



Requirements for Embedded CDMA Modules and Specialty Devices

CDG Document 176

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Revision History

Date	Version	Description
20 July 2010	1.1	To correct the reference for RUIM and CSIM based devices
31 August 2009	1.0	First revision



1. Introduction

1.1 Purpose

This document provides detailed functional requirements for embedded CDMA voice and/or data modules, and also the specialty vertical devices that use these modules. These modules and devices would be able to provide one or more of the following services using CDMA technologies:

- CDMA2000® 1X circuit-switched voice services (C.S0002, C.S0005)
- CDMA2000® 1X data services (C.S0002, C.S0005)
- Short Messages Services (SMS)
- 1xEV-DO packet-data services (C.S0024)
- Location-based Services

The specialty vertical devices can include, but are not limited to, fixed wireless modems, location devices, sensors, meter readers, PDAs, netbooks, digital cameras, and point-of-sale terminals.

The specialty vertical devices, and their associated applications, that will utilize the embedded modules fall into three major categories:

1. Machine to Machine (M2M) Devices
2. Consumer Devices
3. Telematic Devices

1.2 Scope of Document

This document specifies a nominal set of features that define a commercially viable and usable device containing an embedded CDMA module, which correctly and optimally interoperates in all global markets, and which provides a nominal set of services and features to the application or end-user.

Incorporating features from various industry specifications and CDG specifications, including CDG 90, 143, 148, 155, and 160, this document focuses on the requirements for an embedded CDMA wireless module and specialty vertical device that it may be embedded within.

Additional requirements such as power, environmental, storage, and user interface (UI) will be covered in this document.

Best practices for manufacturers developing such devices and applications will be included in this document. These best practices are designed to maximize the device

and application performance while minimizing the impact to the CDMA network. Different requirements contained in this document will apply to different types of devices.

Developers can use this document as a framework to select the application/device being designed, identify the applicable requirements, and incorporate these requirements into the specialty vertical device.

1.3 Organization

This document is organized in sections relating to major functional elements:

- Introduction
- Carrier/Network Specific Software options
- Common Requirements (Section 4.
- Optional Device Specific Requirements (Section 5.
- CDMA2000 1X Requirements (Section 6.
- Data Services Requirements (Section 7.

1.4 Reference Documents

NOTE: When requirements in this document refer to other CDG or CCF specifications, the term **device** should be always be used instead of *handset* or *terminal*.

3GPP2 reference documents can be found at:

- http://www.3gpp2.org/Public_html/specs/index.cfm.
- CDG reference documents can be found at <http://www.cdg.org>.
- CCF reference documents can be found at <http://www.globalccf.org>.

Standard	Description
C.S0001-0-2	Introduction to cdma2000® Standards for Spread Spectrum Systems - Addendum 2 (Release 0)
C.S0002-0-2	Physical Layer Standard for cdma2000® Spread Spectrum Systems - Addendum 2 (Release 0)
C.S0003-0-2	Medium Access Control (MAC) Standard for cdma2000® Spread Spectrum Systems - Addendum 2 (Release 0)
C.S0004-0-2	Signaling Link Access Control (LAC) Standard for cdma2000® Spread Spectrum Systems - Addendum 2 (Release 0)
C.S0005-0-2	Upper Layer (Layer 3) Signaling Standard for cdma2000® Spread Spectrum Systems - Addendum 2 (Release 0)
C.S0011-C	Recommended Minimum Performance Standards for cdma2000® Spread Spectrum Mobile Stations
C.S0015-A	Short Message Services for Wideband Spread Spectrum Systems

Standard	Description
C.S0017-0-2	Data Service Options for Spread Spectrum Systems - Addendum 2
C.S0017-03	Data Service Options for Spread Spectrum Systems Addendum 3 - cdma2000® High Speed Packet Data Service Option 33
C.S0016-B	Over-the-Air Service Provisioning of Mobile Stations in Spread Spectrum Systems
C.S0014-A	Enhanced Variable Rate Codec, Speech Service Option 3 for Wideband Spread Spectrum Digital Systems - Addendum 3
C.S0020-A	High Rate Speech Service Option 17 for Wideband Spread Spectrum Communication Systems - Addendum 2
C.S0023-A-1	Removable User Identity Module for Spread Spectrum Systems - Release A Addendum 1
C.S0033-A	Recommended Minimum Performance Standards for cdma2000® High Rate Packet Data Access Terminal
C.S0036-0	Recommended Minimum Performance Specification for C.S0022-0 Spread Spectrum Mobile Stations
C.S0037-0	Signaling Conformance Specification for cdma2000® Wireless IP Network
C.S0038-A	Signaling Conformance Specification for High Rate Packet Data Air Interface
C.S0043-0	Signaling Conformance Specification for High Rate Packet Data Air Interface
C.S0060-0	Signaling Conformance Test Specification for Over-the-Air Service Provisioning
C.S0061-0	Signaling Conformance Test Specification for Short Message Service
C.S0062-0	Signaling Conformance Test Specification for cdma2000® Data Services
C.S0066-0	Over-the-Air Service Provisioning for MEID-Equipped Mobile Stations in Spread Spectrum Systems
C.S0072-0	MEID for CDMA2000
C.S0073-B	Signaling Test Specification for Mobile Station Equipment Identifier (MEID) Support for cdma2000® Spread Spectrum Systems
RFC2396	Uniform Resource Identifiers (URI): Generic Syntax http://www.ietf.org/rfc/ .
CDG Document 90	Global Handset Requirements For CDMA — CDMA2000® Voice, SMS and Data

Standard	Description
CDG Document143	Recommended System Selection Requirements for 1X and 1xEV-DO - Capable Terminals
CDG Document 148	CDMA Device Requirements — CDMA2000® 1xEV-DO Release 0 & Revision A
CDG Document 155	CDMA Handset Requirements — CDMA2000® Wireless IP
CDG Document 160	Global Handset Requirements for CDMA — Data Session Throttling
RFC 791	Internet Protocol
RFC 2460	Internet Protocol, Version 6

1.5 Acronyms and Abbreviations

Table 1-1: Acronyms and Abbreviations

Acronym / Abbreviation	Description
1xEV-DO	1x Evolution of Data Optimized is defined in the 3GPP2 C.S0024 specification
AMPS	Advanced Mobile Phone System (Analogue Cellular)
AT	Attention Commands
CAVE	Cellular Authentication and Voice Encryption
CCF	CDMA Certification Forum
CDG	CDMA Development Group
CDMA	Code Division Multiple Access
CDMA2000® 1X	Defined in 3GPP2 specifications C.S0002 and C.S0005, with a 1.2288 MHz spreading rate
CFB	Call Forwarding Busy
CFNA	Call Forwarding No Answer
CFU	Call Forwarding Unconditional
CHAP	Challenge Handshake Authentication Protocol
CLIP	Calling Line Identification Presentation
CM Service Req	Connection Management Service Request
CS	Circuit Switched
CVT	Compliance Verification Test
CW	Call Waiting

Acronym / Abbreviation	Description
DAK	Delivery ACK
DLL	Dynamic-Link Library
DTMF	Dual Tone Multiple Frequency
EHDM	Extended Handoff Direction Message
ESCAM	Extended Supplemental Channel Assignment Message
ESN	Electronic Serial Number
EVRC	Enhanced Variable Rate Vocoder
F-SCH	Forward Supplemental Channel
FTP	File Transfer Protocol
GHDM	General Handoff Direction Message
GSM	Global System for Mobile communication
HTTP	Hypertext Transfer Protocol
IM	Instant Messaging
IMSI	International Mobile Subscriber Identity
IOTA	IP-based Over the Air
IPCP	PPP Internet Protocol Control Protocol (see RFC 1332)
IRDA	Infrared Data Association
LBS	Location Based Services
LCP	Link Control Protocol (see RFC 1661)
MAC	Medium Access Control
MCC	Mobile Country Code
MDN	Mobile Directory Number
MIN	Mobile Identifier Number
MMS	Multimedia Messaging Service
MNC	Mobile Network Code
MWI	Message Waiting Indication
NAM	Number Assignment Module
NID	Network Identification
OEM	Original Equipment Manufacturer
OOA	Original Originating Address
OSMS	Over-the-Air Short Message Service

Acronym / Abbreviation	Description
OTA	(Push) Over The Air
OTAPA	Over-the-Air Parameter Administration
OTASP	Over-the-Air Service Provisioning
OTKSL	One Time Key Subsidy Lock
PAP	Password Authentication Protocol
PCF	Packet Control Function
PDSN	Packet Data Serving Node
PI	Presentation Indicator
PPP	Point-to-Point Protocol
PRI	Product Release Instruction
PRL	Preferred Roaming List
PSMM	Pilot Strength Measurement Message
PST	Programming Service Tool
QCELP	Qualcomm Code Excited Linear Predictive
RC	Radio Configuration
RF	Radio Frequency
RLP	Radio Link Protocol
R-SCH	Reverse Supplemental Channel
R-UIM	Removable Universal Identity Module
SAR	Specific Absorption Rate
SID	System Identification
SIR	Service Initiation Request
SDMPI	Standard Diagnostic Monitor Programming Interface
SEA	South East Asia
SL	Service Loading
SMS	Short Message Service
SPC	Service Programming Code (see TIA/EIA/IS-683A)
SSD	Shared Secret Data
TCP	Transmission Control Protocol
TLS	Transport Layer Security
UAPROF	User Agent Profile

Acronym / Abbreviation	Description
UDP	User Datagram Protocol
UHDM	Universal Handoff Direction Message
UIM	Universal Identity Module
UTK	UIM Tool Kit
VM	Voice Mail
WAP	Wireless Application Protocol

1.6 Terms and Definitions

The term **device** refers to any type of specialty vertical device that may or may not contain an embedded CDMA module. The term **terminal** can be used interchangeably with **device**.

