement for the Base Station Not to Reuse a MSG_SEQ Number

7.6.4.1.3.3 Acknowledgement Procedures Reset

The base station shall reset the acknowledgement procedures as follows:

- Message sequence number reset.
  - If ACK_WAITING[n] is equal to YES for any n, the base station should save the corresponding messages and retransmit them after completing the reset of the acknowledgement procedures. For each such message, the base station shall set the retransmission counter (RETRY_COUNT) to zero.
  - The base station shall set MSG_SEQ_ACK to 0, MSG_SEQ_NOACK to 0, and shall set ACK_WAITING[n] to NO for all values of n from 0 to 7.
- Acknowledgement sequence number reset. The base station shall set the ACK_SEQ field of all Forward Traffic Channel messages to '111' until the first message requiring acknowledgement is received.
- Duplicate detection reset. The base station shall set MSG_SEQ_RCVD[n] to NO for all values of n from 0 to 7.

7.6.4.1.4 Message Action Times

A Forward Traffic Channel message without a USE_TIME field or with a USE_TIME field set to '0' has an implicit action time. A message with its USE_TIME field set to '1' has an explicit action time which is specified in the ACTION_TIME field of the message. A message with a future action time is called a pending message.

Unless otherwise specified, a message having an implicit action time shall take effect no later than the first 80 ms boundary (relative to System Time) occurring at least 80 ms after the end of the frame containing the last bit of the message. A message with an explicit action time shall take effect when System Time (in 80 ms units) modulo 64 becomes equal to the message's ACTION_TIME field. The difference in time between ACTION_TIME and the end of the frame containing the last bit of the message shall be at least 80 ms.

The base station shall support one pending message at any given time, not including pending *Service Option Control Orders*. The number of pending *Service Option Control Orders* that the base station is required to support is specific to the service option (see the relevant service option descriptions).

7.6.4.1.5 Long Code Transition Request Processing

If a request for voice privacy is specified in the *Origination Message* or *Page Response Message*, the base station may send a *Long Code Transition Request Order* (ORDQ = '00000001') requesting a transition to the private long code.

The base station shall process the *Long Code Transition Request Order* as follows:

- If the *Long Code Transition Request Order* requests a transition to the private long code and the base station accepts the request, the base station shall send a *Long Code Transition Request Order* (ORDQ = '00000001'). If the base station does not accept the private long code transition request, the base station shall send a *Long Code Transition Request Order* (ORDQ = '00000000').

- If the *Long Code Transition Request Order* requests a transition to the public long code and the base station accepts the request, the base station shall send a *Long Code Transition Request Order* (ORDQ = '00000000'). If the base station does not accept the public long code transition request, the base station shall send a *Long Code Transition Request Order* (ORDQ = '00000001').

The base station shall process the *Long Code Transition Response Order* as follows:

- If the *Long Code Transition Response Order* indicates that the mobile station accepts the long code transition requested in the *Long Code Transition Request Order* sent by the base station, the base station shall use the requested long code mask on both the Forward Traffic Channel and the Reverse Traffic Channel. If the base station did not specify an explicit action time in the *Long Code Transition Request Order*, the base station should begin using the requested long code mask at the first 80 ms boundary (relative to the start of System Time) after N_{4m} frames after the last frame in which any portion of the *Long Code Transition Response Order* was received.

7.6.4.2 Traffic Channel Initialization Substate

In this substate, the base station begins transmitting on the Forward Traffic Channel and acquires the Reverse Traffic Channel.

Upon entering the *Traffic Channel Initialization Substate*, the base station shall perform the following:

- The base station shall reset the message acknowledgement procedures as specified in 7.6.4.1.3.3.
- The base station shall set SO_CUR to NULL to indicate that there is no active service option.
- The base station shall perform service option request initialization (see 7.6.4.1.2.2.4) specifying NULL as the service option number.
- The base station shall set its Forward and Reverse Traffic Channel long code masks to the public long code mask (see 7.1.3.5.6).
- The base station shall set its Forward and Reverse Traffic Channel frame offsets (see 7.1.3.5.1) to the frame offset assigned to the mobile station.

While in the *Traffic Channel Initialization Substate*, the base station shall perform the following:

- The base station shall transmit null Traffic Channel data.
- The base station shall perform the message acknowledgement procedures as specified in 7.6.4.1.3.
- If the base station acquires the Reverse Traffic Channel, the base station shall send a *Base Station Acknowledgement Order*. The base station should send the *Base Station Acknowledgement Order* as a message requiring acknowledgement. If the call is a mobile station terminated call, the base station shall enter the *Waiting for Order Substate* (see 7.6.4.3.1). If the call is a mobile station originated call, the base station shall enter the *Conversation Substate* (see 7.6.4.4).
- If the base station fails to acquire the Reverse Traffic Channel, the base station shall either retransmit the *Channel Assignment Message* on the Paging Channel and remain in the *Traffic Channel Initialization Substate*, or the base station should disable transmission on the Forward Traffic Channel and discontinue the *Traffic Channel Processing* for the mobile station.

7.6.4.3 Alerting

7.6.4.3.1 Waiting for Order Substate

In this substate, the base station sends an *Alert With Information Message* to the mobile station.

Upon entering the *Waiting for Order Substate*, the base station shall perform the following:

- The base station shall process the service option request specified in the *Page Response Message* as specified in 7.6.4.1.2.2.1.

While in the *Waiting for Order Substate*, the base station shall perform the following:

- The base station shall transmit the power control subchannel as specified in 7.1.3.1.7.
- If there is an active service option (SO_CUR is not equal to NULL), the base station shall process the received primary traffic bits in accordance with the requirements for the active service option; otherwise, the base station shall discard the received primary traffic bits.
- If there is an active service option (SO_CUR is not equal to NULL), the base station shall transmit primary traffic bits in accordance with the requirements for the active service option; otherwise, the base station shall transmit null Traffic Channel data.
- The base station shall perform the message acknowledgement procedures as specified in 7.6.4.1.3.
- If the base station declares a loss of Reverse Traffic Channel continuity (see 7.4.2), the base station should send a *Release Order* to the mobile station. If the base station sends a *Release Order*, the base station shall enter the *Release Substate*.
- The base station may perform Forward Traffic Channel power control as specified in 7.6.4.1.1.
- The base station may request a service option as specified in 7.6.4.1.2. To do so, the base station shall perform service option request initialization (see 7.6.4.1.2.2.4) specifying the requested service option number, and shall send a *Service Option Request Order* (ORDQ = requested service option number).
- If there is an active service option (SO_CUR is not equal to NULL), the base station may send a *Service Option Control Order* (ORDQ = function code) to invoke a service option specific function in accordance with the requirements for the active service option.
- The base station may request a long code transition, as specified in 7.6.4.1.5, either autonomously or in response to a request for voice privacy specified in the *Origination Message* or *Page Response Message*.
- The base station may perform authentication procedures as specified in 7.3.1.

- The base station may send the following messages. If the base station sends a message, the base station shall comply with the specified requirements for sending the message, if any.
  1. _Alert With Information Message_: The base station shall enter the *Waiting for Answer Substate*.
  2. _Analog Handoff Direction Message_: The base station shall enter the Waiting for Order Task (see 3.6.4.3.1).
  3. _Audit Order_
  4. _Authentication Challenge Message_
  5. _Base Station Acknowledgement Order_
  6. _Base Station Challenge Confirmation Order_
  7. _Data Burst Message_
  8. _Handoff Direction Message_
  9. _In-Traffic System Parameters Message_
  10. _Local Control Order_
  11. _Lock Until Power-Cycled Order_
  12. _Long Code Transition Request Order_
  13. _Maintenance Order_: The base station shall enter the *Waiting for Answer Substate*.
  14. _Maintenance Required Order_
  15. _Message Encryption Mode Order_
  16. _Mobile Station Registered Message_
  17. _Neighbor List Update Message_
  18. _Parameter Update Order_: see 2.3.12.1.3.
  19. _Pilot Measurement Request Order_
  20. _Power Control Parameters Message_
  21. _Release Order_: The base station shall enter the *Release Substate*.
  22. _Retrieve Parameters Message_
  23. _Service Option Control Order_
  24. _Service Option Request Order_
  25. _Service Option Response Order_
  26. _Set Parameters Message_
  27. _SSD Update Message_
  28. _Status Request Order_

- If the base station receives one of the following autonomous messages from the mobile station, the base station shall process the message according to the specified requirements, if any:

  1. *Data Burst Message*
  2. *Handoff Completion Message*: The base station shall process the message as described in 7.6.6.2.2.3.
  3. *Long Code Transition Request Order*: The base station shall process the message as described in 7.6.4.1.5.
  4. *Parameter Update Confirmation Order*
  5. *Pilot Strength Measurement Message*: The base station shall process the message as described in 7.6.6.2.2.1.
  6. *Power Measurement Report Message*: The base station may process the message as described in 7.6.4.1.1.
  7. *Release Order*: The base station shall send the mobile station a *Release Order*, within T_{2b} seconds, and enter the *Release Substate*, or the base station shall send an *Alert with Information Message*, within T_{2b} seconds, and enter the *Waiting for Answer Substate*.
  8. *Request Analog Service Order*: The base station may respond with an *Analog Handoff Direction Message*.
  9. *Service Option Control Order*: The base station shall process the message as described in 7.6.4.1.2.2.3.
  10. *Service Option Request Order*: The base station shall process the message as described in 7.6.4.1.2.2.1.
  11. *Service Option Response Order*: The base station shall process the message as described in 7.6.4.1.2.2.2.

7.6.4.3.2 Waiting for Answer Substate

In this substate, the base station waits for a *Connect Order* from the mobile station.

While in the *Waiting for Answer Substate*, the base station shall perform the following:

- The base station shall transmit the power control subchannel as specified in 7.1.3.1.7.
- If there is an active service option (SO_CUR is not equal to NULL), the base station shall process the received primary traffic bits in accordance with the requirements for the active service option; otherwise, the base station shall discard the received primary traffic bits.
- If there is an active service option (SO_CUR is not equal to NULL), the base station shall transmit primary traffic bits in accordance with the requirements for the active service option; otherwise, the base station shall transmit null Traffic Channel data.

- The base station shall perform the message acknowledgement procedures as specified in 7.6.4.1.3.
- If the base station declares a loss of Reverse Traffic Channel continuity (see 7.4.2), the base station should send a *Release Order* to the mobile station. If the base station sends a *Release Order*, the base station shall enter the *Release Substate*.
- The base station may perform Forward Traffic Channel power control as specified in 7.6.4.1.1.
- The base station may request a service option as specified in 7.6.4.1.2. To do so, the base station shall perform service option request initialization (see 7.6.4.1.2.2.4) specifying the requested service option number, and shall send a *Service Option Request Order* (ORDQ = requested service option number).
- If there is an active service option (SO_CUR is not equal to NULL), the base station may send a *Service Option Control Order* (ORDQ = function code) to invoke a service option specific function in accordance with the requirements for the active service option.
- The base station may request a long code transition, as specified in 7.6.4.1.5, either autonomously or in response to a request for voice privacy specified in the *Origination Message* or *Page Response Message*.
- The base station may perform authentication procedures as specified in 7.3.1.
- The base station may send the following messages. If the base station sends a message, the base station shall comply with the specified requirements for sending the message, if any.

  1. *Alert With Information Message*
  2. *Analog Handoff Direction Message*: The base station shall enter the Waiting for Answer Task (see 3.6.4.3.2).
  3. *Audit Order*
  4. *Authentication Challenge Message*
  5. *Base Station Acknowledgement Order*
  6. *Base Station Challenge Confirmation Order*
  7. *Data Burst Message*
  8. *Handoff Direction Message*
  9. *In-Traffic System Parameters Message*
  10. *Local Control Order*
  11. *Lock Until Power-Cycled Order*
  12. *Long Code Transition Request Order*
  13. *Maintenance Order*
  14. *Maintenance Required Order*

15. *Message Encryption Mode Order*
16. *Mobile Station Registered Message*
17. *Neighbor List Update Message*
18. *Parameter Update Order*: see 2.3.12.1.3.
19. *Pilot Measurement Request Order*
20. *Power Control Parameters Message*
21. *Release Order*: The base station shall enter the *Release Substate*.
22. *Retrieve Parameters Message*
23. *Service Option Control Order*
24. *Service Option Request Order*
25. *Service Option Response Order*
26. *Set Parameters Message*
27. *SSD Update Message*
28. *Status Request Order*

- If the base station receives one of the following autonomous messages from the mobile station, the base station shall process the message according to the specified requirements, if any:

1. *Connect Order*: The base station shall enter the *Conversation Substate*.
2. *Data Burst Message*
3. *Handoff Completion Message*: The base station shall process the message as described in 7.6.6.2.2.3.
4. *Long Code Transition Request Order*: The base station shall process the message as described in 7.6.4.1.5.
5. *Parameter Update Confirmation Order*
6. *Pilot Strength Measurement Message*: The base station shall process the message as described in 7.6.6.2.2.1.
7. *Power Measurement Report Message*: The base station may process the message as described in 7.6.4.1.1.
8. *Release Order*: The base station shall send the mobile station a *Release Order*, within T_{2b} seconds, and enter the *Release Substate*, or the base station shall send an *Alert with Information Message*, within T_{2b} seconds, and enter the *Waiting for Answer Substate*.
9. *Request Analog Service Order*: The base station may respond with an *Analog Handoff Direction Message*.
10. *Service Option Control Order*: The base station shall process the message as described in 7.6.4.1.2.2.3.

11. *Service Option Request Order*: The base station shall process the message as described in 7.6.4.1.2.2.1.

12. *Service Option Response Order*: The base station shall process the message as described in 7.6.4.1.2.2.2.

7.6.4.4 Conversation Substate

In this substate, the base station exchanges primary traffic bits with the mobile station's primary traffic service option application.

Upon entering the *Conversation Substate*, the base station shall perform the following:

- If the call is mobile station originated, the base station shall process the service option request specified in the *Origination Message* as specified in 7.6.4.1.2.2.1.

While in the *Conversation Substate*, the base station shall perform the following:

- The base station shall transmit the power control subchannel as specified in 7.1.3.1.7.
- If there is an active service option (SO_CUR is not equal to NULL), the base station shall process the received primary traffic bits in accordance with the requirements for the active service option; otherwise, the base station shall discard the received primary traffic bits.
- If there is an active service option (SO_CUR is not equal to NULL), the base station shall transmit primary traffic bits in accordance with the requirements for the active service option; otherwise, the base station shall transmit null Traffic Channel data.
- The base station shall perform the message acknowledgement procedures as specified in 7.6.4.1.3.
- If the base station declares a loss of Reverse Traffic Channel continuity (see 7.4.2), the base station should send a *Release Order* to the mobile station. If the base station sends a *Release Order*, the base station shall enter the *Release Substate*.
- The base station may perform Forward Traffic Channel power control as specified in 7.6.4.1.1.
- The base station may request a service option as specified in 7.6.4.1.2. To do so, the base station shall perform service option request initialization (see 7.6.4.1.2.2.4) specifying the requested service option number, and shall send a *Service Option Request Order* (ORDQ = requested service option number).
- If there is an active service option (SO_CUR is not equal to NULL), the base station may send a *Service Option Control Order* (ORDQ = function code) to invoke a service option specific function in accordance with the requirements for the active service option.
- The base station may request a long code transition, as specified in 7.6.4.1.5, either autonomously or in response to a request for voice privacy specified in the *Origination Message* or *Page Response Message*.
- The base station may perform authentication procedures as specified in 7.3.1.

- The base station may send the following messages. If the base station sends a message, the base station shall comply with the specified requirements for sending the message, if any.
  1. *Alert With Information Message*: If the message contains a signal information record with the SIGNAL_TYPE field set to '01' or '10', or if the message does not contain a signal information record, the base station shall enter the *Waiting for Answer Substate*.
  2. *Analog Handoff Direction Message*: The base station shall enter the Conversation Task (see 3.6.4.4).
  3. *Audit Order*
  4. *Authentication Challenge Message*
  5. *Base Station Acknowledgement Order*
  6. *Base Station Challenge Confirmation Order*
  7. *Continuous DTMF Tone Order*
  8. *Data Burst Message*
  9. *Flash With Information Message*
  10. *Handoff Direction Message*
  11. *In-Traffic System Parameters Message*
  12. *Local Control Order*
  13. *Lock Until Power-Cycled Order*
  14. *Long Code Transition Request Order*
  15. *Maintenance Order*: The base station shall enter the *Waiting for Answer Substate*.
  16. *Maintenance Required Order*
  17. *Message Encryption Mode Order*
  18. *Mobile Station Registered Message*
  19. *Neighbor List Update Message*
  20. *Parameter Update Order*: see 2.3.12.1.3.
  21. *Pilot Measurement Request Order*
  22. *Power Control Parameters Message*
  23. *Release Order*: The base station shall enter the *Release Substate*.
  24. *Retrieve Parameters Message*
  25. *Send Burst DTMF Message*
  26. *Service Option Control Order*

27. *Service Option Request Order*
28. *Service Option Response Order*
29. *Set Parameters Message*
30. *SSD Update Message*
31. *Status Request Order*

- If the base station receives one of the following autonomous messages from the mobile station, the base station shall process the message according to the specified requirements, if any:

1. *Continuous DTMF Tone Order*
2. *Data Burst Message*
3. *Flash With Information Message*
4. *Handoff Completion Message*: The base station shall process the message as described in 7.6.6.2.2.3.
5. *Long Code Transition Request Order*: The base station shall process the message as described in 7.6.4.1.5.
6. *Origination Continuation Message*
7. *Parameter Update Confirmation Order*
8. *Pilot Strength Measurement Message*: The base station shall process the message as described in 7.6.6.2.2.1.
9. *Power Measurement Report Message*: The base station may process the message as described in 7.6.4.1.1.
10. *Release Order*: The base station shall send the mobile station a *Release Order*, within T_{2b} seconds, and enter the *Release Substate*, or the base station shall send an *Alert with Information Message*, within T_{2b} seconds, and enter the *Waiting for Answer Substate*.
11. *Request Analog Service Order*: The base station may respond with an *Analog Handoff Direction Message*.
12. *Send Burst DTMF Message*
13. *Service Option Control Order*: The base station shall process the message as described in 7.6.4.1.2.2.3.
14. *Service Option Request Order*: The base station shall process the message as described in 7.6.4.1.2.2.1.
15. *Service Option Response Order*: The base station shall process the message as described in 7.6.4.1.2.2.2.

7.6.4.5 Release Substate

In this substate, the base station disconnects the call.

While in the *Release Substate*, the base station shall perform the following:

- The base station shall transmit the power control subchannel as specified in 7.1.3.1.7.
- The base station shall transmit null Traffic Channel data for at least T_{3b} seconds. After this interval, the base station should stop transmitting on the Forward Traffic Channel.
- The base station shall perform the message acknowledgement procedures as specified in 7.6.4.1.3.
- The base station may perform Forward Traffic Channel power control as specified in 7.6.4.1.1.
- The base station may send the following messages. If the base station sends a message, the base station shall comply with the specified requirements for sending the message, if any.

