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Introduction to cdma2000 Spread Spectrum Systems

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This addendum is provided to correct errors and omissions in the previously published version of this standard.

Revisions are indicated by change bars located in the left or right hand margins, and also by specific markings applied to the text.

New text is underlined, as shown below.

This is how new text is identified.

Deleted text is crossed out, as shown below.

~~This is how deleted text is identified.~~

A modified figure is marked similarly to modified text. A new figure is underlined; a deleted figure is crossed out through the middle of the figure.

The table of contents does not identify revisions to any section heading, table, or figure.

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2 No text.

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1 OVERVIEW

1.1 The cdma2000 Family of Standards

The cdma2000 family of standards specifies a spread spectrum radio interface that uses Code Division Multiple Access (CDMA) technology to meet the requirements for 3G wireless communication systems. The standards in the family are: [\[1, 2, 3, 4, 5\]](#).

~~IS-2000-1—Introduction to cdma2000 Standards for Spread Spectrum Systems~~

~~IS-2000-2—Physical Layer Standard for cdma2000 Spread Spectrum Systems~~

~~IS-2000-3—Medium Access Control (MAC) Standard for cdma2000 Spread Spectrum Systems~~

~~IS-2000-4—Signaling Link Access Control (LAC) Standard for cdma2000 Spread Spectrum Systems~~

~~IS-2000-5—Upper Layer (Layer 3) Signaling Standard for cdma2000 Spread Spectrum Systems~~

In addition, the family includes a standard [\[6\]](#) that specifies analog operation, to support dual-mode mobile stations and base stations:

~~IS-2000-6—Analog Signaling Standard for cdma2000 Spread Spectrum Systems~~

Throughout the remainder of this document, use of the term cdma2000 refers to the cdma2000 family of standards.

1.1.1 Purpose

The technical requirements contained in cdma2000 form a compatibility standard for ~~800 MHz cellular mobile telecommunications systems and 1.8 to 2.0 GHz Code Division Multiple Access (CDMA) Personal Communications Services (PCS)~~[CDMA](#) systems. They ensure that a mobile station can obtain service in a ~~cellular or PCS~~ system manufactured in accordance with the cdma2000 standards. The requirements do not address the quality or reliability of that service, nor do they cover equipment performance or measurement procedures.

Compatibility, as used in connection with cdma2000, is understood to mean: any [cdma2000](#) mobile station is able to place and receive calls in [cdma2000 or IS-95](#) ~~any 800 MHz CDMA cellular mobile telecommunications system or in any 1.8 to 2.0 GHz CDMA PCS systems~~. Conversely, ~~any cdma2000 all CDMA systems are is~~ [any cdma2000](#) ~~all CDMA systems are is~~ able to place and receive calls for ~~any CDMA~~[cdma2000 and IS-95](#) mobile stations. In a subscriber's home system, all call placement is automatic. Similarly, it is preferable for call placement to be automatic when a mobile station is roaming.

To ensure compatibility, both radio system parameters and call processing procedures are specified. The sequence of call processing steps that the mobile stations and base stations execute to establish calls is specified, along with the digital control messages and, for dual-mode systems, the analog signals that are exchanged between the two stations.

The base station is subject to different compatibility requirements than is the mobile station. Radiated power levels, both desired and undesired, are fully specified for mobile

1 stations, in order to control the RF interference that one mobile station can cause another.
2 Base stations are fixed in location and their interference is controlled by proper layout and
3 operation of the system in which the station operates. Detailed call processing procedures
4 are specified for mobile stations to ensure a uniform response to all base stations. Base
5 station procedures which do not affect the mobile stations' operation are left to the
6 designers of the overall land system. This approach to writing the compatibility
7 specification provides the land system designer with sufficient flexibility to respond to local
8 service needs and to account for local topography and propagation conditions.