Four categories of requirements are established:

(M) Mandatory	The device must support that characteristic in order to achieve approval.
(HD) Highly Desirable	It is highly desirable and recommended that the device supports this characteristic. This feature may become Mandatory in subsequent versions of the document. Supporting this characteristic will be valued in the commercial promotion of the terminal.
(O) Optional	It is left up to the manufacturer whether or not the terminal supports this characteristic. The device may support this characteristic.
(D) Discard	The manufacturer should not support this feature or function.



2. Device Profiles, Best Practices, and Example Applications

This section defines a framework for the use of this requirements document. The different categories of specialty vertical devices are defined in this section. In addition, devices are grouped according to the technologies they support (e.g., circuit-switched voice services, packet data services, etc.).

The framework is intended to be used in the following manner:

- The device developer should identify the category their device belongs in (Section 2.1)
- Then, the relevant application profile for the device should be identified (Section 2.2.1)
- The developer then should implement the specific requirements based on the combination of device type and application profile.

Some of the requirements in this document apply to all devices, whereas other requirements are technology specific.

Integrators and developers must comply with the requirements set forth in this document. The requirements apply to various aspects of the device, including the CDMA module, the external interfaces, and software/hardware included with the device.

2.1 Types of Devices

The types of applications and devices under consideration for this document can be grouped into three major categories:

- **Machine to Machine (M2M) Devices:** These devices will typically communicate autonomously with other machines connected to the Internet. These devices would typically perform functions such as monitoring, tracking, autonomous management, and feedback/reporting. There will usually be no end-user interaction with the device itself. These devices will also typically be stationary and not mobile.
 - **Examples:** Smart Meters, Home automation controllers, Automated Meter Infrastructure, Security and Surveillance, and Point-of-Sale machines
- **Consumer Electronic (CE) Devices:** These devices would communicate with application servers and other CE devices connected to the Internet through autonomous or user-initiated mechanisms. These devices would perform a variety of functions depending on the type of device. There will be significant end-

1 user interaction with the device itself. These devices can be stationary and/or
2 mobile.

3 ○ **Examples:** Digital cameras, e-book readers, netbooks and tablet PC's, digital
4 media players, surveillance cameras, and gaming devices.

- 5 ● **Telematic Devices:** These devices will typically communicate with application
6 servers connected to the Internet or emergency services personnel and first
7 responders. These devices would perform autonomous functions such as vehicle
8 diagnostics, location tracking, or crash incident reporting, as well as user-initiated
9 functions such as vehicle navigation, and concierge services. There will be some
10 end-user interaction with the device itself. These devices will typically be mobile
11 and may require support for inter-operator CDMA roaming.

12 ○ **Examples:** Vehicle diagnostics, Navigation, and Asset Tracking

13 **2.2 Application profiles and requirements**

14 The applications considered in this document have many commonalities. By grouping
15 these commonalities together, a logical organization of these applications occurs. This
16 organization allows for the definition of profiles for common applications as well as
17 application specific requirements.

18 **2.2.1 Profiles**

19 The framework of this document is based on the application profiles defined below.
20 These profiles are differentiated based on the technology that is used by the
21 application/device. A device manufacturer should use the requirements associated with
22 a profiles as a guideline when developing an application or device that uses embedded
23 wireless modules.

24 As a device manufacturer, the device being developed shall use one of the profiles listed
25 below.

26 **2.2.1.1 Data Only Profiles**

27 The characteristics of the "Data only" profile are defined below:

- 28 ● This type of device will require only data services to accomplish its tasks. The lack
29 of voice services implies this device will communicate with application servers or
30 other machines connected to the Internet.
- 31 ● For packet-data services, the device may use CDMA2000 1X data, but if the
32 application requires higher data transfer speeds, then the device should use
33 1xEV-DO Rel. 0 or 1xEV-DO Rev. A
- 34 ● If the device requires a more symmetric downlink and uplink in terms of data
35 transfers speeds, then the device should use 1xEV-DO Rev. A.
- 36 ● If the device requires Quality-of-Service for a real-time application (e.g., video
37 surveillance), then the device shall use 1xEV-DO Rev. A for its data services if
38 allowed and supported by the network.

NOTE: Additional considerations should be made for stationary and mobile devices when designing a device with data only. These considerations are discussed in Section 2.2.4 Best Practices and Considerations.

2.2.1.2 Voice and Data Profiles

The characteristics of the “Voice and Data” profile are defined below:

- This type of device will require both circuit-switched voice and packet-data services to accomplish its tasks.
- Characteristics for when the device uses data services are defined above in 2.2.1.1.
- For circuit-switched voice services, the device shall use CDMA2000 1X circuit-switched voice services.

2.2.1.3 Profile Types

The two profile combinations listed below shall be used by the applications/devices considered in this document. These profiles define the combination of services (e.g., voice, data, and LBS) that an application/device can potentially use.

The technical requirements for each of these two profiles differ and are clearly defined throughout this document. Based on the application or device type that is being developed, one of the two profiles shall be used and the technical requirements associated with that profile shall be implemented.

The technologies each profile should use are listed in the table below.

Device Profile Type	Description	CDMA2000 1X Voice	CDMA2000 1X Data	1xEV-DO
A	Voice and Data	M	M	O
B	Data only	--	M	HD

The associated sections containing the requirements for each technology are in the table below:

Technology	Section in CDG 176
CDMA2000 1X Voice	Section 6.
CDMA2000 1X Data	Section 7.
1xEV-DO Data	Section 7.

If a device implements any combination of the above technologies, the requirements for each technology described in their respective sections must be adhered to.

2.2.2 Common Requirements

All devices that belong to the two device profile types defined above will also have a set of common requirements. These common requirements will apply to all devices, whether they fall into device profile type A or B.

The common requirements defined in Section 4. that are applicable to all devices include:

- Carrier Acceptance
- Frequency Bands/Modes
- Mobile Station Class
- External Interfaces
- Antenna
- System Selection and PRL
- Basic Functions
- Languages / Information Encoding
- Indicators
- OTA Provisioning Functions
- NAM Requirements
- AT Commands
- Conformance Tests
- Debug Menus
- Roaming

2.2.3 Optional Application Specific Technology, Service, and Feature Requirements

In addition to the basic voice and data services, additional technologies, services, and features required by the device/application may be needed. These are deemed optional, but if the technology, service, or feature is used by the device, the developer must adhere to the requirements specific to the technology, service or feature being used.

Optional application specific technologies, services, and features whose requirements are defined in Section 5. include:

- Short Message Service (SMS)
- Location-based Services via GPS
- RUIM and CSIM (on UICC)

- 1 • MEID
- 2 • TTY
- 3 • Storage (e.g., Secure Digital, Transflash, etc.)

4 **2.2.4 Best Practices and Considerations**

5 Finally, various devices/applications will utilize the embedded CDMA module differently.
6 Smart Meters may only transmit data once a day, whereas an asset tracking device will
7 constantly transfer data to a server and utilize location-based services.

8 Best practices and considerations such as network loading, end-user throughput, and
9 call setup delays should be taken into account when deciding to implement an
10 application specific behavior.

11 The best practices defined in this document are guidelines for device/application
12 developers in order to maximize the end-device experience while minimizing the
13 negative impact to the CDMA network.

14 It is strongly recommended to adhere to the best practices. At a later time, the best
15 practices may become mandatory requirements.

16 In addition, it is always recommended to consult with the CDMA operator on whose
17 network the device will be deployed to ensure the features being used can be supported
18 by the network.

19 The best practices and considerations provided in this document include:

- 20 • Battery Life Impacts
- 21 • Concept of Sessions
- 22 • Best Practices for Polled Devices
- 23 • Best Practices for Periodic Update Devices
- 24 • Best Practices for Continuous Monitoring Devices
- 25 • Best Practices for Data Transfers

26 **2.2.4.1 Introduction to Best Practices**

27 The best practices described in this section should be used by application and device
28 developers implementing this CDG specification. The purpose of these best practices is
29 so the application/device being developed will perform efficiently and in an optimized
30 manner when operating on the cellular network (i.e., CDMA2000 1X or 1xEV-DO).
31 Providing a consistent good user experience as well as scalability of the
32 devices/applications being deployed is important.

33 The primary driver for these best practices is to inform developers so they can take
34 advantage of the features CDMA networks have. Wireless networks require different
35 operational efficiencies and trade-offs compared to wired networks. These can include
36 battery life (stand-by time), resource contention, RF coverage, capacity, and connection
37 establishment.

Applications and devices should be designed differently than they would be for wired networks and additional considerations should be taken into account. This will ease the deployment and allow for scalability of applications/devices onto a cellular network.

2.2.4.1.1 Battery Life Impacts

A variety of factors can impact the stand-by time and battery life of a device, such as PPP sessions, mobility, keep-alive messages, and polling intervals. Some additional factors outside the control of the developer can also have an impact, including network loading and RF coverage.

2.2.4.1.2 Concept of Sessions (EV-DO, PPP, IP)

The term session is used in a variety of ways in CDMA technologies.