    1. *Alert With Information Message*: If the message contains a signal information record with the SIGNAL_TYPE field set to '01' or '10', or if the message does not contain a signal information record, the base station shall enter the *Waiting for Answer Substate*.
    2. *Audit Order*
    3. *Base Station Acknowledgement Order*
    4. *Data Burst Message*
    5. *Handoff Direction Message*
    6. *In-Traffic System Parameters Message*
    7. *Local Control Order*
    8. *Lock Until Power-Cycled Order*
    9. *Maintenance Order*: The base station shall enter the *Waiting for Answer Substate*.
    10. *Maintenance Required Order*
    11. *Mobile Station Registered Message*
    12. *Neighbor List Update Message*
    13. *Parameter Update Order*
    14. *Power Control Parameters Message*
    15. *Release Order*
    16. *Retrieve Parameters Message*
    17. *Service Option Control Order*
    18. *Status Request Order*

- If the base station receives one of the following autonomous messages from the mobile station, the base station shall process the message according to the specified requirements, if any:
  1. *Connect Order*
  2. *Continuous DTMF Tone Order*
  3. *Data Burst Message*
  4. *Flash With Information Message*
  5. *Handoff Completion Message*: The base station shall process the message as described in 7.6.6.2.2.3.
  6. *Pilot Strength Measurement Message*
  7. *Power Measurement Report Message*
  8. *Long Code Transition Request Order*
  9. *Origination Continuation Message*
  10. *Release Order*
  11. *Request Analog Service Order*
  12. *Send Burst DTMF Message*
  13. *Service Option Control Order*
  14. *Service Option Request Order*
  15. *Service Option Response Order*

7.6.5 Registration

Registration is the process by which a mobile station notifies the base station of its location, status, identification, slot cycle, and other characteristics. The base station can make use of location information to efficiently page the mobile station when establishing a mobile-terminated call. Registration also provides the mobile station's SLOT_CYCLE_INDEX parameter so that the base station can determine which Paging Channel slots a mobile station operating in the slotted mode is monitoring. Registration also provides the station class mark and protocol revision number so that the base station knows the capabilities of the mobile station.

The CDMA system supports nine different forms of registration:

1. Power-up registration. The mobile station registers when it powers on, switches from using the alternate serving system, or switches from using the analog system.
2. Power-down registration. The mobile station registers when it powers off if previously registered in the current serving system.
3. Timer-based registration. The mobile station registers when a timer expires.

4. Distance-based registration. The mobile station registers when the distance between the current base station and the base station in which it last registered exceeds a threshold.

5. Zone-based registration. The mobile station registers when it enters a new zone.

6. Parameter-change registration. The mobile station registers when certain of its stored parameters change.

7. Ordered registration. The mobile station registers when the base station requests it.

8. Implicit registration. When a mobile station successfully sends an *Origination Message* or *Page Response Message*, the base station can infer the mobile station's location. This is considered an implicit registration.

9. Traffic Channel registration. Whenever the base station has registration information for a mobile station that has been assigned to a Traffic Channel, the base station can notify the mobile station that it is registered.

The first five forms of registration, as a group, are called autonomous registration and are conditioned, in part, by roaming status and by indicators contained in the *System Parameters Message* (see 6.6.5.3). The base station may initiate ordered registration through an *Order Message*.

While a mobile station is assigned a Traffic Channel, the base station may obtain registration information by using the *Status Request Order* to obtain *Status Messages* from the mobile station. The base station may notify the mobile station that it is registered through the *Mobile Station Registered Message*.

7.6.5.1 Registration on the Paging and Access Channels

The base station shall specify the forms of registration that are enabled, the corresponding registration parameters, and the roaming status conditions for which registration is enabled in the *System Parameters Message*. If any of the autonomous registration forms are enabled, the base station should also enable parameter-based registration.

The base station should process an *Origination Message* or *Page Response Message* sent on the Access Channel as an implicit registration of the mobile station sending the message. The base station can obtain complete registration information about the mobile station at any time by sending a *Registration Request Order* to the mobile station.

7.6.5.2 Registration on the Traffic Channels

The base station can obtain registration information from a mobile station on the traffic channel by means of the *Status Request Order*. When the base station has registration data for a mobile station, the base station may send a *Mobile Station Registered Message* to the mobile station, specifying the base station's registration system, zone and location information.

7.6.6 Handoff Procedures

7.6.6.1 Overview

7.6.6.1.1 Types of Handoff

The base station supports the following three handoff procedures:

- *Soft Handoff*: A handoff in which a new base station commences communications with the mobile station without interrupting the communications with the old base station. The base station[13] can direct the mobile station to perform a soft handoff only when all Forward Traffic Channels assigned to the mobile station have identical frequency assignments. Soft handoff provides diversity of Forward Traffic Channels and Reverse Traffic Channel paths on the boundaries between base stations.
- *CDMA to CDMA Hard Handoff*: A handoff in which the base station directs the mobile station to transition between disjoint sets of base stations, different frequency assignments, or different frame offsets.
- *CDMA to Analog Handoff*: A handoff in which the base station directs the mobile station from a Forward Traffic Channel to an analog voice channel.

Section 6.6.6 describes the mobile station requirements during handoff.

7.6.6.1.2 The Active Set

The Active Set contains the pilots (see 6.6.6.1.2) associated with the Forward Traffic Channels assigned to the mobile station. The base station informs the mobile station of the contents of the Active Set using the *Channel Assignment Message* and the *Handoff Direction Message*.

7.6.6.2 Requirements

7.6.6.2.1 Overhead Information

The base station sends the following messages governing the pilot search procedures performed by the mobile station:

- *System Parameters Message*
- *In-Traffic System Parameters Message*
- *Neighbor List Message*
- *Neighbor List Update Message*
- *Handoff Direction Message*

[13] In this section the term base station may imply multiple cells or sectors.

7.6.6.2.1.1 System Parameters

The base station sends handoff related parameters on the Paging Channel in the *System Parameters Message*.

The base station may revise handoff related parameters for a mobile station operating on the Traffic Channel by sending the *In-Traffic System Parameters Message*.

The base station may also modify the values of the parameters SRCH_WIN_A, T_ADD, T_DROP, T_COMP, and T_TDROP through the *Handoff Direction Message*.

7.6.6.2.1.2 Neighbor List

The base station sends a Neighbor List on the Paging Channel, in the *Neighbor List Message*.

The base station may revise the Neighbor List for a mobile station operating on the Traffic Channel by sending a *Neighbor List Update Message*.

The base station shall not include a pilot that is a member of the mobile station's Active Set in a *Neighbor List Update Message*. The base station shall not specify more than N_{8m} pilots in the *Neighbor List Message* or in the *Neighbor List Update Message*. The base station should list the pilots in the *Neighbor List Update Message* in descending priority order (see 6.6.6.2.6.3).

7.6.6.2.2 Call Processing During Handoff

7.6.6.2.2.1 Processing the *Pilot Strength Measurement Message*

The base station should use the pilot strength measurements in the *Pilot Strength Measurement Message* to determine a new Active Set.

The base station may also use the PN phase measurements in the *Pilot Strength Measurement Message* to estimate the propagation delay to the mobile station. This estimate can be used to reduce Reverse Traffic Channel acquisition time.

The base station may respond to a *Pilot Strength Measurement Message* received from the mobile station by sending the *Handoff Direction Message*.

7.6.6.2.2.2 Processing the *Handoff Direction Message*

The base station shall maintain a *Handoff Direction Message* sequence number. The sequence number shall be initialized to zero prior to the transmission of the first *Handoff Direction Message* to the mobile station. The base station shall increment the sequence number modulo 4 each time the base station modifies the pilot list (including the order in which pilots are specified within the list) sent to the mobile station in a *Handoff Direction Message*.

Following a hard handoff, the base station should set the *Handoff Direction Message* sequence number to the value of the LAST_HDM_SEQ field of the *Handoff Completion Message* and should use the pilot order contained in the *Handoff Completion Message* to interpret the contents of subsequent *Power Measurement Report Messages*.

The base station shall set the contents of a *Handoff Direction Message* according to the following rules:

- A *Handoff Direction Message* shall list no more than N_{6m} pilots in the new Active Set.
- A *Handoff Direction Message* shall identify the identical power control subchannels (i.e., those carrying identical power control symbols).
- When the CDMA frequency assignment is not changed, the *Handoff Direction Message* shall not change the code channel associated with an Active Set pilot that remains in the new Active Set.
- The base station specifies the long code mask to be used on the new Forward Traffic Channel by using the PRIVATE_LCM field of the *Handoff Direction Message*. The base station may change the contents of this field only for CDMA to CDMA hard handoffs. If a change of long code mask is specified and the base station does not specify an explicit action time in the *Handoff Direction Message*, the base station shall begin using the new long code mask on the first 80 ms boundary (relative to System Time) occurring at least 80 ms after the end of the frame containing the last bit of the message.
- For CDMA to CDMA hard handoffs, the base station may require the mobile station to perform a reset of the acknowledgement procedures by using the RESET_L2 field of the *Handoff Direction Message*. If the base station requires the mobile station to reset the acknowledgement procedures, the base station shall also reset the acknowledgement procedures, as specified in 7.6.4.1.3.3.
- For CDMA to CDMA hard handoffs, the base station may alter the frame offset by setting the FRAME_OFFSET field to a new value. If the base station specifies a new frame offset and does not specify an explicit action time, the base station shall change its Forward and Reverse Traffic Channel frame offsets at the second 80 ms boundary (relative to System Time) after the end of transmission of the *Handoff Direction Message*, unless the end of transmission of the message coincides with an 80 ms boundary, in which case the change in frame offsets shall occur 80 ms after the end of transmission.

7.6.6.2.2.3 Transmitting During Handoff

The base station shall continue transmission to the mobile station on a Forward Traffic Channel removed from the Active Set until it receives the *Handoff Completion Message* from the mobile station or determines that the call has been released.

The base station shall discontinue transmission to the mobile station on a Forward Traffic Channel removed from the Active Set after it receives the *Handoff Completion Message*.

7.6.6.2.2.4 Ordering Pilot Measurements From the Mobile Station

The base station may direct the mobile station to send a *Pilot Strength Measurement Message* by sending a *Pilot Measurement Request Order*.

7.6.6.2.3 Active Set Maintenance

The base station shall maintain an Active Set for each mobile station under its control as follows:

- When the base station sends the *Channel Assignment Message* it shall initialize the Active Set to contain only the pilot associated with the assigned Forward Traffic Channel.
- When the base station sends a *Handoff Direction Message* it shall add to the Active Set, before the action time of the message, all pilots named in the message, if they are not already in the Active Set.
- The base station shall delete the pilots that were not named in the most recent *Handoff Direction Message* from the Active Set upon receipt of the *Handoff Completion Message*.

7.6.6.2.4 Soft Handoff

The base station should use soft handoff when directing a mobile station from one Forward Traffic Channel to another Forward Traffic Channel having the same frequency assignment.

7.6.6.2.4.1 Receiving During Soft Handoff

Each base station in the Active Set shall demodulate the Reverse Traffic Channel. The base station should provide diversity combining of the demodulated signals obtained by each base station in the Active Set.

7.6.6.2.4.2 Transmitting During Soft Handoff

The base station shall begin transmitting identical modulation symbols on all Forward Traffic Channels specified in a *Handoff Direction Message* (with the possible exception of the power control subchannel) by the action time of the message.

The base station shall transmit identical power control symbols on all identical power control subchannels that were identified as such in the last *Handoff Direction Message*.

The base station shall use the same long code mask on the Reverse Traffic Channel and on all Forward Traffic Channels whose associated pilots are in the Active Set.

7.6.6.2.5 CDMA to Analog Hard Handoff

The base station may direct the mobile station to perform a handoff from the CDMA system to the analog system by sending an *Analog Handoff Direction Message*.

7.7 Signaling Formats

The following sections specify the requirements on the signaling message formats transmitted on the Sync Channel, the Paging Channel, and the Traffic Channel.

In any multi-bit field in the following messages, the most significant bit (MSB) shall be transmitted first.

7.7.1 Sync Channel

The sync channel is used to provide time and frame synchronization to the mobile station. Only one message, the *Sync Channel Message*, is sent on the Sync Channel.

7.7.1.1 Sync Channel Structure

The Sync Channel is divided into 80 ms superframes (see 7.1.3.3.2). Each superframe is divided into three 26.666... ms frames. The first bit of each frame is a SOM Bit, and the remaining bits in the frame comprise the Sync Channel frame body.

A Sync Channel message capsule is composed of a Sync Channel message and padding. A Sync Channel message consists of a length field, a message body, and a CRC field. Padding consists of zero or more bits.

Sync Channel message capsules shall begin with the first bit of the first Sync Channel frame body of a Sync Channel superframe. The base station shall set the SOM Bit immediately preceding the beginning of a Sync Channel message capsule to '1', and shall set all other SOM Bits to '0'. The base station shall transmit the Sync Channel message in consecutive Sync Channel frame bodies. The base station shall include sufficient padding bits in each Sync Channel message capsule to extend it through the bit preceding the SOM Bit at the beginning of the next Sync Channel superframe. The base station shall begin a new Sync Channel message capsule in the first Sync Channel frame of that superframe.

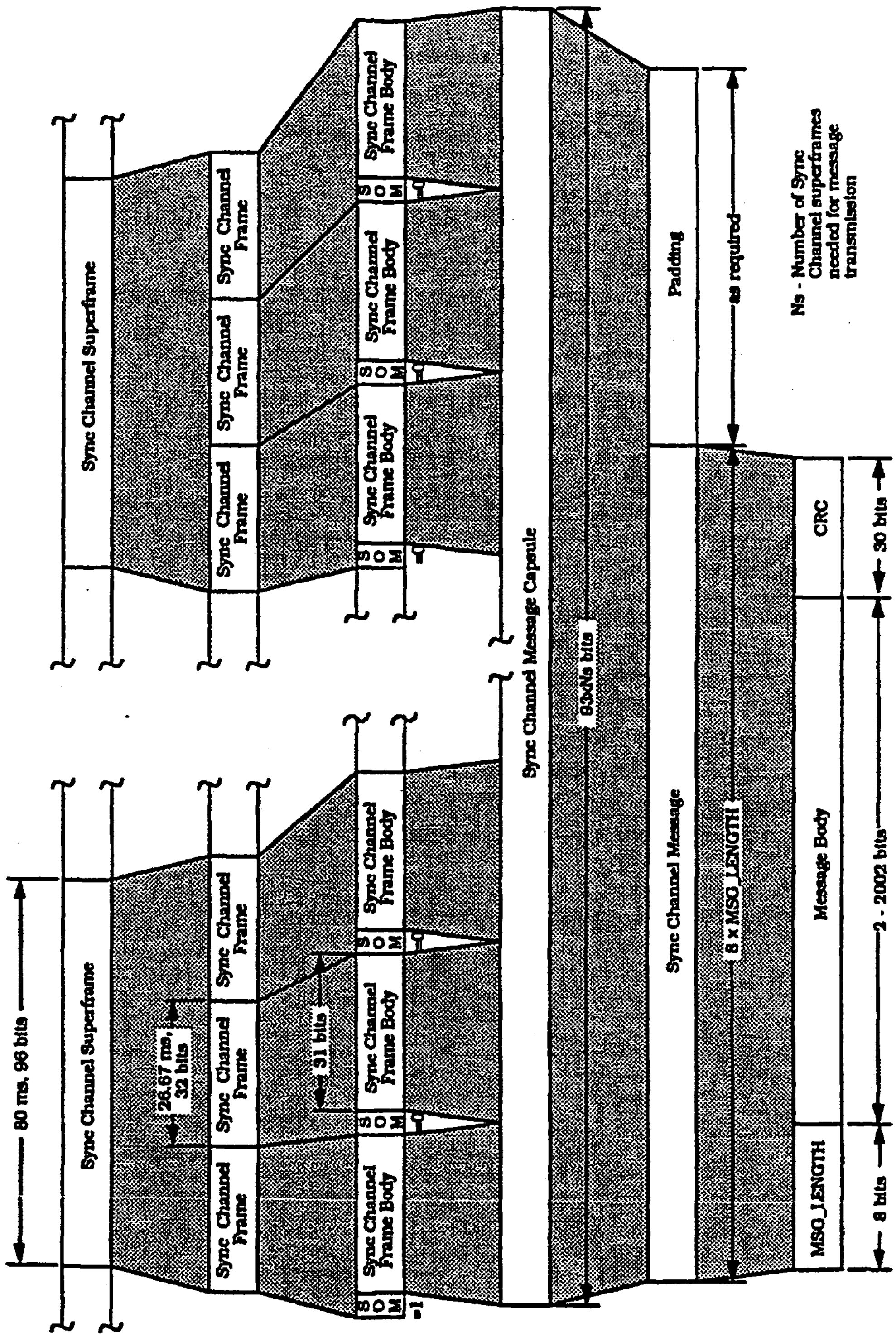

Figure 7.7.1.1-1. Sync Channel Structure (1200 bps) Example

7.7.1.2 Sync Channel Message Structure

The *Sync Channel Message* shall consist of an 8-bit MSG_LENGTH field, a *Sync Channel Message* body field, and a CRC field. Padding bits shall be appended to the end of the *Sync Channel Message* so that the total of the *Sync Channel Message* length added to the length of the padding bits shall be equal to an integer multiple of 93 bits. Padding bits shall be set to '0'.

7.7.1.2.1 Sync Channel MSG_LENGTH Field

The base station shall set the MSG_LENGTH field of the *Sync Channel Message* to the length of the *Sync Channel Message* in octets, including the MSG_LENGTH field, the *Sync Channel Message* body, and the CRC. The MSG_LENGTH field shall be 8 bits in length. The base station shall limit the maximum *Sync Channel Message* length to 148 octets, or 1184 bits. That is, the value of the MSG_LENGTH field shall not exceed 148.

7.7.1.2.2 Sync Channel Signaling Message CRC

A 30-bit CRC shall be computed for each *Sync Channel Message*. The CRC includes the MSG_LENGTH field and the message body field. The generator polynomial for the CRC shall be as follows:

$$g(x) = x^{30} + x^{29} + x^{21} + x^{20} + x^{15} + x^{13} + x^{12} + x^{11} + x^{8} + x^{7} + x^{6} + x^{2} + x + 1.$$

The following procedure and the logic shown in Figure 7.7.1.2.2-1 (or equivalent) shall be used to compute the CRC:

- All shift register elements shall be initialized to logical one.[14]
- The switches shall be set in the up position.
- The information bit count k shall be defined as 8 + message body length in bits.
- The register shall be clocked k times, with the length and message body fields of the message as the k input bits.
- The switches shall be set in the down position.
- The register shall be clocked an additional 30 times.
- The 30 additional output bits shall be the CRC field.
- The bits shall be transmitted in the order in which they appear at the output of the CRC encoder.

[14] Initialization of the register to ones causes the CRC for all-zero data to be non-zero.

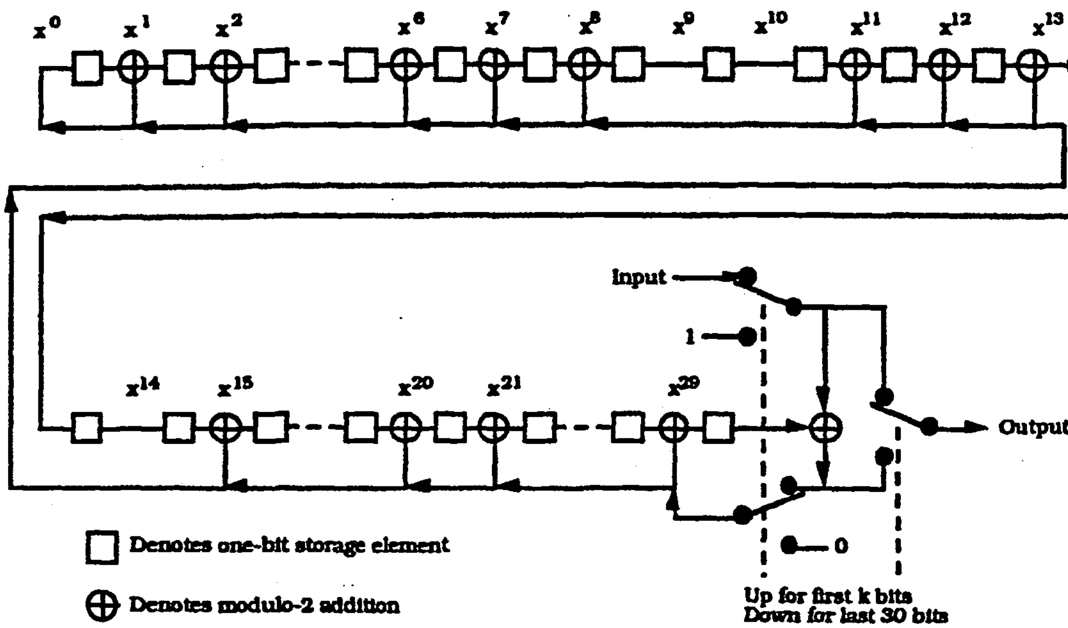

Figure 7.7.1.2.2-1. Sync Channel CRC Calculation

7.7.1.3 Sync Channel Message Body Format

When the base station sends a *Sync Channel Message*, it shall use the following fixed-length message format:

Field	Length (bits)
MSG_TYPE ('00000001')	8
P_REV	8
MIN_P_REV	8
SID	15
NID	16
PILOT_PN	9
LC_STATE	42
SYS_TIME	36
LP_SEC	8
LTM_OFF	6
DAYLT	1
PRAT	2
RESERVED	3

MSG_TYPE - Message type.

The base station shall set this field to '00000001'.

P_REV - Protocol revision level.

The base station shall set this field to '00000001'.

MIN_P_REV - Minimum protocol revision level.

Only mobile stations that support revision numbers greater than or equal to this field access the system.

The base station shall set this field to the minimum protocol revision level that it supports.[15]

SID - System identification.

The base station shall set this field to the system identification number for this cellular system.

[15]It is intended that all future revisions of this specification be backward compatible. However, if a future revision is not compatible, the MIN_P_REV level field allows the protocol to be upgraded, preventing incompatible mobile stations from attempting system acquisition.

NID - Network identification.

This field serves as a sub-identifier of a system as defined by the owner of the SID.

The base station shall set this field to the network identification number for this network. The NID value of 65,535 is reserved.

PILOT_PN - Pilot PN sequence offset index.

The base station shall set this field to the pilot PN sequence offset for this base station, in units of 64 PN chips.

LC_STATE - Long code state.

The base station shall set this field to the long code state at the time given by the SYS_TIME field of this message.

SYS_TIME - System time.

The base station shall set this field to the System Time as of four Sync Channel superframes (320 ms) after the end of the last superframe containing any part of this *Sync Channel Message*, minus the pilot PN sequence offset, in units of 80 ms (see 1.2).

LP_SEC - The number of leap seconds that have occurred since the start of System Time.

The base station shall set this field to the number of leap seconds that have occurred since the start of System Time, as of the time given by the SYS_TIME field of this message.

LTM_OFF - Offset of local time from System Time.

The current local time of day is equal to SYS_TIME - LP_SEC + LTM_OFF.

The base station shall set this field to the two's complement offset of local time from System Time, in units of 30 minutes.

DAYLT - Daylight savings time indicator.

If the daylight savings time is in effect, the base station shall set this field to '1'. Otherwise, the base station shall set this field to '0'.

PRAT - Paging Channel data rate.

The base station shall set this field to the PRAT field value shown in Table 7.7.1.3-1 corresponding to the data rate used by the Paging Channels in the system.

Table 7.7.1.3-1. Paging Channel Data Rate

PRAT Field (binary)	Paging Channel data rate
00	9600 bps
01	4800 bps
10	Reserved
11	Reserved

RESERVED - Reserved bits.

The base station shall set this field to '000'.

7.7.2 Paging Channel

The Paging Channel is used to send control information to mobile stations that have not been assigned to a Traffic Channel.

7.7.2.1 Paging Channel Structure

7.7.2.1.1 Paging Channel Slot Structure

The Paging Channel is divided into 80 ms slots. The slots are grouped into cycles of 2048 slots (163.84 seconds) referred to as maximum slot cycles. Each maximum slot cycle begins at the start of the frame when System Time, in units of 80 ms, modulo 2048 is zero. The slots of each maximum slot cycle are numbered from 0 to 2047, as shown in Figure 7.7.2.1.1-1. A mobile station operating in the slotted mode monitors the Paging Channel using a slot cycle with a length that is a submultiple of the maximum slot cycle length (see 6.6.2.1.1.3).

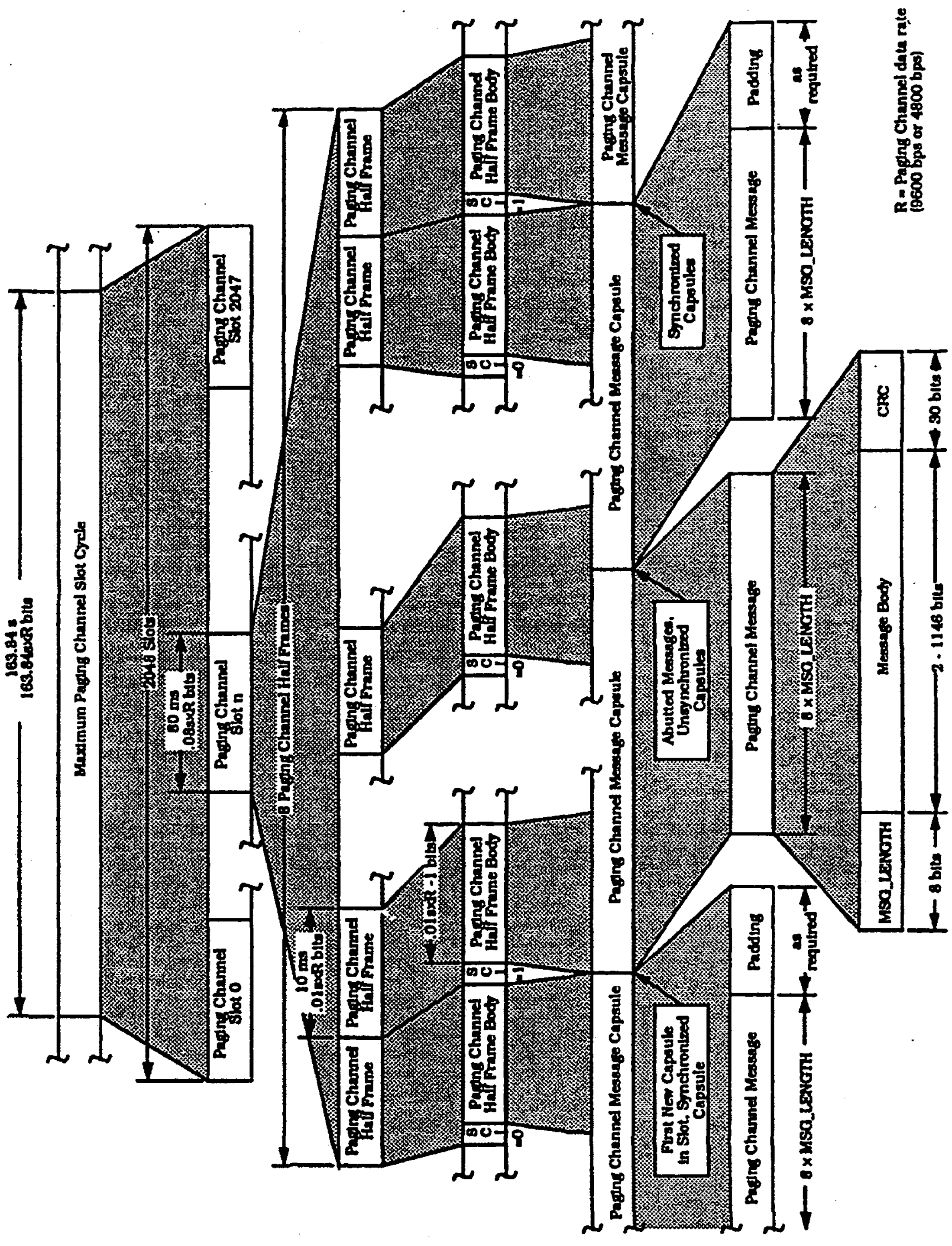

Figure 7.7.2.1.1-1. Paging Channel Structure Example

7.7.2.1.2 Paging Channel Message Capsule Structure

Each 80 ms slot is composed of four Paging Channel frames, each 20 ms in length. As shown in Figure 7.7.2.1.1-1, a 20 ms long Paging Channel frame is divided into 10 ms long Paging Channel half frames. The first bit in any Paging Channel half frame is an SCI (Synchronized Capsule Indicator) Bit.

A Paging Channel message capsule is composed of a Paging Channel message and padding. A Paging Channel message consists of a length field, a message body, and a CRC field. Padding consists of zero or more bits.

The base station may transmit synchronized or unsynchronized Paging Channel message capsules. A synchronized message capsule starts on the second bit of a Paging Channel half frame. An unsynchronized message capsule begins immediately after the previous message capsule.

If after the end of a Paging Channel message there remain 8 bits or more[16] before the next SCI Bit, the base station may transmit an unsynchronized message capsule immediately following that message. The base station shall not include any padding bits in a Paging Channel message capsule that is followed by an unsynchronized Paging Channel message capsule.

If after the end of a Paging Channel message there remain fewer than 8 bits before the next SCI Bit, or if no unsynchronized message capsule is transmitted following a Paging Channel message capsule, the base station shall include sufficient padding bits in that message capsule to extend it through the bit preceding the next SCI Bit, and the base station shall transmit a synchronized message capsule immediately following that SCI Bit.[17] The base station shall set all padding bits to '0'.

When a message capsule immediately follows an SCI Bit, the base station shall set that SCI Bit to '1'. The base station shall set all other SCI Bits to '0'.

The base station shall transmit the first message that begins in each Paging Channel slot in a synchronized message capsule.[18]

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[16]This restriction permits the mobile station to determine whether an unsynchronized message is being transmitted by checking the first 8 bits after the end of the message for a non-zero MSG_LENGTH value.

[17]This implies that all bits transmitted on the Paging Channel are either SCI bits or are part of a message capsule.

[18]This permits mobile stations operating in the slotted mode to obtain synchronization immediately after becoming active.

7.7.2.2 Paging Channel Message Structure

7.7.2.2.1 Paging Channel MSG_LENGTH Field

The base station shall set the MSG_LENGTH field of each Paging Channel message to the length of the message in octets, including the MSG_LENGTH field, the message body, and the CRC. The MSG_LENGTH field shall be 8 bits in length. The base station shall limit the maximum Paging Channel message length to 148 octets, or 1184 bits. That is, the value of the MSG_LENGTH field shall not exceed 148.

7.7.2.2.2 Paging Channel Message CRC

A 30-bit CRC shall be computed for each Paging Channel signaling message. The CRC shall include the MSG_LENGTH field and the message body field. The generator polynomial for the CRC shall be as follows:

$$g(x) = x^{30} + x^{29} + x^{21} + x^{20} + x^{15} + x^{13} + x^{12} + x^{11} + x^{8} + x^{7} + x^{6} + x^{2} + x + 1.$$

The CRC shall be the value computed by the following procedure and the logic shown in Figure 7.7.2.2.2-1:

- All shift register elements shall be initialized to logical one.[19]
- The switches shall be set in the up position.
- The information bit count k shall be defined as 8 + message body length in bits.
- The register shall be clocked k times, with the length and message body fields of the message as the k input bits.
- The switches shall be set in the down position.
- The register shall be clocked an additional 30 times.
- The 30 additional output bits shall be the CRC field.
- The bits shall be transmitted in the order in which they appear at the output of the CRC encoder.

[19] Initialization of the register to ones causes the CRC for all-zero data to be non-zero.

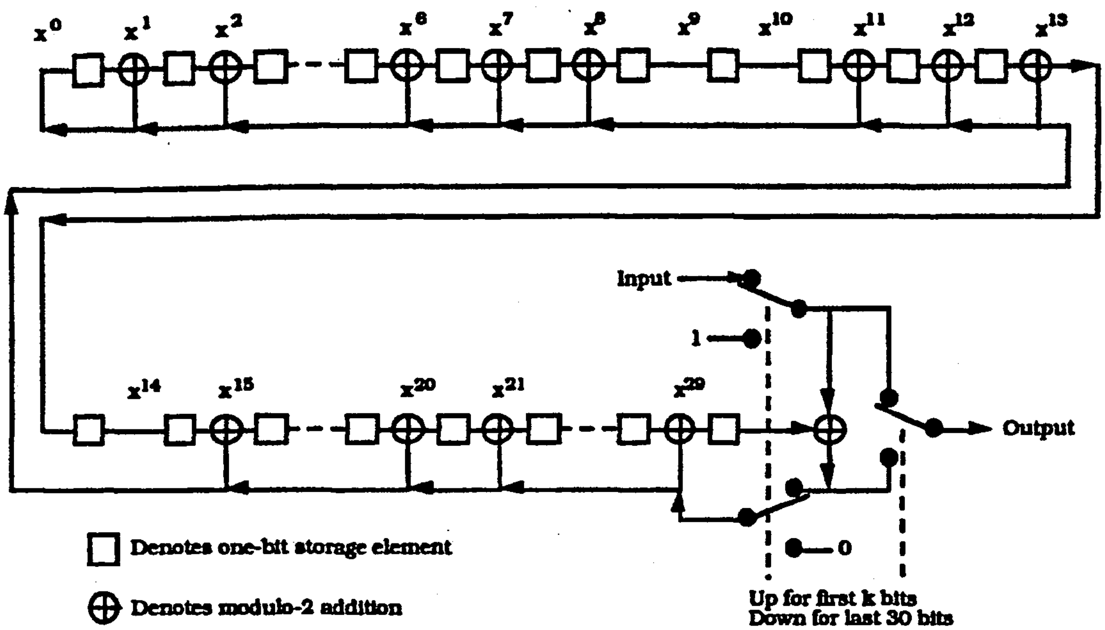

Figure 7.7.2.2.2-1. Paging Channel CRC Calculation

7.7.2.3 Paging Channel Message Body Format

The Paging Channel messages are summarized in Table 7.7.2.3-1. Paging Channel messages are grouped into the message groups shown in the table. Messages of each group are sent either periodically or on an as-needed basis.

Table 7.7.2.3-1. Paging Channel Messages

Message Name	**Message Type (binary)**
System Parameters Message	00000001
Access Parameters Message	00000010
Neighbor List Message	00000011
CDMA Channel List Message	00000100
Slotted Page Message	00000101
Page Message	00000110
Order Message	00000111
Channel Assignment Message	00001000
Data Burst Message	00001001
Authentication Challenge Message	00001010
SSD Update Message	00001011
Feature Notification Message	00001100
Null Message	–

7.7.2.3.1 Common Fields

Many Paging Channel messages include the following common fields defining the mobile station to which the message is addressed.

ADDR_TYPE - Address field type.

The base station shall set this field to the value shown in Table 7.7.2.3.1-1 corresponding to the address type contained in the ADDRESS field.

Table 7.7.2.3.1-1. Address Types

Description	ADDR_TYPE (binary)	ADDR_LEN (octets)
MIN (MIN1 and MIN2)	000	5
ESN	001	4
All other ADDR_TYPE values are reserved		

ADDR_LEN - Address field length.

The base station shall set this field to the number of octets in the ADDRESS field.

ADDRESS - Mobile station address.

The base station shall set this field to the mobile station address, using the address type specified in the ADDR_TYPE field.

If ADDR_TYPE is equal to '000', the ADDRESS field shall consist of the following subfields:

Subfield	Length (bits)
MIN1	24
MIN2	10
RESERVED	6

MIN1 - First part of the mobile identification number (MIN).

The base station shall set this subfield to the MIN1 value for the MIN specified by this address field (see 2.3.1).

MIN2 - Second part of the mobile identification number (MIN).

The base station shall set this subfield to the MIN2 value for the MIN specified by this address field (see 2.3.1).

RESERVED - Reserved bits.

The base station shall set this field to '000000'.

If ADDR_TYPE is equal to '001', the ADDRESS field shall consist of the following subfield:

Subfield	Length (bits)
ESN	32

ESN - Mobile station's electronic serial number.

The base station shall set this field to the electronic serial number of the mobile station to which this message is addressed.

7.7.2.3.2 Message Body Contents

The following sections specify the contents of the message body for each message that may be sent on the Paging Channel.

7.7.2.3.2.1 System Parameters Message

When the base station sends a *System Parameters Message*, it shall use the following fixed-length message format:

Field	Length (bits)
MSG_TYPE ('00000001')	8
PILOT_PN	9
CONFIG_MSG_SEQ	6
SID	15
NID	16
REG_ZONE	12
TOTAL_ZONES	3
ZONE_TIMER	3
MULT_SIDS	1
MULT_NIDS	1
BASE_ID	16
BASE_CLASS	4
PAGE_CHAN	3
MAX_SLOT_CYCLE_INDEX	3
HOME_REG	1
FOR_SID_REG	1
FOR_NID_REG	1
POWER_UP_REG	1
POWER_DOWN_REG	1
PARAMETER_REG	1
REG_PRD	7
BASE_LAT	22
BASE_LONG	23
REG_DIST	11
SRCH_WIN_A	4

(continues on next page)

Field	Length (bits)
SRCH_WIN_N	4
SRCH_WIN_R	4
NGHBR_MAX_AGE	4
PWR_REP_THRESH	5
PWR_REP_FRAMES	4
PWR_THRESH_ENABLE	1
PWR_PERIOD_ENABLE	1
PWR_REP_DELAY	5
RESCAN	1
T_ADD	6
T_DROP	6
T_COMP	4
T_TDROP	4
RESERVED	4

MSG_TYPE - Message type.

The base station shall set this field to '00000001'.

PILOT_PN - Pilot PN sequence offset index.

The base station shall set this field to the pilot PN sequence offset for this base station, in units of 64 PN chips.

CONFIG_MSG_SEQ - Configuration message sequence number.

The base station shall set this field to CONFIG_SEQ (see 7.6.2.2).

SID - System identification.

The base station shall set this field to the system identification number for this cellular system.

NID - Network identification.

This field serves as a sub-identifier of a system as defined by the owner of the SID.

The base station shall set this field to the network identification number for this network. The NID value of 65,535 is reserved.

REG_ZONE - Registration zone.

The base station shall set this field to its registration zone number (see 6.6.5.1.5).

TOTAL_ZONES - Number of registration zones to be retained.

The base station shall set this field to the number of registration zones the mobile station is to retain for purposes of zone-based registration (see 6.6.5.1.5).

If zone-based registration is to be disabled, the base station shall set this field to '000'.

ZONE_TIMER - Zone timer length.