- **1xEV-DO Session** – This session pertains to a 1xEV-DO capable device and is a physical layer session. The 1xEV-DO session is a logical state between the AT and the RNC that provides an identity for the device on that specific access network. A 1xEV-DO session can last a few hours to even 54 hours, but is dependent on the network configuration. This session is independent of a PPP or IP session.
- **PPP Session** – This point-to-point session pertains to either a CDMA2000 1X or 1xEV-DO capable device and is a Link Layer session. A PPP session is established when a SO33 or SO59 data call is made, which creates a link between the MS/AT and the PDSN. A PPP session can last for many hours and is independent of an airlink connection, but does require a 1xEV-DO session or 1X registration. A PPP session is also needed in order to obtain an IP address.
- **IP Session** – An IP session is an IP Layer concept and is a source/destination IP address/port pair. The IP address can be obtained through Simple IP or Mobile IP procedures. This IP address is required for transfer of application layer data between IP endpoints. A PPP session is required in order to be assigned an IP address.
- **Connection** - The term connection refers specifically to the actual airlink connection. A traffic channel is requested from the network and being assigned resources are assigned to the device via the Traffic Channel Assignment message.

2.2.4.2 Best Practices for Polled Devices

These devices are periodically polled by an application server to retrieve information. These devices will require a PPP session and an IP session in order for the device to be paged and the data to be retrieved, although the PPP/IP session does not need to be always-on.

The recommended best practices include:

- Minimize the polling frequency of the device to maximize battery life
- If the device is being polled once per day, it is recommended to poll the device during off-peak hours. This is typically after 12am.

- 1 • When retrieving data, transfer the maximum amount that is needed rather than
- 2 transferring small portions during each polling interval
- 3 • Tear-down the PPP session if the polling occurs infrequently.
- 4 • Establishing a PPP session that is network-initiated requires alternate
- 5 mechanisms available in 3GPP2 specifications
- 6 • Configuring longer device wake-up periods (1X or 1xEV-DO) through OTA
- 7 parameters is recommended to improve stand-by time
- 8 • For on-demand polling, it is not recommended to tear down the PPP session. The
- 9 trade-off is stand-by time can be impacted based on the slot cycle used.
- 10 • If a device is polled to retrieve data, the device should close the airlink connection
- 11 shortly after the data transfer has completed. It is not necessary to wait for the
- 12 network to declare dormancy, which is typically 10 seconds. This can improve
- 13 stand-by time.
- 14 • Connections should not be closed pre-maturely though as this will cause an
- 15 additional traffic channel setup and delay if additional data needs to be
- 16 transferred.

17 **2.2.4.3 Best Practices for Periodic Updating Devices**

18 These devices are NOT periodically polled by an application server to retrieve
19 information, but rather, the device initiates the PPP session and connection itself to
20 transfer the data to the application server.

- 21 • These devices will require a PPP session and an IP session in order for the
- 22 device to send/receive data. However, the PPP/IP session does not need to be
- 23 always-on. Since the updates are periodic in nature.
- 24 • If the device is designed to initiate an airlink connection to synchronize with a
- 25 server or for some other data transfer, ensure all devices use some
- 26 randomization mechanism to avoid all devices accessing the system at the same
- 27 time.
- 28 • If the device initiates the connection, early dormancy should be used. The device
- 29 does not necessarily have to wait until the network closes the traffic channel, it
- 30 can declare dormancy at an earlier time to improve stand-by time.

31 **2.2.4.4 Best Practices for Continuous Monitoring Devices (Always-on)**

32 These devices will typically require a constant PPP session and an IP session to
33 exchange data with the application server on an on-demand basis. The device can
34 initiate the connection as well as the network for the data transfer. These devices would
35 typically have long PPP session durations and can be classified as *always-on* devices.

- 36 • Since these devices will require a constant PPP session, the device should be
- 37 designed to monitor the PPP session status. In the event the PPP session is lost,
- 38 the device should be able to re-establish the PPP session automatically (i.e.,
- 39 without user intervention) so the application server can contact the device.

- 1 • Keep-alive mechanisms (e.g., pings) should **not** be used to maintain a constant
2 airlink connection between the device and the CDMA network. Using keep-alive
3 mechanisms impacts the device battery life as well as causes resource
4 contention on the network.
- 5 • Configuring longer device wake-up periods (1X or 1xEV-DO) through OTA
6 parameters is recommended to improve stand-by time.

7 **2.2.4.5 Best Practices for Data Transfers**

8 These best practices in this section are specific to data transfers between a device and
9 another entity.

- 10 • The technology chosen for the data transfer (CDMA2000 1X or 1xEV-DO) should
11 be taken into account when designing a device.
 - 12 ○ Applications requiring higher bandwidths (i.e., greater than 300-500kbps)
13 should use 1xEV-DO as the air interface technology. This is especially
14 true for devices that provide streaming multimedia.
 - 15 ○ Applications and service requiring quality-of-service (QoS) shall use
16 1xEV-DO Rev. A as the interface technology.
- 17 • Additional considerations should be made regarding the choice of implementing
18 only 1xEV-DO as the air interface technology or implementing 1X and 1xEV-DO
19 on the device.
 - 20 ○ If a device will not be mobile (i.e., only stationary) a single air interface
21 technology may suffice (1X or 1xEV-DO). The choice is dependent on the
22 bandwidth requirements on QoS needs.
 - 23 ○ If a device will be mobile (i.e., stationary and mobile), and 1xEV-DO is the
24 desired air interface technology, then CDMA2000 1X should also be
25 implemented to facilitate hand-downs to 1X in areas where 1xEV-DO
26 service may not be available.
- 27 • When the device is sending data, the application should push as much data to
28 the modem buffer so the packing efficiency can be maximized. This will also help
29 to achieve higher throughputs and finish the data transfer more quickly.
- 30 • When transferring small amounts of data, consider transmitting the data over the
31 Access or Control Channels of the technology being used. This will eliminate the
32 need for an airlink connection and utilize network resources more effectively.
- 33 • The frequency or interval of re-synchronization with an application server should
34 be carefully evaluated. A longer re-synchronization interval will improve stand-by
35 time and system capacity; whereas a shorter interval will reduce stand-by time
36 and cause more network resource contention.
 - 37 ○ The re-synchronization interval should be set based on the wireless
38 operator's network dormancy timer.

- For example, if the network dormancy timer is 10 seconds and the re-synchronization interval is set to 15 seconds, then this is an inefficient use of the airlink resources and will cause frequent connections to be setup.
- Bundling of messages is recommended to maximize packing efficiency and the resources of the device/network. The device should bundle as many messages as it can rather than sending them all as single transmissions. This can also improve connection setup times.
- For real-time applications that require differentiated service treatment, QoS provided by 1xEV-DO Rev. A should be used.
- For non-real-time applications that require differentiated bandwidth needs, mechanisms that may be available at the PDSN for traffic shaping can be used.
- It is strongly recommended to use IPv6 addresses as the default IP address type for these devices. As IPv4 addresses are nearly depleted, using IPv6 addresses as the default for devices will ensure millions to billions of these devices will have unique, always-on IP addresses.
- Compression techniques for application layer data should be considered for use.

2.3 Example Applications

A variety of applications will be considered for this document that fall into the above broad divisions. These applications can be further classified into specific industry categories. The applications that will be considered in this document are the following:

Industry Category	Example Application	Description of Features	Suggested Profile Type	Rec. Data Technology
Consumer Telematics	Safety / Concierge Services	Crash reporting, remote unlocking, stolen vehicle slow-down, emergency services, etc.	A	1X
	In-vehicle Entertainment	Media downloads (music, video, television), broadcast TV, radio, web surfing, etc.	B	1xEV-DO
	Enhanced Navigation	Traffic re-routing, traffic reports, etc.	A	1xEV-DO
	Vehicle Diagnostics	Airbag deployments, critical parts failure, maintenance requests and scheduling, speed sensors, international border sensors	B	1X

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Industry Category	Example Application	Description of Features	Suggested Profile Type	Rec. Data Technology
Security and Surveillance	Home, Business, and Government security	Entrance/exit monitoring, remote garage door opening, intrusion alert, video feeds	B	1X
Industry Automation and Monitoring	Leased Factory Line Equipment	Monitoring, usage tracking, abuse, , etc.	B	1X
	Equipment Operational Reporting	Inventory management, usage tracking, etc.	B	1X
	Equipment Maintenance	Service requests, diagnostic reports, etc.	B	1X
Industry Asset Management and Tracking	Asset Tracking	Tracking of valuable assets, cargo, shipments, etc.	B	1X
	Geo-fencing	Fencing of children, vehicles, animals, pets, etc.	B	1X
	Limit Operational Usage	Vehicle lock-down	B	1X
Telemedicine and Health	Body Sensor and Diagnostic Reporting	Blood pressure monitor, pulse, blood flow, body temperature, blood sugar, etc.	B	1X
	Fitness Tracking and Monitoring	Calories, speed, distance, pace, heart rate, etc.	B	1X
	Virtual Doctor Consultation	Virtual assessment of a patient	A	1xEV-DO
Utility Metering and Telemetry	AMR (Automated Meter Reading)	Simple meter reading for power, water, energy/usage, consumption, parking meters, etc.	B	1X
	AMI (Automated Meter Infrastructure) – Smart Meters	Meter reading requiring two-way communication, storage of information, device maintenance, etc.	B	1X
	Sensor Telemetry	Real-time information and stats for agriculture, water management, traffic data through the use of sensors	B	1X

Industry Category	Example Application	Description of Features	Suggested Profile Type	Rec. Data Technology
Fleet Management	Salesforce Tracking	Sales team monitoring, product supplies and inventory, re-stocking needs, etc.	B	1X
	Fleet Management (automobiles, boats, motorcycles)	Vehicle supplies, location and availability, return times and estimated time of checkout/return	B	1X
	Asset Protection (Automated Repo)	Repossession of fleet vehicles, vehicle lock-down, etc.	B	1X
Advertising	Outdoor Digital Billboards	Digital signage, real-time SMS, concert feeds, special events, etc.	B	1xEV-DO
	Indoor TV / Panel	Displays in coffee shops, elevators, stores showing ads, weather forecasts, stock quotes, etc.	B	1xEV-DO
Consumer Applications	Home automation	Temperature, humidity, lighting, and appliance control	B	1X
	Financial and Retail POS/Kiosks	Point-of-sale machines, ATM's, bank machines, vending machines	B	1X
	Electronics	Digital cameras, e-readers, media players, gaming devices, etc.	B	1xEV-DO
Wireless Data Modules	Data Modules	Wireless data modules for laptops, netbooks, UMPC's, in addition to the aforementioned devices.	B	1xEV-DO

1

2 This table is intended to provide sufficient breadth to cover the array of potential
3 applications that will make use of an embedded wireless module. The "Suggested Profile
4 Type" column is a suggestion for which profile type the device should use. The actual
5 implementation is dependent on the choice of the developer.