The base station shall set this field to the ZONE_TIMER value shown in Table 7.7.2.3.2.1-1 corresponding to the length of the zone registration timer to be used by mobile stations.

Table 7.7.2.3.2.1-1. Value of Zone Timer

ZONE_TIMER Value (binary)	Timer Length (Minutes)
000	1
001	2
010	5
011	10
100	20
101	30
110	45
111	60

MULT_SIDS - Multiple SID storage indicator.

If mobile stations may store entries of SID_NID_LIST containing different SIDs, the base station shall set this field to '1'; otherwise the base station shall set this field to '0'.

MULT_NIDS - Multiple NID storage indicator.

If mobile stations may store multiple entries of SID_NID_LIST having the same SID (with different NIDs), the base station shall set this field to '1'; otherwise the base station shall set this field to '0'.

BASE_ID - Base station identification.

The base station shall set this field to its identification number.

BASE_CLASS - Base station class.

The base station shall set this field to the value shown in Table 7.7.2.3.2.1-2 corresponding to the class of service provided by this base station.

Table 7.7.2.3.2.1-2. Base Station Classes

Value (binary)	Class of Service Provided
0000	Public Macrocellular System
All other values are reserved.	

PAGE_CHAN - Number of Paging Channels.

The base station shall set this field to the number of Paging Channels on this CDMA Channel. The base station shall not set this field to '000'.

MAX_SLOT_CYCLE_INDEX - Maximum slot cycle index.

The base station shall set this field to the SLOT_CYCLE_INDEX value corresponding to the maximum slot cycle length permitted (see 6.6.2.1.1).

HOME_REG - Home registration indicator.

If mobile stations that are not roaming (see 6.6.5.3) and have MOB_TERM_HOME equal to '1' are to be enabled for autonomous registrations, the base station shall set this field to '1'. If such mobile stations are not to be enabled for autonomous registration, the base station shall set this field to '0'.

FOR_SID_REG - SID roamer registration indicator.

If mobile stations that are foreign SID roamers (see 6.6.5.3) and have MOB_TERM_FOR_SID equal to '1' are to be enabled for autonomous registration, the base station shall set this field to '1'. If such mobile stations are not to be enabled for autonomous registration, the base station shall set this field to '0'.

FOR_NID_REG - NID roamer registration indicator.

If mobile stations that are foreign NID roamers (see 6.6.5.3) and have MOB_TERM_FOR_NID equal to '1' are to be enabled for autonomous registration, the base station shall set this field to '1'. If such mobile stations are not to be enabled for autonomous registration, the base station shall set this field to '0'.

POWER_UP_REG - Power-up registration indicator.

If mobile stations enabled for autonomous registration are to register immediately after powering on and receiving the system overhead messages, the base station shall set this field to '1'. Otherwise, the base station shall set this field to '0'.

POWER_DOWN_REG - Power-down registration indicator.

If mobile stations enabled for autonomous registration are to register immediately before powering down, the base station shall set this field to '1'. Otherwise, the base station shall set this field to '0'.

PARAMETER_REG - Parameter-change registration indicator.

If mobile stations are to register on parameter change events as specified in 6.6.5.1.6, the base station shall set this field to '1'. If not, the base station shall set this field to '0'.

REG_PRD - Registration period.

If mobile stations are not to perform timer-based registration, the base station shall set this field to '0000000'. If mobile stations are to perform timer-based registration, the base station shall set this field to the value in the range 29 to 85 inclusive, such that the desired timer value is

$$\lfloor 2^{REG\_PRD/4} \rfloor \times 0.08 \text{ seconds.}$$

BASE_LAT - Base station latitude.

The base station shall set this field to its latitude in units of 0.25 second, expressed as a two's complement signed number with positive numbers signifying North latitudes.

BASE_LONG - Base station longitude.

The base station shall set this field to its longitude in units of 0.25 second, expressed as a two's complement signed number with positive numbers signifying East longitude.

REG_DIST - Registration distance.

If mobile stations are to perform distance-based registration, the base station shall set this field to the non-zero "distance" beyond which the mobile station is to re-register (see 6.6.5.1.4). If mobile stations are not to perform distance-based registration, the base station shall set this field to 0.

SRCH_WIN_A - Search window size for the Active Set and Candidate Set.

The base station shall set this field to the value shown in Table 6.6.6.2.1-1 corresponding to the search window size to be used by mobile stations for the Active Set and Candidate Set.

SRCH_WIN_N - Search window size for the Neighbor Set.

The base station shall set this field to the value shown in Table 6.6.6.2.1-1 corresponding to the search window size to be used by mobile stations for the Neighbor Set.

SRCH_WIN_R - Search window size for the Remaining Set.

The base station shall set this field to the value shown in Table 6.6.6.2.1-1 corresponding to the search window size to be used by mobile stations for the Remaining Set.

NGHBR_MAX_AGE - Neighbor Set maximum AGE.

The base station shall set this field to the maximum AGE value beyond which mobile stations are to drop members from the Neighbor Set (see 6.6.6.2.6.3).

PWR_REP_THRESH - Power control reporting threshold.

The base station shall set this field to the number of bad frames (see 6.2.2.2) to be received in a measurement period before mobile stations are to generate a *Power Measurement Report Message* (see 6.6.4.1.1). If the base station sets PWR_THRESH_ENABLE to '1', it shall not set this field to '00000'.

PWR_REP_FRAMES - Power control reporting frame count.

The base station shall set this field to the value such that the number given by

$$\lfloor 2^{(PWR\_REP\_FRAMES/2)} \times 5 \rfloor \text{ frames}$$

is the number of frames over which mobile stations are to count frame errors.

PWR_THRESH-_ENABLE - Threshold report mode indicator.

If mobile stations are to generate threshold *Power Measurement Report Messages*, the base station shall set this field to '1'. If mobile stations are not to generate threshold *Power Measurement Report Messages*, the base station shall set this field to '0'.

PWR_PERIOD-_ENABLE - Threshold report mode indicator.

If mobile stations are to generate periodic *Power Measurement Report Messages*, the base station shall set this field to '1'. If mobile stations are not to generate periodic *Power Measurement Report Messages*, the base station shall set this field to '0'.

PWR_REP_DELAY - Power report delay.

The period that mobile stations wait following a *Power Measurement Report Message* before restarting frame counting for power control purposes.

The base station shall set this field to the power report delay value, in units of 4 frames (see 6.6.4.1.1).

RESCAN - Rescan indicator.

If mobile stations are to re-initialize and re-acquire the system upon receiving this message, the base station shall set this field to '1'. Otherwise, the base station shall set this field to '0'.

T_ADD - Pilot detection threshold.

This value is used by mobile stations to trigger the sending of the *Pilot Strength Measurement Message* initiating the handoff process (see 6.6.6).

The base station shall set this field to the pilot detection threshold, expressed as an unsigned binary number equal to $\lfloor -2 \times 10 \times \log_{10} E_c/I_0 \rfloor$.

T_DROP - Pilot drop threshold.

This value is used by mobile stations to start a handoff drop timer for pilots in the Active Set and the Candidate Set (see 6.6.6.2.3).

The base station shall set this field to the pilot drop threshold, expressed as an unsigned binary number equal to $\lfloor -2 \times 10 \times \log_{10} E_c/I_0 \rfloor$.

T_COMP - Active Set versus Candidate Set comparison threshold.

Mobile stations transmit a *Pilot Strength Measurement Message* when the strength of a pilot in the Candidate Set exceeds that of a pilot in the Active Set by this margin (see 6.6.6.2.5.2).

The base station shall set this field to the threshold Candidate Set pilot to Active Set pilot ratio, in units of 0.5 dB.

T_TDROP - Drop timer value.

Timer value after which an action is taken by mobile stations for a pilot that is a member of the Active Set or Candidate Set, and whose strength has not become greater than T_DROP. If the pilot is a member of the Active Set, a *Pilot Strength Measurement Message* is issued. If the pilot is a member of the Candidate Set, it will be moved to the Neighbor Set.

The base station shall set this field to the T_TDROP value shown in Table 6.6.6.2.3-1 corresponding to the drop timer value to be used by mobile stations.

RESERVED - Reserved bits.

The base station shall set this field to '0000'.

7.7.2.3.2.2 Access Parameters Message

The *Access Parameters Message* defines the parameters used by mobile stations when transmitting to the base station on an Access Channel. When the base station sends an *Access Parameters Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00000010')	8
PILOT_PN	9
ACC_MSG_SEQ	6
ACC_CHAN	5
NOM_PWR	4
INIT_PWR	5
PWR_STEP	3
NUM_STEP	4
MAX_CAP_SZ	3
PAM_SZ	4
PSIST(0-9)	6
PSIST(10)	3
PSIST(11)	3
PSIST(12)	3
PSIST(13)	3
PSIST(14)	3
PSIST(15)	3
MSG_PSIST	3
REG_PSIST	3
PROBE_PN_RAN	4
ACC_TMO	4
PROBE_BKOFF	4
BKOFF	4

(continues on next page)

Field	Length (bits)
MAX_REQ_SEQ	4
MAX_RSP_SEQ	4
AUTH	2
RAND	0 or 32
RESERVED	7

MSG_TYPE - Message type.

The base station shall set this field to '00000010'.

PILOT_PN - Pilot PN sequence offset index.

The base station shall set this field to the pilot PN sequence offset for this base station, in units of 64 PN chips.

ACC_MSG_SEQ - Access parameters message sequence number.

The base station shall set this field to ACC_CONFIG_SEQ (see 7.6.2.2).

ACC_CHAN - Number of Access Channels.

The base station shall set this field to one less than the number of Access Channels associated with this Paging Channel.

NOM_PWR - Nominal transmit power offset.

The base station shall set this field to the correction factor to be used by mobile stations in the open loop power estimate, expressed as a two's complement value in units of 1 dB (see 6.1.2.3.1).

INIT_PWR - Initial power offset for access.

The base station shall set this field to the correction factor to be used by mobile stations in the open loop power estimate for the initial transmission on an Access Channel, expressed as a two's complement value in units of 1 dB (see 6.1.2.3.1).

PWR_STEP - Power increment.

The base station shall set this field to the value by which mobile stations are to increase their transmit power between successive access probes in an access probe sequence, in units of 1 dB.

NUM_STEP - Number of access probes.

The base station shall set this field to one less than the maximum number of access probes mobile stations are to transmit in a single access probe sequence.

MAX_CAP_SZ - Maximum Access Channel message capsule size.

The base station shall set this field to the value in the range 0 to 7, three less than the maximum number of Access Channel frames in an Access Channel message capsule.

PAM_SZ - Access Channel preamble length.

The base station shall set this field to one less than the number of Access Channel frames that mobile stations are to transmit in each Access Channel preamble.

PSIST(0-9) - Persistence value for access overload classes 0 through 9.

If mobile stations in access overload classes 0 through 9 are permitted to transmit requests on the Access Channel, the base station shall set this field to the persistence value to be used. If such mobile stations are not permitted to transmit requests on the Access Channel, the base station shall set this field to '111111'.

PSIST(10) - Persistence value for access overload class 10 (test mobile stations).

If mobile stations in access overload class 10 are permitted to transmit requests on the Access Channel, the base station shall set this field to the persistence value to be used. If such mobile stations are not permitted to transmit requests on the Access Channel, the base station shall set this field to '111'.

PSIST(11) - Persistence value for access overload class 11 (emergency mobile stations).

If mobile stations in access overload class 11 are permitted to transmit requests on the Access Channel, the base station shall set this field to the persistence value to be used. If such mobile stations are not permitted to transmit requests on the Access Channel, the base station shall set this field to '111'.

PSIST(12) - Persistence value for access overload class 12.

If mobile stations in access overload class 12 are permitted to transmit requests on the Access Channel, the base station shall set this field to the persistence value to be used. If such mobile stations are not permitted to transmit requests on the Access Channel, the base station shall set this field to '111'.

PSIST(13) - Persistence value for access overload class 13.

If mobile stations in access overload class 13 are permitted to transmit requests on the Access Channel, the base station shall set this field to the persistence value to be used. If such mobile stations are not permitted to transmit requests on the Access Channel, the base station shall set this field to '111'.

PSIST(14) - Persistence value for access overload class 14.

If mobile stations in access overload class 14 are permitted to transmit requests on the Access Channel, the base station shall set this field to the persistence value to be used. If such mobile stations are not permitted to transmit requests on the Access Channel, the base station shall set this field to '111'.

PSIST(15) - Persistence value for access overload class 15.

If mobile stations in access overload class 15 are permitted to transmit requests on the Access Channel, the base station shall set this field to the persistence value to be used. If such mobile stations are not permitted to transmit requests on the Access Channel, the base station shall set this field to '111'.

MSG_PSIST - Persistence modifier for Access Channel attempts for message transmissions.

A mobile station multiplies its transmission probability by 2^{-MSG_PSIST} for such attempts.

The base station shall set this field to the persistence modifier for Access Channel attempts for message transmissions.

REG_PSIST - Persistence modifier for Access Channel attempts for registrations which are not responses to the *Registration Request Order*.

A mobile station multiplies its transmission probability by 2^{-REG_PSIST} for such attempts.

The base station shall set this field to the persistence modifier for Access Channel attempts for registrations which are not responses to the *Registration Request Order*.

PROBE_PN_RAN - Time randomization for Access Channel probes.

A mobile station delays its transmission from System Time by RN PN chips, where RN is a number determined by hashing between 0 and $2^{PROBE\_PN\_RAN} - 1$ PN chips.

The base station shall set this field to the value in the range 0 to 9 inclusive such that the time randomization range is $2^{PROBE\_PN\_RAN} - 1$ PN chips.

ACC_TMO - Acknowledgement timeout.

The base station shall set this field to two less than the length of time mobile stations are to wait after the end of an Access Channel transmission before determining that the base station did not receive the transmission, in units of 80 ms.

PROBE_BKOFF - Access Channel probe backoff range.

The base station shall set this field to one less than the maximum number of slots mobile stations are to delay due to random backoff between consecutive access probes.

BKOFF - Access Channel probe sequence backoff range.

The base station shall set this field to one less than the maximum number of slots mobile stations are to delay due to random backoff between successive access probe sequences and before the first access probe sequence of a response access.

MAX_REQ_SEQ - Maximum number of access probe sequences for an Access Channel request.

The base station shall set this field to the maximum number of access probe sequences mobile stations are to transmit for an Access Channel request. The base station shall set this field to a value greater than 0.

MAX_RSP_SEQ - Maximum number of access probe sequences for an Access Channel response.

The base station shall set this field to the maximum number of access probe sequences mobile stations are to transmit for an Access Channel response. The base station shall set this field to a value greater than 0.

AUTH - Authentication mode.

If mobile stations are to include standard authentication data in Access Channel messages, the base station shall set this field to '01'. If mobile stations are not to include authentication data in Access Channel messages, the base station shall set this field to '00'. All other values are reserved.

RAND - Random challenge value.

If the AUTH field is set to '01', the base station shall set this field to the random challenge value to be used by mobile stations for authentication. If the AUTH field is set to any other value, the base station shall omit this field.

RESERVED - Reserved bits.

The base station shall set this field to '0000000'.

7.7.2.3.2.3 Neighbor List Message

When the base station sends a *Neighbor List Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00000011')	8
PILOT_PN	9
CONFIG_MSG_SEQ	6
PILOT_INC	4
Zero or more occurrences of the following record:	
NGHBR_CONFIG	3
NGHBR_PN	9
RESERVED	0 - 7 (as needed)

MSG_TYPE - Message type.

The base station shall set this field to '00000011'.

PILOT_PN - Pilot PN sequence offset index.

The base station shall set this field to the pilot PN sequence offset for this base station, in units of 64 PN chips.

CONFIG_MSG_SEQ - Configuration message sequence number.

The base station shall set this field to CONFIG_SEQ (see 7.6.2.2).

PILOT_INC - Pilot PN sequence offset index increment.

A mobile station searches for Remaining Set pilots at pilot PN sequence index values that are multiples of this value.

The base station shall set this field to the pilot PN sequence increment, in units of 64 PN chips, that mobile stations are to use for searching the Remaining Set. The base station should set this field to the largest increment such that the pilot PN sequence offsets of all its neighbor base stations are integer multiples of that increment.

The base station shall include one occurrence of the following two-field record for each member mobile stations are to place in their Neighbor Sets. The base station may include zero or more occurrences of the following record.

NGHBR_CONFIG - Neighbor configuration.

The base station shall set this field to the value shown in Table 7.7.2.3.2.3-1 corresponding to the configuration of this neighbor.

Table 7.7.2.3.2.3-1. Neighbor Configuration Field

Value (bin)	Neighbor Configuration
000	The neighbor base station has the same configuration as the current base station.
001	The neighbor base station has a different configuration. It does have a Primary Paging Channel on the current CDMA frequency assignment.
010	The neighbor base station does not have a Paging Channel on the current CDMA frequency assignment. It does have a Primary Paging Channel on the first CDMA Channel listed in the *CDMA Channel List Message* transmitted by the current base station.
011	The neighbor base station configuration is unknown.
100-111	Reserved.

NGHBR_PN - Neighbor pilot PN sequence offset index.

The base station shall set this field to the pilot PN sequence offset for this neighbor, in units of 64 PN chips.

RESERVED - Reserved bits.

The base station shall add reserved bits as needed in order to make the length of the entire message equal to an integer number of octets. The base station shall set these bits to '0'.

7.7.2.3.2.4 CDMA Channel List Message

When the base station sends a *CDMA Channel List Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00000100')	8
PILOT_PN	9
CONFIG_MSG_SEQ	6
One or more occurrences of the following field:	
CDMA_FREQ	11
RESERVED	0 - 7 (as needed)

MSG_TYPE - Message type.

The base station shall set this field to '00000100'.

PILOT_PN - Pilot PN sequence offset index.

The base station shall set this field to the pilot PN sequence offset for this base station, in units of 64 PN chips.

CONFIG_MSG_SEQ - Configuration message sequence number.

The base station shall set this field to CONFIG_SEQ (see 7.6.2.2).

CDMA_FREQ - CDMA Channel frequency assignment.

The order in which occurrences of this field are included gives the designations of the supported CDMA Channels as CDMA Channel 1 through CDMA Channel N.

The base station shall include one occurrence of this field for each CDMA Channel containing a Paging Channel that is supported by this base station. If the Primary CDMA Channel is supported by this base station, the base station shall include its occurrence of this field first. If the Primary CDMA Channel is not supported and the Secondary CDMA Channel is supported, the base station shall include the occurrence of this field corresponding to the Secondary CDMA Channel first.

The base station shall set each occurrence of this field to the CDMA channel number corresponding to the CDMA frequency assignment for that CDMA Channel (see 7.1.1.1).

RESERVED - Reserved bits.

The base station shall add reserved bits as needed in order to make the length of the entire message equal to an integer number of octets. The base station shall set these bits to '0'.

7.7.2.3.2.5 Slotted Page Message

When the base station sends a *Slotted Page Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00000101')	8
CONFIG_MSG_SEQ	6
ACC_MSG_SEQ	6
MORE_PAGES	1
Zero or more occurrences of the following record:	
MSG_SEQ	3
EXT_ADDR	1
MIN1	24
MIN2	0 or 10
SPECIAL_SERVICE	1
SERVICE_OPTION	0 or 16
RESERVED	0 - 7 (as needed)

MSG_TYPE - Message type.

The base station shall set this field to '0000101'.

CONFIG_MSG_SEQ - Configuration message sequence number.

The base station shall set this field to CONFIG_SEQ (see 7.6.2.2).

ACC_MSG_SEQ - Access parameters message sequence number.

The base station shall set this field to ACC_CONFIG_SEQ (see 7.6.2.2).

MORE_PAGES - More slotted pages to follow indicator.

If this message is the last *Slotted Page Message* to begin in the current Paging Channel slot, the base station shall set this field to '0'. Otherwise, the base station shall set this field to '1'.

The base station shall include one occurrence of the following four-field record for each mobile station MIN to be specified in this message.

MSG_SEQ - Message sequence number.

The base station shall set this field to the message sequence number for this message (see 7.6.2.1.4).

EXT_ADDR - Extra address indicator.

If the MIN2 field is included in this record, the base station shall set this field to '1'. If the MIN2 field is not included in this record, the base station shall set this field to '0'.

MIN1 - First part of the mobile station identification number (MIN).

The base station shall set this field to the MIN1 value for the MIN specified by this record (see 2.3.1).

MIN2 - Second part of the mobile station identification number (MIN).

If the EXT_ADDR field is set to '1', the base station shall set this field to the MIN2 value for the MIN specified by this record (see 2.3.1). If the EXT_ADDR field is set to '0', the base station shall omit this field.

SPECIAL_SERVICE - Special service option indicator.

To request a special service option, the base station shall set this field to '1'. To request the default service option (Service Option 1), the base station shall set this field to '0'.

SERVICE_OPTION - Service option.

If the SPECIAL_SERVICE field is set to '1', the base station shall set this field to the service option code shown in TSB58 "Service Option Number Assignments for Wideband Spread Spectrum Digital Cellular System" corresponding to the requested service option. If the SPECIAL_SERVICE field is set to '0', the base station shall omit this field.

RESERVED - Reserved bits.

The base station shall add reserved bits as needed in order to make the length of the entire message equal to an integer number of octets. The base station shall set these bits to '0'.

7.7.2.3.2.6 Page Message

When the base station sends a *Page Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00000110')	8
CONFIG_MSG_SEQ	6
ACC_MSG_SEQ	6
Zero or more occurrences of the following record:	
MSG_SEQ	3
EXT_ADDR	1
MIN1	24
MIN2	0 or 10
SPECIAL_SERVICE	1
SERVICE_OPTION	0 or 16
RESERVED	0 - 7 (as needed)

MSG_TYPE - Message type.

The base station shall set this field to '00000110'.

CONFIG_MSG_SEQ - Configuration message sequence number.

The base station shall set this field to CONFIG_SEQ (see 7.6.2.2).

ACC_MSG_SEQ - Access parameters message sequence number.

The base station shall set this field to ACC_CONFIG_SEQ (see 7.6.2.2).

The base station shall include one occurrence of the following four-field record for each mobile station MIN to be specified in this message.

MSG_SEQ - Message sequence number.

The base station shall set this field to the message sequence number for this message (see 7.6.2.1.4).

EXT_ADDR - Extra address indicator.

If the MIN2 field is included in this record, the base station shall set this field to '1'. If the MIN2 field is not included in this record, the base station shall set this field to '0'.

MIN1 - First part of the mobile station identification number (MIN).

The base station shall set this field to the MIN1 value for the MIN specified by this record (see 2.3.1).

MIN2 - Second part of the mobile station identification number (MIN).

If the EXT_ADDR field is set to '1', the base station shall set this field to the MIN2 value for the MIN specified by this record (see 2.3.1). If the EXT_ADDR field is set to '0', the base station shall omit this field.

SPECIAL_SERVICE - Special service option indicator.

To request a special service option, the base station shall set this field to '1'. To request the default service option (Service Option 1), the base station shall set this field to '0'.

SERVICE_OPTION - Service option.

If the SPECIAL_SERVICE field is set to '1', the base station shall set this field to the service option code shown in TSB58 "Service Option Number Assignments for Wideband Spread Spectrum Digital Cellular System" corresponding to the requested service option. If the SPECIAL_SERVICE field is set to '0', the base station shall omit this field.

RESERVED - Reserved bits.

The base station shall add reserved bits as needed in order to make the length of the entire message equal to an integer number of octets. The base station shall set these bits to '0'.

7.7.2.3.2.7 Order Message

When the base station sends an *Order Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00000111')	8
One or more occurrences of the following record:	
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
VALID_ACK	1
ADDR_TYPE	3
ADDR_LEN	4
ADDRESS	8 × ADDR_LEN
ORDER	6
ADD_RECORD_LEN	3
order-specific fields (if used)	8 × ADD_RECORD_LEN
RESERVED	2

MSG_TYPE - Message type.

The base station shall set this field to '00000111'.

The base station shall include one or more occurrences of the following variable-length order record:

ACK_SEQ - Acknowledgement sequence number.

The base station shall set this field to the MSG_SEQ field from the most recently received Access Channel message requiring an acknowledgement from the mobile station addressed by this order (see 7.6.3.1.1).

MSG_SEQ - Message sequence number.

The base station shall set this field to the message sequence number for this order (see 7.6.2.1.4).

ACK_REQ - Acknowledgement required indicator.

		If the mobile station is to acknowledge this order, the base station shall set this field to '1'. If the mobile station is not to acknowledge this order, the base station shall set this field to '0' (see 7.6.3.1.1).
VALID_ACK	-	Valid acknowledgement indicator.
		To acknowledge the most recently received Access Channel message from the mobile station, the base station shall set this field to '1'. If this order record does not acknowledge the most recently received Access Channel message from the mobile station, the base station shall set this field to '0'.
ADDR_TYPE	-	Address type.
		See 7.7.2.3.1.
ADDR_LEN	-	Address field length.
		See 7.7.2.3.1.
ADDRESS	-	Mobile station address.
		See 7.7.2.3.1.
ORDER	-	Order code.
		The base station shall set this field to the ORDER code (see 7.7.4) for this type of order.
ADD_RECORD_LEN	-	Additional record length.
		The base station shall set this field to the number of octets in the order-specific fields included in this order record.
order-specific fields	-	Order specific fields.
		The base station shall include order-specific fields as specified in 7.7.4 for this type of order.
RESERVED	-	Reserved bits.
		The base station shall set this field to '00'.

7.7.2.3.2.8 Channel Assignment Message

When the base station sends a *Channel Assignment Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00001000')	8
One or more occurrences of the following record:	
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
VALID_ACK	1
ADDR_TYPE	3
ADDR_LEN	4
ADDRESS	8 × ADDR_LEN
ASSIGN_MODE	3
ADD_RECORD_LEN	3
If ASSIGN_MODE = '000', the record also includes the following fields:	
FREQ_INCL	1
CODE_CHAN	8
CDMA_FREQ	0 or 11
FRAME_OFFSET	4
ENCRYPT_MODE	2
RESERVED	0 - 7 (as needed)
If ASSIGN_MODE = '001', the record also includes the following fields:	
RESPOND	1
FREQ_INCL	1
CDMA_FREQ	0 or 11
One or more occurrences of the following field:	
PILOT_PN	9
RESERVED	0 - 7 (as needed)

(continues on next page)

If ASSIGN_MODE = '010', the record also includes the following fields:

RESPOND	1
RESERVED	7

If ASSIGN_MODE = '011', the record also includes the following fields:

SID	15
VMAC	3
ANALOG_CHAN	11
SCC	2
MEM	1

RESERVED	0 - 7 (as needed)

MSG_TYPE - Message type.

The base station shall set this field to '00001000'.

The base station shall include one or more occurrences of the following variable-length assignment record:

ACK_SEQ - Acknowledgement sequence number.

The base station shall set this field to the MSG_SEQ field from the most recently received Access Channel message requiring an acknowledgement from the mobile station addressed by this assignment (see 7.6.3.1.1).

MSG_SEQ - Message sequence number.

The base station shall set this field to the message sequence number for this assignment (see 7.6.2.1.4).

ACK_REQ - Acknowledgement required indicator.

If the mobile station is to acknowledge this message record, the base station shall set this field to '1'. If the mobile station is not to acknowledge this message record, the base station shall set this field to '0' (see 7.6.3.1.1).

VALID_ACK - Valid acknowledgement indicator.

To acknowledge the most recently received Access Channel message from the mobile station, the base station shall set this field to '1'. If this assignment record does not acknowledge the most recently received Access Channel message from the mobile station, the base station shall set this field to '0'.

ADDR_TYPE - Address type.

See 7.7.2.3.1.

ADDR_LEN - Address field length.

See 7.7.2.3.1.

ADDRESS - Mobile station address.

See 7.7.2.3.1.

ASSIGN_MODE - Assignment mode.

The base station shall set this field to the value shown in Table 7.7.2.3.2.8-1 corresponding to the assignment mode for this assignment.

Table 7.7.2.3.2.8-1. Assignment Mode

Value (binary)	Assignment Mode
000	Traffic Channel Assignment
001	Paging Channel Assignment
010	Acquire Analog System
011	Analog Voice Channel Assignment
All other values are reserved.	

ADD_RECORD_LEN - Additional record length.

The base station shall set this field to the number of octets in the fields included after this one in this assignment record.

If the ASSIGN_MODE field is set to '000', the base station shall include the following five fields in the assignment record:

FREQ_INCL - Frequency included indicator.

If the CDMA_FREQ field is included in this assignment record, the base station shall set this bit to '1'. If the CDMA_FREQ field is not included in this assignment record, the base station shall set this bit to '0'.

CODE_CHAN - Code channel.

The base station shall set this field to the code channel index (see 7.1.3.1.8) in the range 1 to 63 inclusive that the mobile station is to use on the Forward Traffic Channel.

CDMA_FREQ - Frequency assignment.

If the FREQ_INCL bit is set to '1', the base station shall set this field to the CDMA Channel number corresponding to the CDMA frequency assignment for the CDMA Channel containing the Forward Traffic Channel the mobile station is to use. If the FREQ_INCL bit is set to '0', the base station shall omit this field.

FRAME_OFFSET - Frame offset.

The Forward and Reverse Traffic Channel frames are delayed FRAME_OFFSET × 1.25 ms relative to system timing (see 7.1.3.5.1).

The base station shall set this field to the Forward and Reverse Traffic Channel frame offset.

ENCRYPT_MODE - Message encryption mode.

The base station shall set this field to the ENCRYPT_MODE value shown in Table 7.7.2.3.2.8-2 corresponding to the encrypting mode that is to be used for messages sent on the Forward and Reverse Traffic Channels, as specified in 6.3.12.2.

Table 7.7.2.3.2.8-2. Message Encryption Modes

ENCRYPT_MODE Field (binary)	Encryption Mode Used
00	Encryption disabled
01	Encrypt call control messages
All other ENCRYPT_MODE values are reserved.	

RESERVED - Reserved bits.

The base station shall add reserved bits as needed in order to make the total length of the fields after the preceding ADD_RECORD_LEN field through this RESERVED field equal to an integer number of octets. The base station shall set these bits to '0'.

If the ASSIGN_MODE field is set to '001', the base station shall include the following four fields in the assignment record:

RESPOND - Respond on new Access Channel indicator.

If the mobile station is to retransmit an *Origination Message* or *Page Response Message* after processing this channel assignment, the base station shall set this field to '1'. The base station may set this field to '0' only in response to a *Page Response Message*.

FREQ_INCL - Frequency included indicator.

If the CDMA_FREQ field is included in this assignment record, the base station shall set this bit to '1'. If the CDMA_FREQ field is not included in this assignment record, the base station shall set this bit to '0'.

CDMA_FREQ - Frequency assignment.

If the FREQ_INCL bit is set to '1', the base station shall set this field to the CDMA Channel number corresponding to the CDMA frequency assignment for the CDMA Channel containing the Paging Channel the mobile station is to use. If the FREQ_INCL bit is set to '0', the base station shall omit this field.

The base station shall include one occurrence of the following field for each base station whose Paging Channel may be monitored by the mobile station. The base station may include one or more occurrences of this field.

PILOT_PN - Pilot PN sequence offset index.

The base station shall set this field to the pilot PN sequence offset for a base station, in units of 64 PN chips. The base station having this pilot PN sequence offset should support a Primary Paging Channel with the same Paging Channel rate as the current base station.

RESERVED - Reserved bits.

The base station shall add reserved bits as needed in order to make the total length of the fields after the preceding ADD_RECORD_LEN field through this RESERVED field equal to an integer number of octets. The base station shall set these bits to '0'.

If the ASSIGN_MODE field is set to '010', the base station shall include the following two fields in the assignment record:

RESPOND - Respond on analog control channel indicator.

If the mobile station is to retransmit an *Origination Message* or *Page Response Message* (see 2.7.1.1) on the analog control channel after processing this channel assignment, the base station shall set this field to '1'. The base station may set this field to '0' only in response to a *Page Response Message*.

RESERVED - Reserved bits.

The base station shall set this field to '0000000'.

If the ASSIGN_MODE field is set to '011', the base station shall include the following six fields in the assignment record:

SID - System identification of the analog system.

The base station shall set this field to the system identification of the analog system supporting the assigned voice channel for this assignment (see 2.3.8).

VMAC - Voice mobile station attenuation code.

The base station shall set this field to the mobile station power level associated with the assigned voice channel for this assignment (see 2.1.2).

ANALOG_CHAN - Voice channel number.

The base station shall set this field to the voice channel number for this assignment (see 2.1.1.1).

SCC - SAT color code.

The base station shall set this field to the supervisory audio tone associated with the assigned voice channel.

MEM - Message encryption mode indicator.

If analog control message encryption is to be enabled on the assigned forward and reverse analog voice channels, the base station shall set this bit to '1'. Otherwise, the base station shall set this bit to '0'.

RESERVED - Reserved bits.

The base station shall add reserved bits as needed in order to make the length of the entire message equal to an integer number of octets. The base station shall set these bits to '0'.

7.7.2.3.2.9 Data Burst Message

When the base station sends a *Data Burst Message* on the Paging Channel, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00001001')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
VALID_ACK	1
ADDR_TYPE	3
ADDR_LEN	4
ADDRESS	8 × ADDR_LEN
MSG_NUMBER	8
BURST_TYPE	6
NUM_MSGS	8
NUM_FIELDS	8
NUM_FIELDS occurrences of the following field:	
CHARi	8
RESERVED	5

MSG_TYPE - Message type.

The base station shall set this field to '00001001'.

ACK_SEQ - Acknowledgement sequence number.

The base station shall set this field to the MSG_SEQ field from the most recently received Access Channel message requiring an acknowledgement from the mobile station addressed by this message (see 7.6.3.1.1).

MSG_SEQ - Message sequence number.

The base station shall set this field to the message sequence number for this message (see 7.6.2.1.4).

ACK_REQ - Acknowledgement required indicator.

If the mobile station is to acknowledge this message, the base station shall set this field to '1'. If the mobile station is not to acknowledge this message, the base station shall set this field to '0' (see 7.6.3.1.1).

VALID_ACK - Valid acknowledgement indicator.

To acknowledge the most recently received Access Channel message from the mobile station, the base station shall set this field to '1'. If this message does not acknowledge the most recently received Access Channel message from the mobile station, the base station shall set this field to '0'.

ADDR_TYPE - Address type.

See 7.7.2.3.1.

ADDR_LEN - Address field length.

See 7.7.2.3.1.

ADDRESS - Mobile station address.

See 7.7.2.3.1.

MSG_NUMBER - Message number.

The base station shall set this field to the number of this message within the data burst stream.

BURST_TYPE - Data burst type.

The base station shall set this field to the value shown in Table 7.7.2.3.2.9-1 for the type of this data burst.

Table 7.7.2.3.2.9-1. Burst Data Types

Value (binary)	Burst Data Type
000000	Unknown burst data type
All other burst data type codes are reserved.	

NUM_MSGS - Number of messages in the data burst stream.

The base station shall set this field to the number of messages in this data burst stream.

NUM_FIELDS - Number of characters in this message.

The base station shall set this field to the number of occurrences of the CHARi field included in this message.

CHARi - Character.

The base station shall include NUM_FIELDS occurrences of this field. The base station shall set these fields to the corresponding octet of the data burst stream.

RESERVED - Reserved bits.

The base station shall set this field to '00000'.

7.7.2.3.2.10 Authentication Challenge Message

When the base station sends an *Authentication Challenge Message* on the Paging Channel, it shall use the following fixed-length message format:

Field	Length (bits)
MSG_TYPE ('00001010')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
VALID_ACK	1
ADDR_TYPE	3
ADDR_LEN	4
ADDRESS	8 × ADDR_LEN
RANDU	24
RESERVED	3

MSG_TYPE - Message type.

The base station shall set this field to '00001010'.

ACK_SEQ - Acknowledgement sequence number.

The base station shall set this field to the MSG_SEQ field from the most recently received Access Channel message requiring an acknowledgement from the mobile station addressed by this message (see 7.6.3.1.1).

MSG_SEQ - Message sequence number.

The base station shall set this field to the message sequence number for this message (see 7.6.2.1.4).

ACK_REQ - Acknowledgement required indicator.

If the mobile station is to acknowledge this message, the base station shall set this field to '1'. If the mobile station is not to acknowledge this message, the base station shall set this field to '0' (see 7.6.3.1.1).

VALID_ACK - Valid acknowledgement indicator.

To acknowledge the most recently received Access Channel message from the mobile station, the base station shall set this field to '1'. If this message does not acknowledge the most recently received Access Channel message from the mobile station, the base station shall set this field to '0'.

ADDR_TYPE - Address type.

See 7.7.2.3.1.

ADDR_LEN - Address field length.

See 7.7.2.3.1.

ADDRESS - Mobile station address.

See 7.7.2.3.1.

RANDU - Random challenge data.

The base station shall set this field to the random challenge data (see 6.3.12.1.5).

RESERVED - Reserved bits.

The base station shall set this field to '000'.

7.7.2.3.2.11 SSD Update Message

When the base station sends an *SSD Update Message* on the Paging Channel, it shall use the following fixed-length message format:

Field	Length (bits)
MSG_TYPE ('00001011')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
VALID_ACK	1
ADDR_TYPE	3
ADDR_LEN	4
ADDRESS	8 × ADDR_LEN
RANDSSD	56
RESERVED	3

MSG_TYPE - Message type.

The base station shall set this field to '00001011'.

ACK_SEQ - Acknowledgement sequence number.

The base station shall set this field to the MSG_SEQ field from the most recently received Access Channel message requiring an acknowledgement from the mobile station addressed by this message (see 7.6.3.1.1).

MSG_SEQ - Message sequence number.

The base station shall set this field to the acknowledgement sequence number for this message (see 7.6.2.1.4).

ACK_REQ - Acknowledgement required indicator.

If the mobile station is to acknowledge this message, the base station shall set this field to '1'. If the mobile station is not to acknowledge this message, the base station shall set this field to '0' (see 7.6.3.1.1).

VALID_ACK - Valid acknowledgement indicator.

To acknowledge the most recently received Access Channel message from the mobile station, the base station shall set this field to '1'. If this message does not acknowledge the most recently received Access Channel message from the mobile station, the base station shall set this field to '0'.

ADDR_TYPE	-	Address type. See 7.7.2.3.1.
ADDR_LEN	-	Address field length. See 7.7.2.3.1.
ADDRESS	-	Mobile station address. See 7.7.2.3.1.
RANDSSD	-	Random data for the computation of SSD. The base station shall set this field as specified in 6.3.12.1.9.
RESERVED	-	Reserved bits. The base station shall set this field to '000'.