6 In addition, it is always recommended to consult with the CDMA operator on whose
7 network the device will be deployed to ensure the features being used and services
8 being deployed can be supported by the network.



3. Carrier/Network Specific Software Options

The CDMA2000® Operator will provide a document specifying the software features that are applicable for the target network. This document shall also specify which of the highly desirable and optional requirements the operator requires.

3.1 PRI: Product Release Instruction

The CDMA2000® Operator will provide the PRI in a document. This document contains the parameter values that shall be programmed into the device prior to shipment to the CDMA2000® Operator.

Req. #	Requirement	Category	Remarks	References
3.1.1	Follow CDG90 Section 2.1	M	The requirements in Section 2.1 of CDG90 must be adhered to.	CDG 90 Section 2.1
3.1.2	PRI format shall be in Excel format	M		



4. Common Requirements

This section contains the common requirements that are applicable to all types of devices and profiles, unless otherwise noted.

The common requirements in this section include:

- Carrier Acceptance - Documentation, Programming, Tools, and Hardware/Software
- Frequency Bands/Modes
- Mobile Station Class
- External Interfaces
- Receive Diversity
- System Selection and PRL
- Basic Functions – Control, Dialing / Call Initiation, and General User Interface
- Languages / Information Encoding
- Indicators – Visual and Audible
- OTA Provisioning Functions
- NAM Requirements
- AT Commands
- Conformance Tests
- Debug Menus
- Roaming

4.1 Carrier Acceptance

If required by the CDMA2000® operator, the documentation and equipment that shall be delivered for technical evaluation is detailed below.

1 4.1.1 Documentation

2

Req. #	Requirement	Category	Remarks	References
4.1.1.1	Follow CDG90 Section 1.6.1	M	The requirements in Section 1.6.1 of CDG90 must be adhered to with the following exceptions noted below. Exceptions to CDG 90 that do not need to be followed are: 1.6.1.1 1.6.1.2 1.6.1.3 1.6.1.13 1.6.1.14 1.6.1.17	CDG 90 Section 1.6.1
4.1.1.2	Release notes on Software/Hardware including a minimum list of changes with respect to previous versions and a list of known issues	M	Supersedes CDG 90 requirement 1.6.1.13	
4.1.1.3	Release notes when a new software/hardware version of the device is submitted	M	Supersedes CDG 90 requirement 1.6.1.13	
4.1.1.4	If the device includes an AC adapter or power charger that is intended to be attached to an AC power source, documentation showing cUL, CSA, or ETL approval was obtained	M		
4.1.1.5	The logo of the approval agency and certification number on the external housing of the AC adapter or power source	M		

4.1.2 Programming, Configuration and Maintenance Tools

Supplier must provide software tools and cables for programming, configuration, software download, parameter changes and remote maintenance purposes, considering the following items:

Req. #	Requirement	Category	Remarks	References
4.1.2.1	Follow CDG90 Section 1.6.2	M	The requirements in Section 1.6.2 of CDG90 shall be adhered to with the following exceptions noted below. Exceptions to CDG 90 that do not need to be followed are: 1.6.2.1 1.6.2.2 1.6.2.3	CDG 90 Section 1.6.2
4.1.2.2	Tools and procedures for device configuration and programming	M	Supersedes CDG90 requirement 1.6.2.1	
4.1.2.3	Tools and procedures for software version upgrade through a serial or USB interface	M	Supersedes CDG90 requirement 1.6.2.2. USB is the preferred method.	
4.1.2.4	Software support for Serial cable	O	Supersedes CDG90 requirement 1.6.2.3.	
4.1.2.5	Software support for USB	HD	Supersedes CDG90 requirement 1.6.2.3. This requirement may become mandatory at a later point.	
4.1.2.6	If the device does support a USB interface, it shall support USB 2.0 Full Speed at a minimum	M		USB 2.0 specification April 27, 2000
4.1.2.7	GUI PST compatible with MAC OS X	O		

Req. #	Requirement	Category	Remarks	References
4.1.2.8	Tools, procedures, shielded cables, and a test account to use the service for specialty vertical devices	M		

4.1.3 Basic Software Tools (PST)

This section describes the requirements for PST tools. This section specifies the requirements related to software tools that provide programming capabilities.

Req. #	Requirement	Category	Remarks	References
4.1.3.1	Follow CDG90 Section 1.6.3	M	The requirements in Section 1.6.3 of CDG90 shall be adhered to.	CDG 90 Section 1.6.3
4.1.3.2	The basic software tool should support Mac OS X	O		
4.1.3.3	The tool and device should allow an automatic software push to the device for new software and configuration files without direct interaction with the device	HD	Consult with carrier regarding specific secure mechanisms for automatic software updates using OTA methods	
4.1.3.4	The tool and device should be capable of supporting remote maintenance and troubleshooting through a cellular data connection	HD		
4.1.3.5	The tool and/or device shall support a mechanism to remotely disable the RF functionality remotely	M	For example, a lock until power cycle can be implemented as defined in IS-2000.	

4.1.4 Advanced Software Tools

This section defines the requirements for software tools that provide advanced debugging capabilities.

1

Req. #	Requirement	Category	Remarks	References
4.1.4.1	Follow CDG90 Section 1.6.4	M	The requirements in Section 1.6.4 of CDG90 must be adhered to with the following exceptions noted below. Exceptions to CDG 90 that do not need to be followed are: 1.6.4.3	CDG 90 Section 1.6.4
4.1.4.2	Diagnostic logging and saving of IS-2000 messages exchanged between the terminal and BTS.	M	Applicable to devices supporting to IS-2000 Supersedes CDG 90 requirements 1.6.4.3	
4.1.4.3	Diagnostic logging and saving of IS-856 messages exchanged between the terminal and BTS	M	Applicable to devices supporting IS-856	
4.1.4.4	It shall be possible to take diagnostic logs while the device is operating normally (i.e., while establishing/connecting to a MIP/SIP data session, sending SMS, etc.)	M		
4.1.4.5	If the device is designed to automatically originate data calls on power-up or any other states, tools and instructions to disable this functionality shall be provided	M	Needed for cabled RF and signaling testing	

2

4.1.5 Hardware

3

Req. #	Requirement	Category	Remarks	References
4.1.5.1	Follow CDG90 Section 1.6.5	M	The requirements in Section 1.6.5 of CDG90 must be adhered to with	CDG 90 Section 1.6.5

Req. #	Requirement	Category	Remarks	References
			the following exceptions noted below. Exceptions to CDG 90 that do not need to be followed are: 1.6.5.4	
4.1.5.2	Device for testing purposes	M	Supersedes CDG 90 requirements 1.6.5.4	

4.1.6 End User Software

End user software provided should include the following:

Req. #	Requirement	Category	Remarks	References
4.1.6.1	Follow CDG90 Section 1.6.6	M	The requirements in Section 1.6.6 of CDG90 must be adhered to with the following exceptions noted below. Exceptions to CDG 90 that do not need to be followed are: 1.6.6.2 1.6.6.3	CDG 90 Section 1.6.6
4.1.6.2	For 1xEV-DO data support, any necessary connectivity software (to be supplied in a CD-ROM) for 1xEV-DO data transmission shall be included	M	Applicable to devices supporting IS-856	

4.2 Frequency Bands/Modes

The frequency bands supported by a device shall adhere to the 3GPP2 C.S0057 specification.

4.3 Mobile Station Class

This section defines the mobile station class power requirements that shall be supported are defined in C.S0002.

1 **4.4 External Interfaces**

2 This section describes the external interfaces for a specialty vertical device.

3

Req. #	Requirement	Category	Remarks	References
4.4.1	External interfaces shall be standardized for models of the same manufacturer.	HD	The interfaces for all models of the same manufacturer are preferred to be the same, particularly the data cables and battery charger.	
4.4.2	If the device supports data functions, it should support a standard Ethernet based data interface	HD	May not be required if the device supports USB.	
4.4.3	If the device supports data functions, it should support a USB data interface	HD	Ensure there is an interface to support diagnostic monitoring.	
4.4.4	The device may support SD™ (secure digital), SD-MMC™, and T-FLASH™.	O	Removable media. Highly Desirable (HD) for devices with storage needs. .	
4.4.5	The device may support MMC™ memory card.	O	Multimedia Card, removable media. HD for devices requiring storage.	
4.4.6	The device may support a short-range wireless technology	O	The short-range wireless technology (i.e., Bluetooth) may be used for data exchange or even diagnostic logging.	
4.4.7	If the device supports Receive Diversity, it should have two easily accessible external RF ports	HD		

Req. #	Requirement	Category	Remarks	References
4.4.8	If the device does not support Receive Diversity, it should have one easily accessible external RF ports	HD		

4.5 Receive Diversity

This section covers receive diversity requirements for a specialty vertical device.

Req. #	Requirement	Category	Remarks	References
4.5.1	The device shall at least have a primary antenna with both transmit and receive capabilities	M		
4.5.2	The device should support a secondary receive diversity antenna	HD	This will improve device performance and the end-user experience	
4.5.3	If the device has a receive diversity antenna, it should support receive diversity for both CDMA 1X and 1xEV-DO air interfaces at all operating frequencies supported by the device	HD		

4.6 System Selection and Preferred Roaming List (PRL) Requirements

This section defines the requirements for the Preferred Roaming List, which describes the systems to be acquired and the relative preferences based on a Preferred Roaming List supplied by the CDMA2000® Operator as part of the PRI.

Req. #	Requirement	Category	Remarks	References
4.6.1	Follow CDG90 Section 6.1	M	The requirements in Section 6.1 of CDG90 must be adhered to with the following	CDG 90 Section 6.1

Req. #	Requirement	Category	Remarks	References
			<p>exceptions noted below.</p> <p>Exceptions to CDG 90 section 6.1 that do not need to be followed are:</p> <p>6.1.6 6.1.7</p>	
4.6.2	The device shall comply with the System Selection requirements in CDG Document 143, except for the sections/requirements noted in the remarks.	M	<p>Exceptions to following CDG 143 are noted below:</p> <p>2.1.2 2.3.1 2.4.2 2.5</p>	CDG Document 143
4.6.3	Devices supporting 1xEV-DO shall support IS-683-C PRLs	M	This supersedes the CDG 143 requirement 2.1.2	CDG Document 143 Section 2.1.2
4.6.4	The device may build a default PRL during power-up if no valid PRL is stored in NV memory or RUIM	O	This is not a mandatory requirement in this document.	CDG Document 143 Section 2.3.1
4.6.5	The device shall support IS-683-C based OTA PRL provisioning	M	<p>Supersedes CDG 143 requirement 2.4.2</p> <p>An RUIM card that supports EF-EPRL is expected to write an IS-683-C or newer PRL to the EF-PRL storage location (as opposed to the EF-PRL storage location).</p>	CDG Document 143 Section 2.4.2
4.6.6	The device shall support no less than 230 unique mode/band/channel combinations in the acquisition table	M	This supersedes the CDG 143 requirement and applies to both 1xEV-DO and 1X devices.	CDG Document 143 Section 2.5
4.6.7	The device should support at least 512 unique	HD		

Req. #	Requirement	Category	Remarks	References
	mode/band/channel combinations in the acquisition table			
4.6.8	The user shall be able to verify the PRL version	M	Supersedes CDG 90 requirement 6.1.6 The PRI shall allow the Operator to choose if a PRL version is displayed in this menu or it is presented as blank.	

4.7 Basic Functions

The device should include or support the following basic functions.

4.7.1 Control

The device shall support the following control functions.

Req. #	Requirement	Category	Remarks	References
4.7.1.1	The device shall support adjustable earpiece volume.	O	This may be via the directional input, or dedicated control. Supersedes CDG 90 requirement 6.2.1.12	
4.7.1.2	Devices that support voice services shall support long DTMF tone lengths	M	The vendor should identify the respective duration limits that apply to the long tones.	
4.7.1.3	Devices that support voice services shall support short DTMF tone lengths	M	The vendor should identify the respective duration limits that apply to the short tones.	
4.7.1.4	The device shall support power on/off function.	M	Can be combined/multifunction key or dedicated key.	

Req. #	Requirement	Category	Remarks	References
4.7.1.5	The device shall be able to generate a "+" for international dialing.	HD		

4.7.2 Dialing / Call Initiation

If the device supports dialing or call initiation capabilities, the following requirements are needed:

Req. #	Requirement	Category	Remarks	References
4.7.2.1	If a user interface is supported, it shall support 32-digit dialing	M		
4.7.2.2	The device must be able to originate calls (voice, SMS, or data) to numbers with 2 or more digits.	M	This feature is limited by network capability. The shortest dialing sequence supported by most networks is 2 digits (for emergency numbers, directory service, connection to customer service, etc.).	CDG 90 requirement 6.2.2.5
4.7.2.3	On a device supporting voice services, the user shall be able to dial emergency numbers (defined in PRI) on any available system, even if it is "negative."	M	For devices that support R-UIM, emergency numbers shall be dialed even if no R-UIM card is in the device. Mandatory for devices using voice.	CDG 90 requirement 6.2.2.8 RUIM C.S0023 CSIM C.S0065

4.7.3 General User Interface Requirements

The device shall support the following general functions.

Req. #	Requirement	Category	Remarks	References
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Req. #	Requirement	Category	Remarks	References
4.7.3.1	It shall be possible to view the SW version through either a display or other means	M	Some Operators may desire that their users not be able view the SW version on the handset. This feature should be PRI configurable.	CDG 90 requirement 6.2.4.4
4.7.3.2	The device shall obtain its time information from the CDMA system time when available.	HD	The internal clock should be synchronized with CDMA system time when available.	
4.7.3.3	The device shall support "Airplane mode." The device shall support the disabling of the RF transmitter by the user. The device shall clearly reflect the RF off status.	M		

4.7.1 Indicators

If a device does not have a visual display, it should have at least the capability to provide the information included below.

If the device has the capability to provide visual and/or audible indicators, the following functions should be supported.

4.7.1.1 Visual Indicators – Power

Req. #	Requirement	Category	Remarks	References
4.7.1.1.1	The device should have a visual Battery level meter.	HD	3 or more levels	CDG 90 6.4.7.1.1
4.7.1.1.2	The device should have a visual Low battery indicator.	HD		CDG 90 6.4.7.1.2

4.7.1.2 Visual Indicators – CDMA Service

Req. #	Requirement	Category	Remarks	References
4.7.1.2.1	The device shall have a visual Signal quality meter for 1xRTT	M	4 or more levels should be based on the RSSI and the Pilot Ec/Io of the 1xRTT pilots	
4.7.1.2.2	The device shall have a visual Signal quality meter for 1xEV-DO	M	4 or more levels should be based on the RSSI and SINR of the 1xEV-DO pilots	
4.7.1.2.3	The device shall have a visual Service / No service indicator.	M		
4.7.1.2.4	The device shall have a visual Mode indicator.	M	Indicate operation is CDMA2000® 1x, 1xEV-DO. The operator can choose icon to be displayed in PRI.	
4.7.1.2.5	If the device supports roaming or is expected to roam, the mobile device shall have a visual Roaming indicator.	M	Must support flashing Roaming indicator as per TSB 50.	

1 **4.7.1.3 Visual Indicators – Data Service**

2

Req. #	Requirement	Category	Remarks	References
4.7.1.3.1	The device shall provide a visual PPP link active indicator to indicate an active data call (in modem/relay mode).	M		CDG 90 requirement 6.4.7.8.2
4.7.1.3.2	The device shall provide a visual indicator to indicate when the data session is in dormant mode	M		CDG 90 requirement 6.4.7.8.4

1 **4.7.1.4 Visual Indicators – Provisioning**

2

Req. #	Requirement	Category	Remarks	References
4.7.1.4.1	The device should provide a visual indication that initial programming is required	HD		
4.7.1.4.2	The device should provide a visual indication that programming is in progress	HD		
4.7.1.4.3	The device should provide a visual indication that OTASP programming was successful or unsuccessful	HD		

3 **4.7.1.5 Audible Indicators – Power**

4

Req. #	Requirement	Category	Remarks	References
4.7.1.5.1	The mobile device should provide an audible low battery warning.	HD		

5 **4.7.1.6 Audible Indicators – Provisioning**

6

Req. #	Requirement	Category	Remarks	References
4.7.1.6.1	The device should provide an audible tone that programming was successful	HD		
4.7.1.6.2	The device should provide an audible tone that	HD		

Req. #	Requirement	Category	Remarks	References
	programming was unsuccessful			

1 4.8 OTA Provisioning Functions

Req. #	Requirement	Category	Remarks	References
4.8.1	Follow CDG90 Section 5.1	M	The requirements in Section 5.1 of CDG90 must be adhered to with the following exceptions noted below. Exceptions to CDG 90 section 5.1 that do not need to be followed are: 5.1.2	CDG 90 Section 5.1
4.8.2	The device should support IOTA-DM	HD		
4.8.3	The device shall support a PRL and Extended PRL	M		C.S0016-B IS-683C
4.8.4	Devices that do not support a keypad to dial an activation call shall support an alternate method of initiating OTA activation.	M	This can occur on boot-up or automatically or periodically	
4.8.5	The activation method shall be documented for user activation and testing	M		
4.8.6	Data only devices shall have a method for configuring the OTA activation code based on an operator's requirements.	M	Possible OTA activation codes include *22899 or *22886	

Req. #	Requirement	Category	Remarks	References
4.8.7	The device shall support SO19: Over-the-Air Service Administration – OTAPA.	O	Per IS-683-A	C.R1001-0 §3.1

4.9 NAM Requirements

4.9.1 NAM Programming Access

The IMSI is defined as the 15 digits code, composed by [MCC] + [MNC] + [MIN]. The device's NAM programming access shall be made in two distinct ways: SPC1 / OTSL and SPC2.