7.7.2.3.2.12 Feature Notification Message

When the base station sends a *Feature Notification Message* on the Paging Channel, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00001100')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
VALID_ACK	1
ADDR_TYPE	3
ADDR_LEN	4
ADDRESS	8 × ADDR_LEN
RELEASE	1
One or more occurrences of the following record:	
RECORD_TYPE	8
RECORD_LEN	8
Type-specific fields	8 × RECORD_LEN
RESERVED	2

MSG_TYPE - Message type.

The base station shall set this field to '00001100'.

ACK_SEQ - Acknowledgement sequence number.

The base station shall set this field to the MSG_SEQ field from the most recently received Access Channel message requiring an acknowledgement from the mobile station addressed by this message (see 7.6.3.1.1).

MSG_SEQ - Message sequence number.

The base station shall set this field to the acknowledgement sequence number for this message (see 7.6.2.1.4).

ACK_REQ - Acknowledgement required indicator.

If the mobile station is to acknowledge this message, the base station shall set this field to '1'. If the mobile station is not to acknowledge this message, the base station shall set this field to '0' (see 7.6.3.1.1).

VALID_ACK - Valid acknowledgement indicator.

To acknowledge the most recently received Access Channel message from the mobile station, the base station shall set this field to '1'. If this message does not acknowledge the most recently received Access Channel message from the mobile station, the base station shall set this field to '0'.

ADDR_TYPE - Address type.

See 7.7.2.3.1.

ADDR_LEN - Address field length.

See 7.7.2.3.1.

ADDRESS - Mobile station address.

See 7.7.2.3.1.

RELEASE - Origination completion indicator.

The base station shall set this field to '1' if this message is used to complete an origination request from the mobile station. Otherwise the base station shall set this field to '0'.

The base station shall include occurrences of the following three-field record as specified in 7.7.5.

RECORD_TYPE - Information record type.

The base station shall set this field as specified in 7.7.5.

RECORD_LEN - Information record length.

The base station shall set this field to the number of octets in the type-specific fields included in this record.

type-specific fields - Type-specific fields.

The base station shall include type-specific fields as specified in 7.7.5.

RESERVED - Reserved bits.

The base station shall set this field to '00'.

7.7.2.3.2.13 Null Message

When the base station sends a *Null Message*, it shall use the following fixed-length message format:

Field	Length (bits)
RESERVED	2

RESERVED - Reserved bits.

The base station shall set this field to '00'.

7.7.3 Forward Traffic Channel

During Traffic Channel operation, the base station sends signaling messages to the mobile station using the Forward Traffic Channel.

7.7.3.1 Forward Traffic Channel Structure

When sending a Forward Traffic Channel message, the base station shall send it as signaling traffic using the signaling traffic formats specified in 7.1.3.5.11. The base station may use one or more Forward Traffic Channel frames to send the message.

The first signaling traffic bit in a Forward Traffic Channel frame shall be a Start of Message (SOM) Bit. The base station shall set this bit to '1' if a Forward Traffic Channel message begins in the frame, or to '0' if the frame contains bits of a Forward Traffic Channel message that began in a previous frame. The base station shall use the remaining signaling traffic bits of the frame to send Forward Traffic Channel message bits. If the frame used to send the last bits of a message contains any unused signaling traffic bits, the base station shall set each of these bits, referred to as padding bits, to '0'.

7.7.3.2 Forward Traffic Channel Message Structure

A Forward Traffic Channel message shall consist of a length field (MSG_LENGTH), a message body, and a CRC field, in that order (see Figure 7.7.3.2-1).

MSG_LENGTH	Message Body	CRC
8 bits	16 - 1160 bits	16 bits

Figure 7.7.3.2-1. Forward Traffic Channel Message Structure

7.7.3.2.1 Forward Traffic Channel Message MSG_LENGTH Field

The base station shall set the MSG_LENGTH field of a Forward Traffic Channel message to the length, in octets, of the message, including the MSG_LENGTH field, the message body and the CRC field. The MSG_LENGTH field shall be 8 bits in length. The minimum value of the MSG_LENGTH field shall be 5.[20] The base station shall limit the maximum Forward Traffic Channel message length to 148 octets or 1184 bits. That is, the value of the MSG_LENGTH field shall not exceed 148.

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[20]To accommodate the MSG_LENGTH field, the layer 2 fields present in the Message Body and the CRC field.

7.7.3.2.2 Forward Traffic Channel Message CRC Field

The base station shall set the CRC field of a Forward Traffic Channel message to the CRC computed for the message. The CRC computation shall include the MSG_LENGTH field and the message body. The CRC field shall be 16 bits in length.

The generator polynomial for the CRC shall be the standard CRC-CCITT polynomial:

$$g(x) = x^{16} + x^{12} + x^{5} + 1.$$

The CRC shall be equal to the value computed by the following procedure and the logic shown in Figure 7.7.3.2.2-1:

- All shift register elements shall be initialized to logical one.[21]
- The switches shall be set in the up position.
- The information bit count k shall be defined as 8 + message body length in bits.
- The register shall be clocked k times, with the length and message body fields of the message as the k input bits.
- The switches shall be set in the down position.
- The register shall be clocked an additional 16 times.
- The 16 additional output bits shall be the CRC field.
- The bits shall be transmitted in the order in which they appear at the output of the CRC encoder.

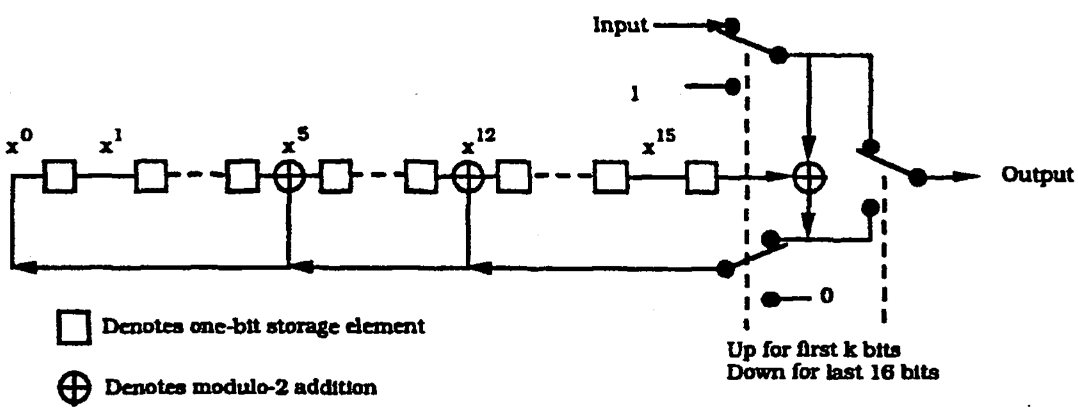

Figure 7.7.3.2.2-1. Forward Traffic Channel Signaling CRC Calculation

[21] Initialization of the register to ones causes the CRC for all-zero data to be non-zero.

7.7.3.3 Forward Traffic Channel Message Body Formats

The signaling messages sent over the Forward Traffic Channel are summarized in Table 7.7.3.3-1.

Table 7.7.3.3-1. Forward Traffic Channel Messages

Message Name	Message type (binary)
Order Message	00000001
Authentication Challenge Message	00000010
Alert With Information Message	00000011
Data Burst Message	00000100
Handoff Direction Message	00000101
Analog Handoff Direction Message	00000110
In-Traffic System Parameters Message	00000111
Neighbor List Update Message	00001000
Send Burst DTMF Message	00001001
Power Control Parameters Message	00001010
Retrieve Parameters Message	00001011
Set Parameters Message	00001100
SSD Update Message	00001101
Flash with Information Message	00001110
Mobile Station Registered Message	00001111

7.7.3.3.1 Common Fields

7.7.3.3.1.1 Common Acknowledgement Fields

All Forward Traffic Channel messages share the same acknowledgement fields:

ACK_SEQ - Acknowledgement sequence number.

The base station shall set this field to the value of the MSG_SEQ field from the most recently received Reverse Traffic Channel message requiring acknowledgement (see 7.6.4.1.3).

MSG_SEQ - Message sequence number.

The base station shall set this field to the message sequence number for this message (see 7.6.4.1.3).

ACK_REQ - Acknowledgement required indicator.

This field indicates whether this message requires an acknowledgement.

To indicate that this message requires acknowledgement, the base station shall set this field to '1'. To indicate that this message does not require acknowledgement, the base station shall set this field to '0'.

7.7.3.3.1.2 Common Encryption Field

All Forward Traffic Channel messages contain the following field:

ENCRYPTION - Message encryption indicator.

The base station shall set this field to the current message encryption mode, equal to the ENCRYPT_MODE field of the last transmitted *Channel Assignment Message* directed to the mobile station, *Handoff Direction Message* or *Message Encryption Mode Order*. The value of this field and the encryption state of a message shall not change if the same message is retransmitted.

7.7.3.3.2 Message Body Contents

The following sections specify the contents of the message body for each message that may be sent on the Forward Traffic Channel.

7.7.3.3.2.1 Order Message

When the base station sends an *Order Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00000001')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
USE_TIME	1
ACTION_TIME	6
ORDER	6
ADD_RECORD_LEN	3
order-specific fields (if used)	8 × ADD_RECORD_LEN
RESERVED	7

MSG_TYPE - Message type.
The base station shall set this field to '00000001'.

ACK_SEQ - Acknowledgement sequence number.
See 7.7.3.3.1.1.

MSG_SEQ - Message sequence number.
See 7.7.3.3.1.1.

ACK_REQ - Acknowledgement required indicator.
See 7.7.3.3.1.1.

ENCRYPTION - Message encryption indicator.
See 7.7.3.3.1.2.

USE_TIME - Use action time indicator.
This field indicates whether an ACTION_TIME is specified in this order.

If an ACTION_TIME can be specified for this order code, as shown in table 7.7.4-1, the base station may set this field to '1'. Otherwise, the base station shall set this field to '0'.

ACTION_TIME - Action time.

If the USE_TIME field is set to '1', the base station shall set this field to the System Time, in units of 80 ms (modulo 64), at which the order is to take effect. If the USE_TIME field is set to '0' the base station shall set this field to '000000'.

ORDER - Order code.

The base station shall set this field to the ORDER code for this type of *Order Message* (see 7.7.4).

ADD_RECORD_LEN - Additional record length.

The base station shall set this field to the number of octets in the order-specific fields included in this message.

order-specific fields - Order specific fields.

The base station shall include order-specific fields as specified in 7.7.4.

RESERVED - Reserved bits.

The base station shall set these bits to '0000000'.

7.7.3.3.2.2 Authentication Challenge Message

When the base station sends an *Authentication Challenge Message* on the Forward Traffic Channel, it shall use the following fixed-length message format:

Field	Length (bits)
MSG_TYPE ('00000010')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
RANDU	24
RESERVED	7

MSG_TYPE - Message type.
The base station shall set this field to '00000010'.

ACK_SEQ - Acknowledgement sequence number.
See 7.7.3.3.1.1.

MSG_SEQ - Message sequence number.
See 7.7.3.3.1.1.

ACK_REQ - Acknowledgement required indicator.
See 7.7.3.3.1.1.

ENCRYPTION - Message encryption indicator.
See 7.7.3.3.1.2.

RANDU - Random challenge data.
The base station shall set this field as specified in 6.3.12.1.5.

RESERVED - Reserved bits.
The base station shall set these bits to '0000000'.

7.7.3.3.2.3 Alert With Information Message

When the base station sends an *Alert With Information Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00000011')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
Zero or more occurrences of the following record:	
RECORD_TYPE	8
RECORD_LEN	8
Type-specific fields	8 × RECORD_LEN
RESERVED	7

MSG_TYPE - Message type.

The base station shall set this field to '00000011'.

ACK_SEQ - Acknowledgement sequence number.

See 7.7.3.3.1.1.

MSG_SEQ - Message sequence number.

See 7.7.3.3.1.1.

ACK_REQ - Acknowledgement required indicator.

See 7.7.3.3.1.1.

ENCRYPTION - Message encryption indicator.

See 7.7.3.3.1.2.

The base station shall include occurrences of the following three-field record as specified in 7.7.5.

RECORD_TYPE - Information record type.

The base station shall set this field as specified in 7.7.5.

RECORD_LEN - Information record length.

The base station shall set this field to the number of octets in the type-specific fields included in this record.

type-specific fields	-	Type-specific fields. The base station shall include type-specific fields as specified in 7.7.5.
RESERVED	-	Reserved bits. The base station shall set these bits to '0000000'.

7.7.3.3.2.4 Data Burst Message

When the base station sends a *Data Burst Message* on the Forward Traffic Channel, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00000100')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
MSG_NUMBER	8
BURST_TYPE	6
NUM_MSGS	8
NUM_FIELDS	8
NUM_FIELDS occurrences of the following field:	
CHARi	8
RESERVED	1

MSG_TYPE - Message type.

The base station shall set this field to '00000100'.

ACK_SEQ - Acknowledgement sequence number.

See 7.7.3.3.1.1.

MSG_SEQ - Message sequence number.

See 7.7.3.3.1.1.

ACK_REQ - Acknowledgement required indicator.

See 7.7.3.3.1.1.

ENCRYPTION - Message encryption indicator.

See 7.7.3.3.1.2.

MSG_NUMBER - Message number.

The base station shall set this field to the number of this message within the data burst stream.

BURST_TYPE - Data burst type.

The base station shall set this field to the value shown in Table 7.7.2.3.2.9-1 for the type of this data burst.

NUM_MSGS - Number of messages in the data burst stream.

The base station shall set this field to the number of messages in this data burst stream.

NUM_FIELDS - Number of characters in this message.

The base station shall set this field to the number of occurrences of the CHARi field included in this message.

CHARi - Character.

The base station shall include NUM_FIELDS occurrences of this field. The base station shall set these fields to the corresponding octet of the data burst stream.

RESERVED - Reserved bits.

The base station shall set this field to '0'.

7.7.3.3.2.5 Handoff Direction Message

When the base station sends a *Handoff Direction Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE('00000101')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
USE_TIME	1
ACTION_TIME	6
HDM_SEQ	2
SRCH_WIN_A	4
T_ADD	6
T_DROP	6
T_COMP	4
T_TDROP	4
FRAME_OFFSET	4
PRIVATE_LCM	1
RESET_L2	1
ENCRYPT_MODE	2
FREQ_INCL	1
CDMA_FREQ	0 or 11
One or more occurrences of the following record:	
PILOT_PN	9
PWR_COMB_IND	1
CODE_CHAN	8
RESERVED	0 - 7 (as needed)

MSG_TYPE - Message type.

The base station shall set this field to '00000101'.

ACK_SEQ - Acknowledgement sequence number.

See 7.7.3.3.1.1.

MSG_SEQ - Message sequence number.

See 7.7.3.3.1.1.

ACK_REQ - Acknowledgement required indicator.

See 7.7.3.3.1.1.

ENCRYPTION - Message encryption indicator.

See 7.7.3.3.1.2.

USE_TIME - Use action time indicator.

This field indicates whether an ACTION_TIME is specified in this message.

If an ACTION_TIME is specified in this message, the base station shall set this field to '1'. Otherwise, the base station shall set this field to '0'.

ACTION_TIME - Action time.

If the USE_TIME field is set to '1', the base station shall set this field to the System Time, in units of 80 ms (modulo 64), at which the handoff is to take effect. If the USE_TIME field is set to '0' the base station shall set this field to '000000'.

HDM_SEQ - *Handoff Direction Message* sequence number.

This field is used by the mobile station in the *Power Measurement Report Message* to identify the order in which the reported pilot strengths are sent.

The base station shall set this field to the *Handoff Direction Message* sequence number, LAST_HDM_SEQ, as specified in 7.6.6.2.2.

SRCH_WIN_A - Search window size for the Active Set and Candidate Set.

The base station shall set this field to the window size parameter shown in Table 6.6.6.2.1-1 corresponding to the number of PN chips that the mobile station is to search for pilots in the Active Set and Candidate Set.

T_ADD - Pilot detection threshold.

This value is used by the mobile station to trigger the sending of the *Pilot Strength Measurement Message* initiating the handoff process (see 6.6.6).

The base station shall set this field to the pilot detection threshold, expressed as an unsigned binary number equal to $\lfloor -2 \times 10 \times \log_{10} E_c/I_0 \rfloor$.

T_DROP - Pilot drop threshold.

This value is used by the mobile station to trigger the sending of the *Pilot Strength Measurement Message* terminating the handoff process and to move pilots from the Candidate Set to the Neighbor Set (see 6.6.6).

The base station shall set this field to the pilot drop threshold, expressed as an unsigned binary number equal to $\lfloor -2 \times 10 \times \log_{10} E_c/I_0 \rfloor$.

T_COMP - Active Set versus Candidate Set comparison threshold.

The mobile station transmits a *Pilot Strength Measurement Message* when the strength of a pilot in the Candidate Set exceeds that of a pilot in the Active Set by this margin (see 6.6.6.2.5.2).

The base station shall set this field to the threshold Candidate Set pilot to Active Set pilot ratio, in units of 0.5 dB.

T_TDROP - Drop timer value.

Timer value after which an action is taken by the mobile station for a pilot that is a member of the Active Set or Candidate Set, and whose strength has not become greater than T_DROP. If the pilot is a member of the Active Set, a *Pilot Strength Measurement Message* is issued. If the pilot is a member of the Candidate Set, it will be moved to the Neighbor Set.

The base station shall set this field to the T_TDROP value shown in Table 6.6.6.2.3-1 corresponding to the drop timer value to be used by the mobile station.

FRAME_OFFSET - Frame offset.

The Forward and Reverse Traffic Channel frames are delayed FRAME_OFFSET × 1.25 ms relative to system timing (see 7.1.3.5.1).

The base station shall set this field to the Forward and Reverse Traffic Channel frame offset.

PRIVATE_LCM - Private long code mask indicator.

This field is used to change the long code mask after a hard handoff.

If the private long code mask is to be used after the handoff, the base station shall set this field to '1'. Otherwise the base station shall set this field to '0'.

RESET_L2 - Reset acknowledgement procedures command.

This field is used to reset acknowledgement processing in the mobile station.

To direct the mobile station to reset its acknowledgement procedures, the base station shall set this field to '1'. Otherwise, the base station shall set this field to '0'.

ENCRYPT_MODE - Message encryption mode.

The base station shall set this field to the ENCRYPT_MODE value shown in Table 7.7.2.3.2.8-2 corresponding to the encrypting mode that is to be used for messages sent on the Forward and Reverse Traffic Channels, as specified in 6.3.12.2.

FREQ_INCL - Alternate frequency assignment indicator.

If the CDMA_FREQ field is included for this message, the base station shall set this field to '1'. Otherwise, the base station shall set this field to '0'.

CDMA_FREQ - Frequency assignment for the CDMA Channel.

If the FREQ_INCL field is set to '1', the base station shall set this field to the CDMA Channel number corresponding to the CDMA frequency assignment for the CDMA Channel as specified in 7.1.1.1. Otherwise, the base station shall omit this field.

The base station shall include one occurrence of the following three-field record for each member of the mobile station's new Active Set.

PILOT_PN - Pilot PN sequence offset index.