Req. #	Requirement	Category	Remarks	References
4.9.1.1	Follow CDG90 Section 5.2.1	M	The requirements in Section 5.2.1 of CDG90 must be adhered to.	CDG 90 Section 5.2.1
4.9.1.2	The device does not need to support NAM items related to AMPS is not required	M		

4.9.2 NAM and Software Update

Req. #	Requirement	Category	Remarks	References
4.9.2.1	Follow CDG90 Section 5.2.2	M	<p>The requirements in Section 5.2.2 of CDG90 must be adhered to with the following exceptions noted below.</p> <p>Exceptions to CDG 90 section 5.1 that do not need to be followed are:</p> <p>5.2.2.1</p>	CDG 90 Section 5.2.2

Req. #	Requirement	Category	Remarks	References
4.9.2.2	The device shall provide a data interface that allows the device software upgrade and NAM programming. Interface for SW upgrade and NAM programming through a PC.	M	Supersedes CDG 90 requirement 5.2.2.1 The device shall provide a data interface that allows the device software upgrade and NAM programming.	Supersedes CDG 90 requirement 5.2.2.1

4.9.3 NAM Management in the Devices

Req. #	Requirement	Category	Remarks	References
4.9.3.1	Follow CDG90 Section 5.2.3	M	The requirements in Section 5.2.3 of CDG90 must be adhered to with the following exceptions noted below. Exceptions to CDG 90 section 5.2.3 that do not need to be followed are: 5.2.3.2	CDG 90 Section 5.2.3
4.9.3.2	Switching active NAM without any code restriction.	HD	Supersedes CDG 90 requirement 5.2.3.2 In the PRI, the Operator may enable or disable this user option. i.e., if disabled, the user cannot switch between NAMs. If the user has enabled a personal lock code (PIN), the lock code prompt shall appear when switching to the alternate NAM. This requirement does not apply to devices with R-UIM.	

4.10 AT Commands Requirements

Devices should provide the ability to use AT commands for testing, debugging, configuration, and other application specific needs.

Req. #	Requirement	Category	Remarks	References
4.10.1	Follow CDG90 Section 8.4	M	The requirements in Section 8.4 of CDG90 must be adhered to.	CDG 90 Section 8.4
4.10.2	An interface to the device that does not solely rely on AT commands should be supported	HD	The interface would allow API's to be used	

4.11 Conformance Tests

All devices are required to adhere to the test specifications below based on the capability of the product. The following applies to all devices based on the capability of the product.

Req. #	Requirement	Category	Remarks	References
4.11.1	The performance of the device should not degrade when multiple radio configurations are radiating concurrently	HD	One example test scenario is using Bluetooth for a 1X voice call	
4.11.2	The device should use a mismatched MIN / MDN pair during conformance testing	M	Inherently tests number portability	
4.11.3	The device shall conform to C.S0011-C v2.0	M	Required for devices that support IS2000	C.S0011-C
4.11.4	The device shall conform to C.S0028-A v1.0	M	Required for devices that support TTY	C.S0028-A v1.0

Req. #	Requirement	Category	Remarks	References
4.11.5	The device shall conform to C.S0033-A v2.0	M	Required for devices that support 1xEV-DO	C.S0033-A v2.0
4.11.6	The device shall conform to C.S0036-0 v1.0	M	Required for devices that support Location Based services (C.S0022-0)	C.S0036-0 v1.0
4.11.7	The device shall conform to C.S0037-0 v1.0	M	Required for devices that support IP packet data	C.S0037-0 v1.0
4.11.8	The device shall conform to C.S0038-A v2.0	M	Required for devices that support 1xEV-DO	C.S0038-A v2.0
4.11.9	The device shall conform to C.S0043-0 v1.0	M	Required for devices that support IS-2000	C.S0043-0 v.10
4.11.10	The device shall conform to C.S0060-0 v1.0	M	Required for devices that support OTASP	C.S0060-0 v1.0
4.11.11	The device shall conform to C.S0061-0 v1,0	M	Required for devices that support OTAPA	C.S0061-0 v1.0
4.11.12	The device shall conform to C.S0062	M	Required for CDMA2000 data services	C.S0062-0
4.11.13	The device shall conform to C.S0073-0 v1.0	M	Required for devices that support MEID	C.S0073-B

1 4.12 Debug Menu

2

Req. #	Requirement	Category	Remarks	References
4.12.1	Follow CDG90 Section 6.6	M	<p>The requirements in Section 6.6 of CDG90 must be adhered to with the following exceptions noted below.</p> <p>The exceptions to section 6.6 of CDG 90 are:</p> <p>6.6.1.1</p>	CDG 90 Section 6.6

Req. #	Requirement	Category	Remarks	References
4.12.2	The device with a UI shall be capable of entering a test mode screen either via a hidden menu or specific key sequence for 1xRTT. When entering test mode, user shall be prompted for a password.	HD	Supersedes CDG 90 requirement 6.6.1 The Debug screen shall minimally display the following information for 1xRTT: - SID - NID - Channel - P_REV - Transmit power - Ec/Io - RC - SO - FER - Active Sets	
4.12.3	The device with a UI shall be capable of entering a test mode screen either via a hidden menu or specific key sequence for 1xEV-DO. When entering test mode, user shall be prompted for a password.	HD	If test mode is supported, see CDG Doc 148 Section 2.8.2 for test mode requirements	

1 **4.13 Security and Privacy**

2 **4.13.1 ESN Security**

3

Req. #	Requirement	Category	Remarks	References
4.13.1.1	If the device uses ESN, the ESN shall be protected from modification.	M		

4 **4.15 Roaming**

5 If a device will be roaming across different operators' CDMA2000 networks, the
6 applicable requirements defined in CDG Document 172 "IRT Roaming Requirements for
7 Handsets", are defined below:

Req. #	Requirement	Category	Remarks	References
4.15.1	Section 2.1 Band class in CDG 172 shall be supported	M		
4.15.2	The device shall support CDG Doc 140	M	Required for roaming	CDG Doc 140 Mobile IP Resolution
4.15.3	Section 2.2 Minimum PRL Size of 8K shall be supported	M		CDG 172 Section 2.2
4.15.4	Section 2.3 OTA Provisioning for PRLs shall be supported	M	Section A.B.C in this document provides additional requirements for OTA provisioning	CDG 172 Section 2.3
4.15.5	Section 2.5 Caller ID Behavior may be supported	O	Not needed for data only devices or devices without a UI	CDG 172 Section 2.5
4.15.6	Section 2.6 Standardized Roaming Indicators should be supported	HD		CDG 172 Section 2.6
4.15.7	Section 2.8 Support for +Code dialing should be supported	HD		CDG 172 Section 2.8
4.15.8	Section 2.9 Mobile IP Capability shall be supported	M	Required for devices using Mobile IP	CDG 172 Section 2.9
4.15.9	Section 2.10 E-PRL Support shall be supported	M		CDG 172 Section 2.10
4.15.10	Section 2.11 MEID/EUIMID should be supported	HD		CDG 172 Section 2.11
4.15.11	Section 2.12 IMSI_T should be supported	HD		CDG 172 Section 2.12



5. Optional Device Specific Requirements

This section defines various features and their associated requirements that may or may not be implemented in the embedded CDMA module and/or the specialty vertical device. If the device developer chooses to implement such features, the requirements below should be adhered to.

5.1 MEID Terminals

This section defines requirements for terminals that use MEID as hardware identifier.

Req. #	Requirement	Category	Remarks	References
5.1.1	If the device is MEID based it shall support C.S0066-0 v1.0 "OTASP for MEID Equipped Devices"	M		
5.1.2	If the device is MEID based it shall support C.S0072-1, "MEID for CDMA2000".	M		C.S0072-1
5.1.3	If the device is MEID based it shall support S.R0048-A v3.0 "3G MEID Stage 1"	M		
5.1.4	The MEID shall be protected from modification.	M		

5.2 R-UIM or CSIM Support

The CDMA2000® Operator may or may not have plans for R-UIM or CSIM on UICC usage. Devices that support an R-UIM must meet the following requirements. Device

- 1 must be compliant with C.S0023-A when using RUIM and be compliant with C.S0065-0
 2 when using CSIM on UICC.

3

Req. #	Requirement	Category	Remarks	References
5.2.1	The device should support R-UIM enable/disable specified by the CDMA2000® Operator.	HD	This option may be controlled by any means not directly accessible to the user, including separate device software.	
5.2.2	R-UIM card authentication for devices supporting R-UIM.	M	Devices supporting R-UIM shall use/execute the authentication algorithm (CAVE) in the R-UIM as specified in EIA/TIA/IS-820, and not in the device.	
5.2.3	Devices supporting R-UIM shall select the ESN or UIM_ID as directed by the R-UIM usage indicator.	M		C.S0023-A § 3.4.32
5.2.4	If the R-UIM option is enabled, the R-UIM only shall be used for provisioning and authentication.	M		
5.2.5	If the R-UIM option is enabled, the R-UIM should be used for voice privacy mask.	O		
5.2.6	Any parameters cached when R-UIM is present shall be cleared when the new R-UIM is installed.	M		

Req. #	Requirement	Category	Remarks	References
5.2.7	The driver for the R-UIM shall include support for standard mode convention per C.S0023-Av2.0.	M		C.S0023-Av2.0, ISO/IEC 7816-3, section 6.4.1
5.2.8	The driver for the R-UIM shall include support for inverse mode convention per C.S0023-Av2.0.	M		C.S0023-Av2.0, ISO/IEC 7816-3, section 6.4.1
5.2.9	The device's R-UIM shall conform to 3GPP2 C.S0023-Av2.0 Removable User Identity Module (R-UIM) for CDMA2000® Spread Spectrum Systems.	M	Includes support for OTASP and OTAPA PRL updates to R-UIM.	C.S0023-Av2.0.
5.2.10	The physical R-UIM socket of the device shall follow the definitions specified in C.S0023-Av2.0.	M		Section 2.1 of C.S0023-A references section 4 of GSM 11.11
5.2.11	The device shall supply the operating voltage for the R-UIM, according to C.S0023-Av2.0 standard.	M		Section 2.2 of C.S0023-A references section 5 of GSM 11.11
5.2.12	The device shall support the R-UIM clock frequency: 4MHz (3V).	M		
5.2.13	The device shall support the R-UIM with the capacities of 32 Kbytes, 64 Kbytes, or higher.	M		

Req. #	Requirement	Category	Remarks	References
5.2.14	The device shall support the selection of optional languages and character sets in the R-UIM via Terminal keypad.	HD	The information on the R-UIM card must be presented in the language selected on the handset by the user.	
5.2.15	The security access to applications (Authentication of user to applications) of the R-UIM card shall follow the definitions specified C.S0023-Av2.0. PIN1 and PUK1 shall be supported.	M		
5.2.16	The security access to applications (Authentication of user to applications) of the R-UIM card shall follow the definitions specified C.S0023-Av2.0. PIN2 and PUK2 shall be supported.	O		
5.2.17	The device shall support the storage and editing of the phonebook and SMS both in the Terminal itself and in the R-UIM (default).	M		
5.2.18	The device shall support for OSMS.	HD	The terminal shall support the OSMS functionality is detailed in Appendix C.	
5.2.19	The device shall fully comply with and support UIM toolkit functionality/feature as described in Appendix B.	M		

Req. #	Requirement	Category	Remarks	References
5.2.20	The device shall fully comply with and support CCAT.	O		C.S0035-0
5.2.21	The PRL requirements stated in Section 7.1 shall apply to the PRL contained in the R-UIM.	M		
5.2.22	The device shall have the ability to check and accept only "Operator" R-UIM cards.	M	The terminal shall have a software mechanism that can detect and check Mobile Country Code (MCC) and Mobile Network Code (MNC) in R-UIM (DF 7F25 CDMA Directory EF 6F22 IMSI_M) against the MCC and MNC of the device or a range of MINs. The MCC and MNC are the first five digits of the IMSI_M.	
5.2.23	If a non-"Operator" R-UIM card is detected; the device shall display the popup error message "Please insert Operator R-UIM" (or equivalent in local language).	M	The device shall still be able to make emergency calls even if non-Operator R-UIM card is detected.	
5.2.24	The RUIM slot in the device should be easily accessible	HD		

1 **5.3 TTY Capability**

2 This section defines requirements for devices that support TTY.

3

Req. #	Requirement	Category	Remarks	References
5.3.1	The Device SHALL support TTY communication between mobile-to-mobile, land-to-mobile and mobile-to-land.	M		
5.3.2	The device shall support EVRC TTY/TDD Extension [8].	M		
5.3.3	The device shall support the TTY mode of (1) Full TTY	M		
5.3.4	The device shall support the TTY mode of (2) TTY+Talk (VCO) VCO allows a user to receive TTY characters and talk into the phone [7]	M		
5.3.5	The device shall support the TTY mode of (3) TTY+Hear (HCO) HCO allows a user to transmit TTY characters and listen to phone [7]	M		
5.3.6	The device shall support the TTY mode of (4) TTY Off (Default Setting)	M		
5.3.7	When Full TTY or TTY+Talk (VCO) mode is selected, the Device SHOULD automatically set the earpiece volume to a fixed level	HD		
5.3.8	Turning TTY Off SHALL return the earpiece volume to the level set prior to entering Full TTY or TTY+Talk (VCO) mode.	M		

Req. #	Requirement	Category	Remarks	References
5.3.9	When the Device is in Full TTY or TTY+Talk (VCO) mode, the Data Device SHALL NOT allow changing earpiece volume.	M		
5.3.10	When the Device is in TTY+Talk (VCO) mode, the device SHOULD use its own microphone to capture only the user's voice.	HD		
5.3.11	If the Terminal's microphone is supported for TTY+Talk (VCO), any key presses made on the TTY equipment SHALL NOT have any effect on the VCO (i.e., if the user is talking and accidentally presses some keys on the TTY equipment).	M		
5.3.12	When TTY+Hear (HCO) mode is selected, the Device SHOULD automatically turn on speakerphone mode by default with the option to switch into earpiece mode during TTY+Hear (HCO).	HD		
5.3.13	When the Device is in TTY+Hear (HCO) mode, the Device SHALL allow changing the earpiece and speakerphone volume.	M		
5.3.14	When the Device is in TTY+Hear (HCO) mode, the Device SHALL NOT allow decreasing the volume below the minimum volume i.e., "level one".	M		

Req. #	Requirement	Category	Remarks	References
5.3.15	If the audio connector is not a standard 2.5 mm, the vendor SHALL provide an adapter so the Data Device can be used with any TTY device that supports a 2.5 mm interface (Note that the adapter does not need to be included in the retail box, as long as the vendor has developed an adaptor which will be provided for TTY testing and which can be purchased separately by the end-user).	M		

1 **5.3.16 Location-based Services**

2 If device supports location-based services, such as GPS or A-GPS, the following
3 requirements are needed.

4 **5.3.16.1 Summary Requirements**

5

Req. #	Requirement	Category	Remarks	References
5.3.16.1.1	The device shall support C.S0022-1	M		
5.3.16.1.2	The device shall support CDG Doc 101	M	CDMA Mobile Station LBS Requirements	
5.3.16.1.3	The device shall support CDG 111	M	IS-801 call flows	
5.3.16.1.4	The device shall adhere to the latest call flows defined in J-STD-036	M		

Req. #	Requirement	Category	Remarks	References
5.3.16.1.5	The device shall support a mechanism for SMS-triggered mobile originated location call flows for position determination	M	Based on the supported technologies, the SMS can be delivered via 1xEV-DO or 1X	
5.3.16.1.6	The device shall support mobile terminated location call flows for position determination	M		
5.3.16.1.7	The device shall provide location information during an E911 voice call	M		

1 **5.3.16.2 Performance and Testing Requirements**

2

Req. #	Requirement	Category	Remarks	References
5.3.16.2.1	The device shall comply with the testing requirements defined in C.S0036 and C.S0059	M		C.S0036 C.S0059
5.3.16.2.2	The GPS RF connector loss shall be less than 4dB	M		
5.3.16.2.3	The CDMA RF connector may be the same as the GPS RF connector if the RF path is shared	O		

3 **5.4 Short Message Service Requirements**

4 If device supports Short Messages Services (SMS) the following requirements are
5 needed.

1 **5.4.1 General Requirements**

2

Req. #	Requirement	Category	Remarks	References
5.4.1.1	Follow CDG90 Section 7.1	M	The requirements in Section 7.1 of CDG90 must be adhered to.	CDG 90 Section 7.1
5.4.1.2	Non-SMS capable device shall support a mechanism to reject the SMS and indicate to the network that the device does not support SMS. The device SHALL not just silently discard the SMS and perform no other action.	M	The cause code field can be used as an indication to the network.	
5.4.1.3	The device should support receiving SMS messages (MT) using SO14	HD		
5.4.1.4	The device shall use SO6 for transmitting SMS messages.	M		

1 **5.4.2 Mobile Terminated SMS Related Functions (MT-SMS)**

2

Req. #	Requirement	Category	Remarks	References
5.4.2.1	Follow CDG90 Section 7.2	M	<p>The requirements in Section 7.2 of CDG90 must be adhered to, with the following exceptions noted below.</p> <p>The exceptions to requirements in section 7.2 of CDG 90 are:</p> <p>7.2.1 7.2.2 7.2.3 7.2.4 7.2.5 7.2.10 7.2.11 7.2.12 7.2.13 7.2.14 7.2.15 7.2.20 7.2.23 7.2.27</p>	CDG 90 Section 7.2
5.4.2.2	The device shall be able to receive SMS during a data session on 1xEV-DO (browser, network aware applications).	M	This assumes the device is in SO59 or appropriate service option for 1xEV-DO.	

3 **5.4.3 Mobile Originated SMS (MO-SMS)**

4

Req. #	Requirement	Category	Remarks	References
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Req. #	Requirement	Category	Remarks	References
5.4.3.1	Follow CDG90 Section 7.3	M	<p>The requirements in Section 7.3 of CDG90 must be adhered to, with the following exceptions noted below.</p> <p>The exceptions to requirements in section 7.3 of CDG 90 are:</p> <p>7.3.5 7.3.6 7.3.7 7.3.8 7.3.12 7.3.13 7.3.14 7.3.15 7.3.16 7.3.17 7.3.18 7.3.21 7.3.22 7.3.24</p>	CDG 90 Section 7.3
5.4.3.2	The device should support up to a 42 digit number for SMS addressing.	HD		
5.4.3.3	The device should support any encoding format for SMS text to send messages if the device supports it.	HD	Possible formats include UTF-8, Unicode, or ISO-Latin format.	
5.4.3.4	The device shall support the Priority Indicator Subparameter for sending and receiving SMS	HD	Note that not all SMSC support this feature.	
5.4.3.5	The device should allow an SMS transmission during a data call.	HD	This is applicable for a data call on 1X or 1xEV-DO	

1 **5.4.4 SMS UI**

2 The requirements for a device supporting SMS as well as having a visual mechanism to
3 display an SMS message are defined below.