The base station shall set this field to the pilot PN sequence offset for this pilot in units of 64 PN chips.

PWR_COMB_IND - Power control symbol combining indicator.

If the Forward Traffic Channel associated with this pilot will carry the same closed-loop power control subchannel bits as that of the previous pilot in this message, the base station shall set this field to '1'. Otherwise, the base station shall set this field to '0'. For the first occurrence of this record in the message, the base station shall set this field to '0'.

CODE_CHAN - Code channel index.

The base station shall set this field to the code channel index (see 7.1.3.1.8) in the range 1 to 63 inclusive that the mobile station is to use on the Forward Traffic Channel associated with this pilot.

RESERVED - Reserved bits.

The base station shall add reserved bits as needed in order to make the length of the entire message equal to an integer number of octets. The base station shall set these bits to '0'.

7.7.3.3.2.6 Analog Handoff Direction Message

When the base station sends an *Analog Handoff Direction Message*, it shall use the following fixed-length message format:

Field	Length (bits)
MSG_TYPE ('00000110')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
USE_TIME	1
ACTION_TIME	6
SID	15
VMAC	3
ANALOG_CHAN	11
SCC	2
MEM	1

MSG_TYPE - Message type.

The base station shall set this field to '00000110'.

ACK_SEQ - Acknowledgement sequence number.

See 7.7.3.3.1.1.

MSG_SEQ - Message sequence number.

See 7.7.3.3.1.1.

ACK_REQ - Acknowledgement required indicator.

See 7.7.3.3.1.1.

ENCRYPTION - Message encryption indicator.

See 7.7.3.3.1.2.

USE_TIME - Use action time indicator.

This field indicates whether an ACTION_TIME is specified in this message.

If an ACTION_TIME is specified in this message, the base station shall set this field to '1'. Otherwise, the base station shall set this field to '0'.

ACTION_TIME - Action time.

If the USE_TIME field is set to '1', the base station shall set this field to the System Time, in units of 80 ms (modulo 64), at which the handoff is to take effect. If the USE_TIME field is set to '0' the base station shall set this field to '000000'.

SID - System identification of the analog system.

The base station shall set this field to the system identification number for the analog cellular system (see 2.3.8).

VMAC - Voice mobile station attenuation code.

This field indicates the mobile station's power level associated with the designated voice channel.

The base shall set this field to the MAC value shown in Table 2.1.2.2-1 corresponding to the nominal power for this mobile station.

ANALOG_CHAN - Analog voice channel number.

The base station shall set this field to the channel number of the analog voice channel, as specified in Table 2.1.1.1-1.

SCC - SAT color code.

This indicates the supervisory audio tone associated with the designated analog voice channel.

The base station shall set this field to the SAT value shown in Table 3.7.1.1-2 (see 2.4.1).

MEM - Message encryption mode indicator.

To enable analog control message encryption on the assigned forward and reverse analog voice channels, the base station shall set this bit to '1'. To disable analog control message encryption, the base station shall set this bit to '0'.

7.7.3.3.2.7 In-Traffic System Parameters Message

When the base station sends an *In-Traffic System Parameters Message*, it shall use the following fixed-length message format:

Field	Length (bits)
MSG_TYPE ('00000111')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
SID	15
NID	16
SRCH_WIN_A	4
SRCH_WIN_N	4
SRCH_WIN_R	4
T_ADD	6
T_DROP	6
T_COMP	4
T_TDROP	4
NGHBR_MAX_AGE	4
RESERVED	4

MSG_TYPE - Message type.
The base station shall set this field to '00000111'.

ACK_SEQ - Acknowledgement sequence number.
See 7.7.3.3.1.1.

MSG_SEQ - Message sequence number.
See 7.7.3.3.1.1.

ACK_REQ - Acknowledgement required indicator.
See 7.7.3.3.1.1.

ENCRYPTION - Message encryption indicator.
See 7.7.3.3.1.2.

SID - System identification.

The base station shall set this field to the system identification number for this cellular system.

NID - Network identification.

This field serves as a sub-identifier of a system as defined by the owner of the SID.

The base station shall set this field to the network identification number for this network. The NID value of 65,535 is reserved.

SRCH_WIN_A - Search window size for the Active Set and Candidate Set.

The base station shall set this field to the window size parameter shown in Table 6.6.6.2.1-1 corresponding to the number of PN chips that the mobile station is to search for pilots in the Active Set and Candidate Set.

SRCH_WIN_N - Search window size for the Neighbor Set.

The base station shall set this field to the window size parameter shown in Table 6.6.6.2.1-1 corresponding to the number of PN chips that the mobile station is to search for pilots in the Neighbor Set.

SRCH_WIN_R - Search window size for the Remaining Set.

The base station shall set this field to the window size parameter shown in Table 6.6.6.2.1-1 corresponding to the number of PN chips that the mobile station is to search for pilots in the Remaining Set.

T_ADD - Pilot detection threshold.

This value is used by the mobile station to trigger the sending of the *Pilot Strength Measurement Message* initiating the handoff process (see 6.6.6).

The base station shall set this field to the pilot detection threshold, expressed as an unsigned binary number equal to $\lfloor -2 \times 10 \times \log_{10} E_c/I_0 \rfloor$.

T_DROP - Pilot drop threshold.

This value is used by the mobile station to trigger the sending of the *Pilot Strength Measurement Message* terminating the handoff process and to move pilots from the Candidate Set to the Neighbor Set (see 6.6.6).

The base station shall set this field to the pilot drop threshold, expressed as an unsigned binary number equal to $\lfloor -2 \times 10 \times \log_{10} E_c/I_0 \rfloor$.

T_COMP - Active Set versus Candidate Set comparison threshold.

The mobile station transmits a *Pilot Strength Measurement Message* when the strength of a pilot in the Candidate Set exceeds that of a pilot in the Active Set by this margin (see 6.6.6.2.5.2).

The base station shall set this field to the threshold Candidate Set pilot to Active Set pilot ratio, in units of 0.5 dB.

T_TDROP - Drop timer value.

Timer value after which an action is taken by the mobile station for a pilot that is a member of the Active Set or Candidate Set, and whose strength has not become greater than T_DROP. If the pilot is a member of the Active Set, a *Pilot Strength Measurement Message* is issued. If the pilot is a member of the Candidate Set, it will be moved to the Neighbor Set.

The base station shall set this field to the T_TDROP value shown in Table 6.6.6.2.3-1 corresponding to the drop timer value to be used by the mobile station.

NGHBR_MAX_AGE - Maximum age for retention of Neighbor Set members.

The mobile station drops neighbor set members whose AGE count exceeds this field.

The base station shall set this field to the Neighbor Set maximum age retention value (see 6.6.6.2.6.3).

RESERVED - Reserved bits.

The base station shall set this field to '0000'.

7.7.3.3.2.8 Neighbor List Update Message

When the base station sends a *Neighbor List Update Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00001000')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
PILOT_INC	4
One or more occurrences of the following field:	
NGHBR_PN	9
RESERVED	0 - 7 (as needed)

MSG_TYPE - Message type.

The base station shall set this field to '00001000'.

ACK_SEQ - Acknowledgement sequence number.

See 7.7.3.3.1.1.

MSG_SEQ - Message sequence number.

See 7.7.3.3.1.1.

ACK_REQ - Acknowledgement required indicator.

See 7.7.3.3.1.1.

ENCRYPTION - Message encryption indicator.

See 7.7.3.3.1.2.

PILOT_INC - Pilot PN sequence offset index increment.

The mobile station searches for Remaining Set pilots at pilot PN sequence offset index values that are multiples of this value.

The base station shall set this field to the pilot PN sequence increment, in units of 64 PN chips, that the mobile station is to use for searching the Remaining Set. The base station should set this field to the largest increment such that the pilot PN sequence offsets of all its neighbor base stations are integer multiples of that increment.

NGHBR_PN - Neighbor pilot PN sequence offset index.

The base station shall include one occurrence of this field for each pilot in its neighbor list. The base station shall set this field to the pilot's PN sequence offset, in units of 64 PN chips.

RESERVED - Reserved bits.

The base station shall add reserved bits as needed in order to make the length of the entire message equal to an integer number of octets. The base station shall set these bits to '0'.

7.7.3.3.2.9 Send Burst DTMF Message

When the base station sends a *Send Burst DTMF Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00001001')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
NUM_DIGITS	8
DTMF_ON_LENGTH	3
DTMF_OFF_LENGTH	3
NUM_DIGITS occurrences of the following field:	
DIGITi	4
RESERVED	0 - 7 (as needed)

MSG_TYPE - Message type.

The base station shall set this field to '00001001'.

ACK_SEQ - Acknowledgement sequence number.

See 7.7.3.3.1.1.

MSG_SEQ - Message sequence number.

See 7.7.3.3.1.1.

ACK_REQ - Acknowledgement required indicator.

See 7.7.3.3.1.1.

ENCRYPTION - Message encryption indicator

See 7.7.3.3.1.2.

NUM_DIGITS - Number of DTMF digits.

The base station shall set this field to the number of DTMF digits included in this message.

DTMF_ON_LENGTH - DTMF pulse width code.

The base station shall set this field to the DTMF_ON_LENGTH value shown in Table 6.7.2.3.2.7-1 corresponding to the requested pulse width of the DTMF pulse to be generated by the mobile station.

DTMF_OFF_LENGTH - DTMF interdigit interval code.

The base station shall set this field to the DTMF_OFF_LENGTH value shown in Table 6.7.2.3.2.7-2 corresponding to the requested minimum interdigit interval between DTMF pulses to be generated by the mobile station.

DIGITi - DTMF digit.

The base station shall include one occurrence of this field for each DTMF digit to be generated by the mobile station. The base station shall set each occurrence of this field to the code value shown in Table 6.7.1.3.2.4-4 corresponding to the dialed digit.

RESERVED - Reserved bits.

The base station shall add reserved bits as needed in order to make the length of the entire message equal to an integer number of octets. The base station shall set these bits to '0'.

7.7.3.3.2.10 Power Control Parameters Message

When the base station sends a *Power Control Parameters Message*, it shall use the following fixed-length message format:

Field	Length (bits)
MSG_TYPE ('00001010')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
PWR_REP_THRESH	5
PWR_REP_FRAMES	4
PWR_THRESH_ENABLE	1
PWR_PERIOD_ENABLE	1
PWR_REP_DELAY	5
RESERVED	7

MSG_TYPE - Message type.

The base station shall set this field to '00001010'.

ACK_SEQ - Acknowledgement sequence number.

See 7.7.3.3.1.1.

MSG_SEQ - Message sequence number.

See 7.7.3.3.1.1.

ACK_REQ - Acknowledgement required indicator.

See 7.7.3.3.1.1.

ENCRYPTION - Message encryption indicator.

See 7.7.3.3.1.2.

PWR_REP_THRESH - Power control reporting threshold.

The base station shall set this field to the number of bad frames (see 6.2.2.2) to be received in a measurement period before mobile stations are to generate a *Power Measurement Report Message* (see 6.6.4.1.1). If the base station sets PWR_THRESH_ENABLE to '1', it shall not set this field to '00000'.

PWR_REP_FRAMES - Power control reporting frame count.

The base station shall set this field to the value such that the number given by

$$\lfloor 2^{(PWR\_REP\_FRAMES/2)} \times 5 \rfloor \text{ frames}$$

is the number of frames over which the mobile station is to count frame errors.

PWR_THRESH-_ENABLE - Threshold report mode indicator.

If mobile stations are to generate threshold *Power Measurement Report Messages*, the base station shall set this field to '1'. If mobile stations are not to generate threshold *Power Measurement Report Messages*, the base station shall set this field to '0'.

PWR_PERIOD-_ENABLE - Threshold report mode indicator.

If mobile stations are to generate periodic *Power Measurement Report Messages*, the base station shall set this field to '1'. If mobile stations are not to generate periodic *Power Measurement Report Messages*, the base station shall set this field to '0'.

PWR_REP_DELAY - Power report delay.

The period that the mobile station waits following a *Power Measurement Report Message* before restarting frame counting for power control purposes.

The base station shall set this field to the power report delay value, in units of 4 frames (see 6.6.4.1.1).

RESERVED - Reserved bits.

The base station shall set this field to '0000000'.

7.7.3.3.2.11 Retrieve Parameters Message

When the base station sends a *Retrieve Parameters Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00001011')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
One or more occurrences of the following field:	
PARAMETER_ID	16
RESERVED	7

MSG_TYPE - Message type.

The base station shall set this field to '00001011'.

ACK_SEQ - Acknowledgement sequence number.

See 7.7.3.3.1.1.

MSG_SEQ - Message sequence number.

See 7.7.3.3.1.1.

ACK_REQ - Acknowledgement required indicator.

See 7.7.3.3.1.1.

ENCRYPTION - Message encryption indicator.

See 7.7.3.3.1.2.

PARAMETER_ID - Parameter identification.

The base station can request the mobile station to report any parameter specified in Table E-1.

The base station shall include one occurrence of this field for each parameter requested. The base station shall set this field to the parameter identification number specified in Table E-1 corresponding to the parameter requested.

RESERVED - Reserved bits.

The base station shall set this field to '0000000'.

7.7.3.3.2.12 Set Parameters Message

When the base station sends a *Set Parameters Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00001100')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
One or more occurrences of the following record:	
PARAMETER_ID	16
PARAMETER_LEN	10
PARAMETER	PARAMETER_LEN
RESERVED	0 - 7 (as needed)

MSG_TYPE - Message type.
The base station shall set this field to '00001100'.

ACK_SEQ - Acknowledgement sequence number.
See 7.7.3.3.1.1.

MSG_SEQ - Message sequence number.
See 7.7.3.3.1.1.

ACK_REQ - Acknowledgement required indicator.
See 7.7.3.3.1.1.

ENCRYPTION - Message encryption indicator.
See 7.7.3.3.1.2.

The base station shall include one occurrence of the following three-field record for each parameter to be set.

PARAMETER_ID - Parameter identification.
The base station shall set this field to the identification shown in Table E-1 corresponding to the settable parameter to be set.

PARAMETER_LEN	-	Parameter length. The base station shall set this field to the length shown in Table E-1 corresponding to the parameter to be set.
PARAMETER	-	Parameter value. The base station shall set this field to the value of the parameter specified by the PARAMETER_ID field.
RESERVED	-	Reserved bits. The base station shall add reserved bits as needed in order to make the length of the entire message equal to an integer number of octets. The base station shall set these bits to '0'.

7.7.3.3.2.13 SSD Update Message

When the base station sends an *SSD Update Message* on the Forward Traffic Channel, it shall use the following fixed-length message format:

Field	Length (bits)
MSG_TYPE ('00001101')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
RANDSSD	56
RESERVED	7

MSG_TYPE - Message type. The base station shall set this field to '00001101'.

ACK_SEQ - Acknowledgement sequence number.
See 7.7.3.3.1.1.

MSG_SEQ - Message sequence number.
See 7.7.3.3.1.1.

ACK_REQ - Acknowledgement required indicator.
See 7.7.3.3.1.1.

ENCRYPTION - Message encryption indicator.
See 7.7.3.3.1.2.

RANDSSD - Random data.
The base station shall set this field as specified in 6.3.12.1.9.

RESERVED - Reserved bits.
The base station shall set this field to '0000000'.

7.7.3.3.2.14 Flash With Information Message

When the base station sends a *Flash With Information Message*, it shall use the following variable-length message format:

Field	Length (bits)
MSG_TYPE ('00001110')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
One or more occurrences of the following record:	
RECORD_TYPE	8
RECORD_LEN	8
Type-specific fields	8 × RECORD_LEN
RESERVED	7

MSG_TYPE - Message type.
The base station shall set this field to '00001110'.

ACK_SEQ - Acknowledgement sequence number.
See 7.7.3.3.1.1.

MSG_SEQ - Message sequence number.
See 7.7.3.3.1.1.

ACK_REQ - Acknowledgement required indicator.
See 7.7.3.3.1.1.

ENCRYPTION - Message encryption indicator.
See 7.7.3.3.1.2.

The base station shall include occurrences of the following three-field record as specified in 7.7.5.

RECORD_TYPE - Information record type.
The base station shall set this field as specified in 7.7.5.

RECORD_LEN - Information record length.
The base station shall set this field to the number of octets in the type-specific fields included in this record.

type-specific fields	-	**Type-specific fields.** The base station shall include type-specific fields as specified in 7.7.5.
RESERVED	-	**Reserved bits.** The base station shall set this field to '0000000'.

7.7.3.3.2.15 Mobile Station Registered Message

When the base station sends a *Mobile Station Registered Message*, it shall use the following fixed-length message format:

Field	Length (bits)
MSG_TYPE ('00001111')	8
ACK_SEQ	3
MSG_SEQ	3
ACK_REQ	1
ENCRYPTION	2
SID	15
NID	16
REG_ZONE	12
TOTAL_ZONES	3
ZONE_TIMER	3
MULT_SIDS	1
MULT_NIDS	1
BASE_LAT	22
BASE_LONG	23
REG_DIST	11
RESERVED	4

MSG_TYPE - Message type.

The base station shall set this field to '00001111'.

ACK_SEQ - Acknowledgement sequence number.

See 7.7.3.3.1.1.

MSG_SEQ - Message sequence number.

See 7.7.3.3.1.1.

ACK_REQ - Acknowledgement required indicator.

See 7.7.3.3.1.1.

ENCRYPTION - Message encryption indicator.

See 7.7.3.3.1.2.

SID - System identification.

The base station shall set this field to the system identification number for this cellular system.

NID - Network identification.

This field serves as a sub-identifier of a system as defined by the owner of the SID.

The base station shall set this field to the network identification number for this network. The NID value of 65,535 is reserved.

REG_ZONE - Registration zone.

The base station shall set this field to its registration zone number (see 6.6.5.1.5).

TOTAL_ZONES - Number of registration zones to be retained.

The base station shall set this field to the number of registration zones the mobile station is to retain for purposes of zone-based registration (see 6.6.5.1.5).

If zone-based registration is to be disabled, the base station shall set this field to '000'.

ZONE_TIMER - Zone timer length.

The base station shall set this field to the ZONE_TIMER value shown in Table 7.7.2.3.2.1-1 corresponding to the length of the zone registration timer to be used by mobile stations.

MULT_SIDS - Multiple SID storage indicator.

If mobile stations may store entries of SID_NID_LIST containing different SIDs, the base station shall set this field to '1'; otherwise the base station shall set this field to '0'.

MULT_NIDS - Multiple NID storage indicator.

If mobile stations may store multiple entries of SID_NID_LIST having the same SID (with different NIDs), the base station shall set this field to '1'; otherwise the base station shall set this field to '0'.

BASE_LAT - Base station latitude.

The base station shall set this field to its latitude in units of 0.25 second, expressed as a two's complement signed number with positive numbers signifying North latitudes.

BASE_LONG - Base station longitude.

The base station shall set this field to its longitude in units of 0.25 second, expressed as a two's complement signed number with positive numbers signifying East longitude.

REG_DIST - Registration distance.

If mobile stations are to perform distance-based registration, the base station shall set this field to the non-zero "distance" beyond which the mobile station is to re-register (see 6.6.5.1.4). If mobile stations are not to perform distance-based registration, the base station shall set this field to 0.

RESERVED - Reserved bits.

The base station shall set this field to '0000'.