4

Req. #	Requirement	Category	Remarks	References
5.4.4.1	Follow CDG90 Section 7.4	M	<p>The requirements in Section 7.4 of CDG90 must be adhered to, with the following exceptions noted below.</p> <p>The exceptions to requirements in section 7.4 of CDG 90 are:</p> <p>7.4.1 7.4.2 7.4.3 7.4.4 7.4.5</p>	CDG 90 Section 7.4

5



6. CDMA2000 1X Requirements

The convention for the CDMA requirements is:

- The feature set defined herein is the nominal set of features that a cdma2000® Release-0 mobile is required to support in order to offer acceptable voice and data services in both the home and foreign networks.
- MOB_P_REV values are:
 - 3 – IS-95A
 - 4 – IS-95B
 - 5 – IS-95B
 - 6 – cdma2000® Release-0

The statement “≤” following a given MOB_P_REV value means that all features listed under that MOB_P_REV are supported, as well as all features listed under all mobile protocol revisions less than or equal to the stated value.

The feature set identified by this document is the nominal set of features that a cdma2000® Release-0 mobile is required to support in order to offer basic voice and data services while roaming. Such mobile can roam into a visited 1x system or IS-95 system.

6.1 Versions of CDMA

The following requirements apply to devices supporting IS-2000 (CDMA2000® 1xRTT).

Req. #	Requirement	Category	Remarks	References
6.1.1	Follow CDG90 Section 3.1	M	<p>The requirements in Section 3.1 of CDG90 must be adhered to with the following exceptions noted below.</p> <p>Exceptions to CDG 90 that do not need to be followed are:</p> <p>3.1.3</p>	CDG 90 Section 3.1

Req. #	Requirement	Category	Remarks	References
6.1.2	The device shall support IS-95B (P_Rev = 5)	HD	Exceptions to this requirement are support for PUF and PACA. This supersedes CDG 90 requirement 3.1.3	C.S0001-0-2 C.S0002-0-2 C.S0003-0-2 C.S0004-0-2 C.S0005-0-2

6.2 Physical Channel Support Requirements

This section defines the minimum requirements for the CDMA2000® 1xRTT physical channels.

Req. #	Requirement	Category	Remarks	References
6.2.1	Follow CDG90 Section 3.4	M	The requirements in Section 3.4 of CDG90 must be adhered to.	CDG 90 Section 3.4

6.3 Radio Configuration Requirements

This section defines the minimum requirements for the CDMA2000® 1xRTT radio configurations.

Req. #	Requirement	Category	Remarks	References
6.3.1	Follow CDG90 Section 3.5	M	The requirements in Section 3.5 of CDG90 must be adhered to.	CDG 90 Section 3.5
6.3.2	The device shall minimally support the Radio Configuration RC2 for the Forward Link	M		C.S0002-0-2, §3.1.3.1
6.3.3	The device shall minimally support the Radio Configuration RC2 for the Reverse Link	M		C.S0002-0-2, §3.1.3.1
6.3.4	The device should minimally support Radio configuration RC 4 for the Reverse Link	HD		C.S0002-0-2, §3.1.3.1
6.3.5	The device should	HD		C.S0002-0-2,

Req. #	Requirement	Category	Remarks	References
	minimally support Radio configuration RC5 for the Forward Link			§2.1.3.1
6.3.6	The device should minimally support Radio configuration RC5 for the Reverse Link	HD		C.S0002-0-2, §2.1.3.1

6.4 Power Control Requirements

This section defines the minimum requirements for the CDMA2000® 1x RTT power control.

Req. #	Requirement	Category	Remarks	References
6.4.1	Follow CDG90 Section 3.7	M	The requirements in Section 3.7 of CDG90 must be adhered to.	CDG 90 Section 3.7
6.4.2	The device shall support reverse link power control with step size = 1 dB	M		

6.5 Other Physical Layer Requirements

This section defines other physical layer minimum requirements.

Req. #	Requirement	Category	Remarks	References
6.5.1	Follow CDG90 Section 3.8	M	The requirements in Section 3.8 of CDG90 must be adhered to.	CDG 90 Section 3.8

6.6 Handoff Requirements

This section defines other physical layer minimum requirements.

Req. #	Requirement	Category	Remarks	References
6.6.1	Follow CDG90 Section 3.9	M	The requirements in Section 3.9 of CDG90 must be adhered to.	CDG 90 Section 3.9

6.7 Layer 2 and Layer 3 Minimum Requirements

This section defines Layer 2 and Layer 3 minimum requirements.

Req. #	Requirement	Category	Remarks	References
Layer 3 / Signaling Features and Layer 2 / LAC Features				
6.7.1	Follow CDG90 Section 3.10	M	The requirements in Section 3.10 of CDG90 must be adhered to.	CDG 90 Section 3.10
6.7.2	The device shall support the global service redirection message (GSRM).	M		
6.7.3	The device shall support the CDMA channel list message (CLM) and extended CDMA channel list message (ECLM)	M		
6.7.4	The device shall support the neighbor list message (NLM), extended neighbor list message (ENLM) and general neighbor list message (GNLM)	M		

6.8 Service Option Support Minimum Requirements

This section defines Layer 2 and Layer 3 minimum requirements.

Req. #	Requirement	Category	Remarks	References
6.8.1	Follow CDG90 Section 3.11	M	The requirements in Section 3.11 of CDG90 must be adhered to.	CDG 90 Section 3.11

Req. #	Requirement	Category	Remarks	References
6.8.2	The device shall support SO32: Test Data Service Option (TDSO)	M	For data devices	
6.8.3	The device shall support SO55: 3G/1x Loopback SO (LSO)	M		
6.8.4	The device shall support SO68: EVRC-B Narrow Band (Rate Set 1)	M	This will improve device performance and system capacity.	

1 **6.9 Authentication and Voice Privacy**

Req. #	Requirement	Category	Remarks	References
6.9.1	Follow CDG90 Section 6.5.1	M	The requirements in Section 6.5.1 of CDG90 must be adhered to.	CDG 90 Section 6.5.1
6.9.2	The A-KEY shall only be accessible via password protected menus	M		

3 **6.10 Speech CODEC**

Req. #	Requirement	Category	Remarks	References
6.10.1	Follow CDG90 Section 4.1	M	The requirements in Section 4.1 of CDG90 must be adhered to.	CDG 90 Section 4.1

5 **6.11 Audio CODEC**

6 This section covers audio codecs that may be useful for value added services.

Req. #	Requirement	Category	Remarks	References
6.11.1	Follow CDG90 Section 4.2	M	The requirements in Section 4.2 of CDG90 must be adhered to.	CDG 90 Section 4.2



7. Data Services Requirements

The requirements detailed in this section only apply to devices that support data services. If a device does not support data services, these requirements do not apply. Data services can be provided using CDMA2000 1X (IS-2000) or 1xEV-DO (IS-856) or both.

7.1 Summary Requirements

Req. #	Requirement	Category	Remarks	References
7.1.1	Follow CDG90 Section 8.1	M	The requirements in Section 8.1 of CDG90 must be adhered to.	CDG 90 Section 8.1
7.1.2	The device shall support CDG Doc 140	M	Required for roaming	CDG Doc 140 Mobile IP Resolution
7.1.3	The device should support IPv6	HD	Applicable if the network supports IPv6. May become mandatory at a later time.	RFC 2460
7.1.4	The device may support relay mode packet data services as specified in the reference.	HD	Supersedes CDG 90 requirement 8.1.6	3GPP2 C.S0017-0-2.3 Data Service Options for Spread Spectrum System: AT command Processing & Rm interface.
7.1.5	The device shall support CHAP for A12 authentication for 1xEV-DO	M	RAN authentication	

7.2 General Requirements IS-95A (C.S0017-0-3)

Req. #	Requirement	Category	Remarks	References
7.2.1	Follow CDG90 Section 8.2	M	The requirements in Section 8.2 of CDG90 must be adhered to.	CDG 90 Section 8.2

7.3 IS2000 Packet Data Service

7.3.1 Data Rate Requirements

This section defines the minimum requirements for the CDMA2000® 1x RTT data rates.

Req. #	Requirement	Category	Remarks	References
7.3.1.1	Follow CDG90 Section 3.6	M	The requirements in Section 3.6 of CDG90 must be adhered to.	CDG 90 Section 3.6

7.3.2 Dormant Parameters

Req. #	Requirement	Category	Remarks	References
7.3.2.1	Follow CDG90 Section 8.3.1	M	The requirements in Section 8.3.1 of CDG90 must be adhered to.	CDG 90 Section 8.3.1

7.4 1xEV-DO Requirements (IS-856)

Req. #	Requirement	Category	Remarks	References
7.4.1	The device shall comply with CDG Doc 155	M		CDG Doc 155 Wireless IP
7.4.2	The device shall comply with CDG Doc 148	M	Only mandatory for devices that support 1xEV-DO	CDG Doc 148 Requirements for CDMA2000 1xEV-DO Revision 0 and A

7.5 1xRTT and 1xEV-DO Handoffs

Req. #	Requirement	Category	Remarks	References
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Req. #	Requirement	Category	Remarks	References
7.5.1.1	The device shall support all the handoffs defined in C.S0011-A	M		C.S0011-A
7.5.1.1.1	The device shall support all the handoffs defined in C.S0033-A	M		C.S0033-A
7.5.1.1.2	The device shall support 1xRTT to/from 1xEV-DO inter-technology transitions across the operating frequencies the device supports.	M		

1 **7.6 Data Retry**

2

Req. #	Requirement	Category	Remarks	References
7.6.1.1	The device shall comply with the data retry and data session throttling requirements defined in CDG 160	M		CDG 160 Data Session Throttling

3

¹ END OF DOCUMENT