7.7.4 Orders

Order Messages are sent by the base station on the Paging Channel and on the Forward Traffic Channel. The general format used on the Paging Channel is defined in 7.7.2.3.2.7, and the general format used on the Forward Traffic Channel is defined in 7.7.3.3.2.1. There are many specific types of *Order Messages*, as shown in Table 7.7.4-1.

The base station may send on the Paging Channel any type of order shown in Table 7.7.4-1 with a 'Y' in the first column, but shall not send on the Paging Channel any type of order with an 'N' in the first column. The base station may send on the Forward Traffic Channel any type of order shown in Table 7.7.4-1 with a 'Y' in the second column, but shall not send on the Forward Traffic Channel any type of order with an 'N' in the second column.

An order consists of a 6-bit order code and zero or more order-specific fields. The base station shall set the ORDER field in the *Order Message* to the order code shown in Table 7.7.4-1 corresponding to the type of order being sent.

If the order qualification code in the fourth column of Table 7.7.4-1 is '00000000' and there are no other additional fields as shown by an 'N' in the sixth column, the base station shall include no order qualification code or other order-specific fields in the *Order Message*. The order qualification code of such a message is implicitly '00000000'.

If the order qualification code is not '00000000' and there are no other additional fields as shown in Table 7.7.4-1 by an 'N' in the sixth column, the base station shall include the order qualification code as the only order specific field in the *Order Message*.

If there are other additional fields as shown in Table 7.7.4-1 by a 'Y' in the sixth column, the base station shall include order-specific fields as specified in the corresponding subsection of this section.

Table 7.7.4-1. Order and Order Qualification Codes Used on the Paging Channel and the Forward Traffic Channel (Part 1 of 3)

Paging Channel Order	Forward Traffic Channel Order	Order Code, ORDER (binary)	Order Qualification Code, ORDQ (binary)	ACTION_TIME can be specified	Additional Fields other than ORDQ	Name/Function
Y	N	000001	00000000	N	N	*Abbreviated Alert Order*
Y	Y	000010	00000000	N	Y	*Base Station Challenge Confirmation Order* (see 7.7.4.1)
N	Y	000011	000000nn	Y	N	*Message Encryption Mode Order* (where nn is the mode per Table 7.7.2.3.2.8-2)
Y	N	000100	00000000	N	N	*Reorder Order*
N	Y	000101	0000nnnn	N	N	*Parameter Update Order* (where 'nnnn' is the Request Number)
Y	Y	000110	00000000	N	N	*Audit Order*
Y	N	001001	00000000	N	N	*Intercept Order*
N	Y	001010	00000000	N	N	*Maintenance Order*
Y	Y	010000	00000000	N	N	*Base Station Acknowledgement Order*
N	Y	010001	00000000	N	N	*Pilot Measurement Request Order*
Y	Y	010010	0001nnnn	N	N	*Lock Until Power-Cycled Order* (where nnnn is the lock reason)
Y	Y	010010	0010nnnn	N	N	*Maintenance Required Order* (where nnnn is the maintenance reason)
Y	N	010010	11111111	N	N	*Unlock Order*
N	Y	010011	00000000	Y	Y	*Service Option Request Order* (see 7.7.4.2)

1 **Table 7.7.4-1. Order and Order Qualification Codes Used on the Paging Channel and**
2 **the Forward Traffic Channel (Part 2 of 3)**

Paging Channel Order	Forward Traffic Channel Order	Order Code, ORDER (binary)	Order Qualification Code, ORDQ (binary)	ACTION_TIME can be specified	Additional Fields other than ORDQ	Name/Function
N	Y	010100	00000000	Y	Y	*Service Option Response Order* (see 7.7.4.3)
Y	Y	010101	00000000	N	N	*Release Order* (no reason given)
Y	Y	010101	00000010	N	N	*Release Order* (indicates that requested service option is rejected)
N	Y	010111	00000000	Y	N	*Long Code Transition Request Order* (request public)
N	Y	010111	00000001	Y	N	*Long Code Transition Request Order* (request private)
N	Y	011001	0000nnnn	N	N	*Continuous DTMF Tone Order* (where the tone is designated by 'nnnn' as defined in Table 6.7.1.3.2.4-4)
N	Y	011001	11111111	N	N	*Continuous DTMF Tone Order* (Stop continuous DTMF tone)
N	Y	011010	nnnnnnnn	N	Y	*Status Request Order* (see 7.7.4.4)
Y	N	011011	00000000	N	N	*Registration Accepted Order*
Y	N	011011	00000001	N	N	*Registration Request Order*

Table 7.7.4-1. Order and Order Qualification Codes Used on the Paging Channel and the Forward Traffic Channel (Part 3 of 3)

Paging Channel Order	Forward Traffic Channel Order	Order Code, ORDER (binary)	Order Qualification Code, ORDQ (binary)	ACTION_TIME can be specified	Additional Fields other than ORDQ	Name/Function
Y	N	011011	00000010	N	N	*Registration Rejected Order*
N	Y	011101	nnnnnnnn	Y	N	*Service Option Control Order* (the specific control is designated by 'nnnnnnnn' as determined by each service option)
Y	Y	011110	nnnnnnnn	N	N	*Local Control Order* (the specific order is designated by 'nnnnnnnn' as determined by each system)
All other codes are reserved.						

7.7.4.1 Base Station Challenge Confirmation Order

The *Base Station Challenge Confirmation Order* can be sent on either the Paging Channel or on the Forward Traffic Channel. The base station shall use the following fixed-length format for the order-specific fields:

Order Specific Field	Length (bits)
ORDQ	8
AUTHBS	18
RESERVED	6

ORDQ - Order qualification code.

The base station shall set this field to '00000000'.

AUTHBS - Challenge response.

The base station shall set this field as specified in 6.3.12.1.9.

RESERVED - Reserved bits.

The base station shall set this field to '000000'.

7.7.4.2 Service Option Request Order

The *Service Option Request Order* can be sent only on the Forward Traffic Channel. The base station shall use the following fixed-length format for the order-specific fields:

Order Specific Field	Length (bits)
ORDQ	8
SERVICE_OPTION	16

ORDQ - Order qualification code.

The base station shall set this field to '00000000'.

SERVICE_OPTION - Service option.

The base station shall set this field to the service option code shown in TSB58 "Service Option Number Assignments for Wideband Spread Spectrum Digital Cellular System" corresponding to the requested or alternative service option.

7.7.4.3 Service Option Response Order

The *Service Option Response Order* can be sent only on the Forward Traffic Channel. The base station shall use the following fixed-length format for the order-specific fields:

Order Specific Field	Length (bits)
ORDQ	8
SERVICE_OPTION	16

ORDQ - Order qualification code.

The base station shall set this field to '00000000'.

SERVICE_OPTION - Service option.

The base station shall set this field to the service option code shown in TSB58 "Service Option Number Assignments for Wideband Spread Spectrum Digital Cellular System" corresponding to the accepted service option, or to '0000000000000000' to reject the last service option requested by the mobile station.

7.7.4.4 Status Request Order

The *Status Request Order* can be sent only on the Forward Traffic Channel. The ORDQ field of the *Status Request Order* specifies the information record to be returned by the mobile station in the *Status Message*. The base station shall use the following variable-length format for the order-specific fields:

Order Specific Field	Length (bits)
ORDQ	8
SID	0 or 15
NID	0 or 16
RESERVED	0 or 1 (as needed)

ORDQ - Order qualification code.

The base station shall set this field to the order qualification code corresponding to the information record type to be returned by the mobile station in the *Status Message*, as shown in Table 7.7.4.4-1.

Table 7.7.4.4-1. Status Request ORDQ Values

Information Record Requested	ORDQ (binary)
Identification	00000110
Call Mode	00000111
Terminal Information	00001000
MIN Information	00001001
Security Status	00001010
All other ORDQ values are reserved.	

SID - System identification.

If the ORDQ field is set to '00000110', the base station shall set this field to the system identification number for this cellular system. Otherwise, the base station shall omit this field.

NID - Network identification.

This field serves as a sub-identifier of a system as defined by the owner of the SID.

If the ORDQ field is set to '00000110', the base station shall set this field to the network identification number for this network. The NID value of 65,535 is reserved. Otherwise, the base station shall omit this field.

RESERVED - Reserved bits.

The base station shall add reserved bits as needed in order to make the length of the order-specific fields equal to an integer number of octets. The base station shall set these bits to '0'.

7.7.5 Information Records

On the Paging Channel, information records may be included in the *Feature Notification Message*. On the Forward Traffic Channel, information records may be included in the *Alert with Information Message* and the *Flash with Information Message*. Table 7.7.5-1 lists the information record type values that may be used with each message type. The following sections describe the contents of each of the record types in detail.

Table 7.7.5-1. Information Record Types

Feature	Alert	Flash	Information Record	Record Type (binary)
Y	Y	Y	Display	00000001
Y	Y	Y	Called Party Number	00000010
Y	Y	Y	Calling Party Number	00000011
N	N	Y	Connected Number	00000100
Y	Y	Y	Signal	00000101
Y	N	Y	Message Waiting	00000110
All other record type values are reserved.				

7.7.5.1 Display

This information record allows the network to supply display information that may be displayed by the mobile station. The base station shall use the following variable-length format for the type-specific fields:

Type-Specific Field	Length (bits)
One or more occurrences of the following field:	
CHARi	8

CHARi - Character.

The base station shall include one occurrence of this field for each character to be displayed. The base station shall set each occurrence of this field to the ASCII representation corresponding to the character entered, as specified in ANSI X3.4, with the most significant bit set to '0'.

7.7.5.2 Called Party Number

This information record identifies the called party's number. The base station shall use the following variable-length format for the type-specific fields:

Type-Specific Field	Length (bits)
NUMBER_TYPE	3
NUMBER_PLAN	4
Zero or more occurrences of the following field:	
CHARi	8
RESERVED	1

NUMBER_TYPE - Type of number.

The base station shall set this field to the NUMBER_TYPE value shown in Table 6.7.1.3.2.4-2 corresponding to the type of the called number, as defined in ANSI T1.607 §4.5.9.

NUMBER_PLAN - Numbering plan.

The base station shall set this field to the NUMBER_PLAN value shown in Table 6.7.1.3.2.4-3 corresponding to the numbering plan used for the called number, as defined in ANSI T1.607 §4.5.9.

CHARi - Character.

The base station shall include one occurrence of this field for each character in the called number. The base station shall set each occurrence of this field to the ASCII representation corresponding to the character, as specified in ANSI X3.4, with the most significant bit set to '0'.

RESERVED - Reserved bits.

The base station shall set this field to '0'.

7.7.5.3 Calling Party Number

This information record identifies the calling party's number. The base station shall use the following variable-length format for the type-specific fields:

Type-Specific Field	Length (bits)
NUMBER_TYPE	3
NUMBER_PLAN	4
PI	2
SI	2
Zero or more occurrences of the following field:	
CHARi	8
RESERVED	5

NUMBER_TYPE - Type of number.

The base station shall set this field to the NUMBER_TYPE value shown in Table 6.7.1.3.2.4-2 corresponding to the type of the calling number, as defined in ANSI T1.607 §4.5.9.

NUMBER_PLAN - Numbering plan.

The base station shall set this field to the NUMBER_PLAN value shown in Table 6.7.1.3.2.4-3 corresponding to the numbering plan used for the calling number, as defined in ANSI T1.607 §4.5.9.

PI - Presentation indicator.

This field indicates whether or not the calling number should be displayed.

The base station shall set this field to the PI value shown in Table 6.7.4.4-1 corresponding to the presentation indicator, as defined in ANSI T1.607 §4.5.9.

SI - Screening indicator.

This field indicates how the calling number was screened.

The base station shall set this field to the SI value shown in Table 6.7.4.4-2 corresponding to the screening indicator value, as defined in ANSI T1.607 §4.5.9.

CHARi - Character.

The base stations shall include one occurrence of this field for each character in the calling number. The base station shall set each occurrence of this field to the ASCII representation corresponding to the character, as specified in ANSI X3.4, with the most significant bit set to '0'.

RESERVED - Reserved bits.

The base station shall set this field to '00000'.

7.7.5.4 Connected Number

This information record identifies the responding party to a call. The base station shall use the following variable-length format for the type-specific fields:

Type-Specific Field	Length (bits)
NUMBER_TYPE	3
NUMBER_PLAN	4
PI	2
SI	2
Zero or more occurrences of the following field:	
CHARi	8
RESERVED	5

NUMBER_TYPE - Type of number.

The base station shall set this field to the NUMBER_TYPE value shown in Table 6.7.1.3.2.4-2 corresponding to the type of the connected number, as defined in ANSI T1.607 §4.5.9.

NUMBER_PLAN - Numbering plan.

The base station shall set this field to the NUMBER_PLAN value shown in Table 6.7.1.3.2.4-3 corresponding to the numbering plan used for the connected number, as defined in ANSI T1.607 §4.5.9.

PI - Presentation indicator.

This field indicates whether or not the connected number should be displayed.

The base station shall set this field to the PI value shown in Table 6.7.4.4-1 corresponding to the presentation indicator, as defined in ANSI T1.607 §4.5.9.

SI - Screening indicator.

This field indicates how the connected number was screened.

The base station shall set this field to the SI value shown in Table 6.7.4.4-2 corresponding to the screening indicator value, as defined in ANSI T1.607 §4.5.9.

CHARi - Character.

The base station shall include one occurrence of this field for each character in the connected number. The base station shall set each occurrence of this field to the ASCII representation corresponding to the character, as specified in ANSI X3.4, with the most significant bit set to '0'.

RESERVED - Reserved bits.

The base station shall set this field to '00000'.

7.7.5.5 Signal

This information record allows the network to convey information to a user by means of tones and other alerting signals.

The Standard Alert is defined as SIGNAL_TYPE = '10', ALERT_PITCH = '00' and SIGNAL = '000001'.

The base station shall use the following fixed-length format for the type-specific fields:

Type-Specific Field	Length (bits)
SIGNAL_TYPE	2
ALERT_PITCH	2
SIGNAL	6
RESERVED	6

SIGNAL_TYPE - Signal type.

The base station shall set this field to the signal type value shown in Table 7.7.5.5-1.

Table 7.7.5.5-1. Signal Type

Description	SIGNAL_ TYPE (binary)
Tone signal	00
ISDN Alerting	01
IS-54B Alerting	10
Reserved	11

ALERT_PITCH - Pitch of the alerting signal.

This field is ignored unless SIGNAL_TYPE is '10', IS-54B Alerting.

If SIGNAL_TYPE is '10', the base station shall set this field to the alert pitch shown in Table 7.7.5.5-2. Otherwise, the base station shall set this field to '00'.

Table 7.7.5.5-2. Alert Pitch

Description	ALERT_PITCH (binary)
Medium pitch (standard alert)	00
High pitch	01
Low pitch	10
Reserved	11

SIGNAL - Signal code.

The base station shall set this field to the specific signal desired. If SIGNAL_TYPE is '00', the base station shall set this field as described in Table 7.7.5.5-3. If SIGNAL_TYPE is '01', the base station shall set this field as described in Table 7.7.5.5-4. If SIGNAL_TYPE is '10', the base station shall set this field as described in Table 7.7.5.5-5.

Table 7.7.5.5-3. Tone Signals (SIGNAL_TYPE = '00')

Description	SIGNAL (binary)
Dial tone on: a continuous 350-Hz tone added to a 440-Hz tone.	000000
Ring back tone on: a 440-Hz tone added to a 480-Hz tone repeated in a 2s-on 4s-off pattern	000001
Intercept tone on: alternating 440-Hz and 620-Hz tones, each on for 250 ms.	000010
Abbreviated intercept: alternating 440-Hz and 620-Hz tones, each on for 250 ms, repeated for four seconds.	000011
Network congestion (reorder) tone on: a 480-Hz tone added to a 620-Hz tone repeated in a 250-ms-on, 250-ms-off cycle.	000100
Abbreviated network congestion (reorder): a 480-Hz tone added to a 620-Hz tone repeated in a 250-ms-on, 250-ms-off cycle for four seconds.	000101
Busy tone on: a 480-Hz tone added to a 620-Hz tone repeated in a 500-ms-on, 500-ms-off cycle.	000110
Confirm tone on: a 350-Hz tone added to a 440-Hz tone repeated 3 times in a 100-ms-on, 100-ms-off cycle.	000111
Answer tone on: answer tone is not presently used in North American networks	001000
Call waiting tone on: a 300 ms burst of 440-Hz tone	001001
Tones off	111111
All other SIGNAL values are reserved	

Table 7.7.5.5-4. ISDN Alerting (SIGNAL_TYPE = '01')

Description	SIGNAL (binary)
Normal Alerting: 2.0 s on, 4.0 s off, repeating	000000
Intergroup Alerting: 0.8 s on, 0.4 s off, 0.8 s on, 4.0 s off, repeating	000001
Special/Priority Alerting: 0.4 s on, 0.2 s off, 0.4 s on, 0.2 s off, 0.8 s on, 4.0 s off, repeating	000010
Reserved (ISDN Alerting pattern 3)	000011
"Ping ring": single burst of 500 ms	000100
Reserved (ISDN Alerting pattern 5)	000101
Reserved (ISDN Alerting pattern 6)	000110
Reserved (ISDN Alerting pattern 7)	000111
Alerting off	001111
All other SIGNAL values are reserved	

Table 7.7.5.5-5. IS-54B Alerting (SIGNAL_TYPE = '10')

Description	SIGNAL (binary)
No Tone: Off	000000
Long: 2.0 s on, 4.0 s off, repeating (standard alert)	000001
Short-Short: 0.8 s on, 0.4 s off, 0.8 s on, 4.0 s off, repeating	000010
Short-Short-Long: 0.4 s on, 0.2 s off, 0.4 s on, 0.2 s off, 0.8 s on, 4.0 s off, repeating	000011
Short-Short-2: 1.0 s on, 1.0 s off, 1.0 s on, 3.0 s off, repeating.	000100
Short-Long-Short: 0.5 s on, 0.5 s off, 1.0 s on, 0.5 s off, 0.5 s on, 3.0 s off, repeating.	000101
Short-Short-Short-Short: 0.5 s on, 0.5 s off, 0.5 s on, 0.5 s off, 0.5 s on, 0.5 s off, 0.5 s, 2.5 s off, repeating.	000110
PBX Long: 1.0 s on, 2.0 s off, repeating.	000111
PBX Short-Short: 0.4 s on, 0.2 s off, 0.4 s on, 2.0 off, repeating.	001000
PBX Short-Short-Long: 0.4 s on, 0.2 s off, 0.4 s on, 0.2 s off, 0.8 s on, 1.0 s off, repeating.	001001
PBX Short-Long-Short: 0.4 s on, 0.2 s off, 0.8 s on, 0.2 s off, 0.4 s on, 1.0 s off, repeating.	001010
PBX Short-Short-Short-Short: 0.4 s on, 0.2 s off, 0.4 s on, 0.2 s off, 0.4 s on, 0.2 s off, 0.4 s, 0.8 s off, repeating.	001011
All other SIGNAL values are reserved	

RESERVED - Reserved bits.

The base station shall set this field to '000000'.

7.7.5.6 Message Waiting

This information element conveys to the user the number of messages waiting. The base station shall use the following fixed-length format for the type-specific fields:

Type-Specific Field	Length (bits)
MSG_COUNT	8

MSG_COUNT - Number of waiting messages.

The base station shall set this field to the number of messages waiting.