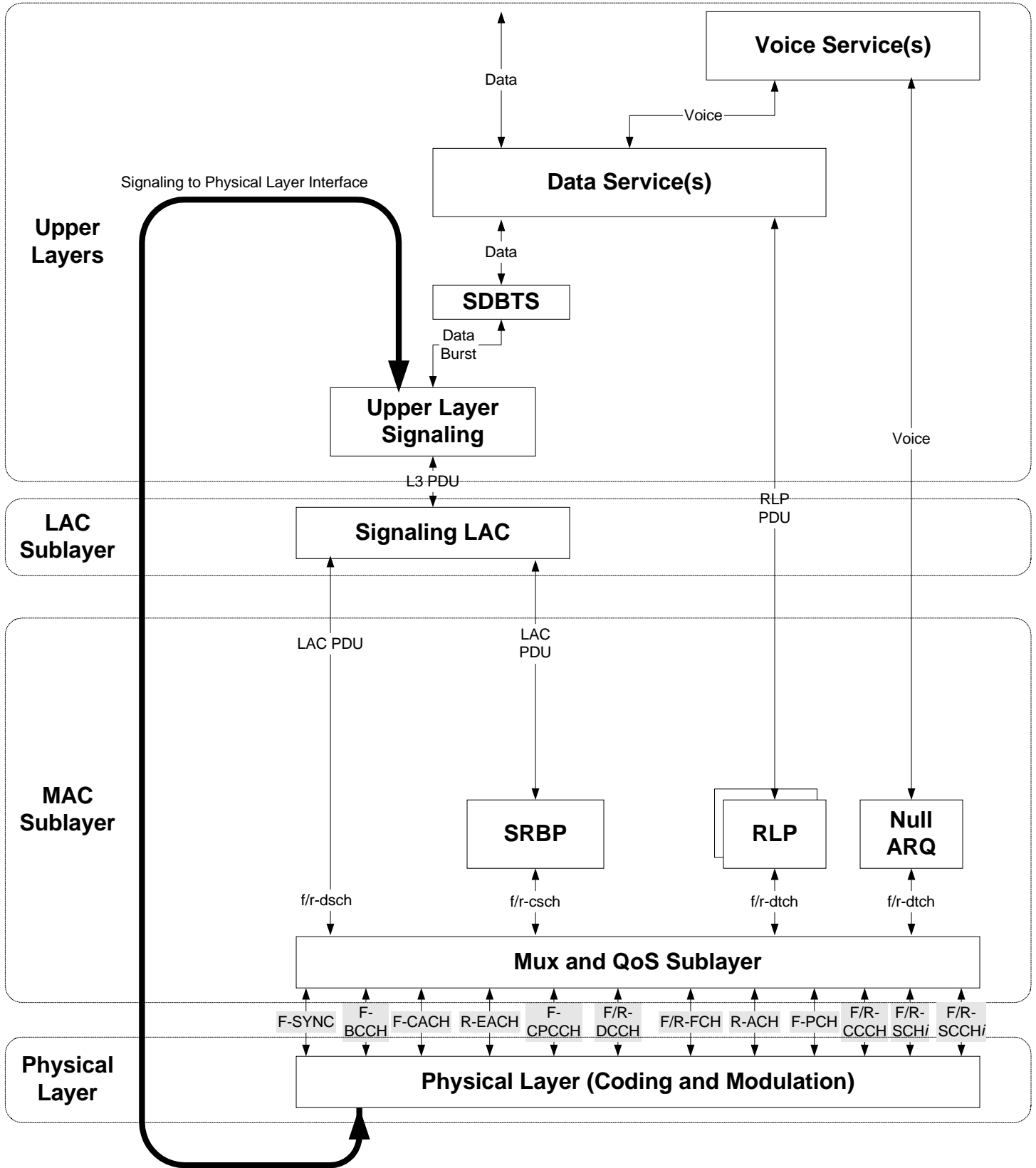
9 cdma2000 includes provisions for future service additions and expansion of system
10 capabilities. This release of the cdma2000 family of standards supports Spreading Rate 1
11 operation (see [TIA/EIA/IS-2000-2\[2\]](#)).

12 1.1.2 Architecture

13 Figure 1 depicts the general architecture of cdma2000. Development of the cdma2000
14 family of standards has, to the greatest extent possible, adhered to the architecture by
15 specifying different layers in different standards.

16 The physical layer is specified in [IS-2000-2\[2\]](#), the [medium access control \(MAC\) layer](#) in
17 [IS-2000-3\[3\]](#), the [link access control \(LAC\) layer](#) in [IS-2000-4\[4\]](#), and upper layer signaling
18 in [IS-2000-5\[5\]](#).

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Figure 1. cdma2000 Architecture

1.2 Relationship to TIA/EIA-95-B

cdma2000 provides full backward compatibility with TIA/EIA-95-B. Backward compatibility permits cdma2000 infrastructure to support TIA/EIA-95-B mobile stations and permits cdma2000 mobile stations to operate in TIA/EIA-95-B systems.

The cdma2000 family also supports reuse of existing TIA/EIA-95-B service standards, such as those that define speech services, data services, Short Message Services, and Over the Air Provisioning and Activation services, with the cdma2000 physical layer.

cdma2000 supports handoff of voice and data calls and other services from a TIA/EIA-95-B system to a cdma2000 system:

- At a handoff boundary and within a single frequency band
- At a handoff boundary and between frequency bands (assuming the mobile station has multi-band capability)
- Within the same cell footprint and within a single frequency band
- Within the same cell footprint and between frequency bands (assuming the mobile station has multi-band capability)

cdma2000 supports handoff of voice and data calls and other services¹ from a cdma2000 system to a TIA/EIA-95-B system:

- At a handoff boundary and within a single frequency band
- At a handoff boundary and between frequency bands (assuming the mobile station has multi-band capability)
- Within the same cell footprint and within a single frequency band
- Within the same cell footprint and between frequency bands (assuming the mobile station has multi-band capability)

1.3 [cdma2000 References](#)

[The following list identifies the current versions of the standards in the cdma2000 family of standards.](#)

- [1. C.S0001-0, *Introduction to cdma2000 Standards for Spread Spectrum Systems.*](#)
- [2. C.S0002-0, *Physical Layer Standard for cdma2000 Spread Spectrum Systems.*](#)
- [3. C.S0003-0, *Medium Access Control \(MAC\) for cdma2000 Spread Spectrum Systems.*](#)
- [4. C.S0004-0, *Signaling Link Access Control \(LAC\) for cdma2000 Spread Spectrum Systems.*](#)
- [5. C.S0005-0, *Upper Layer \(Layer 3\) Signaling for cdma2000 Spread Spectrum Systems.*](#)
- [6. C.S0006-0, *Analog Signaling Standard for cdma2000 Spread Spectrum Systems.*](#)

¹ Assuming that the cdma2000 service can be appropriately mapped to a TIA/EIA-95-B service.

1.3.1.4 Informative References

The documents listed in this section are for information only.

—*American National Standards:*

1. TIA/EIA-664-A, *Cellular Features Description*.
2. TIA/EIA-96-C, *Speech Service Option Standard for Wideband Spread Spectrum Systems*, August 1998.
3. TIA/EIA/IS-733, *High Rate Speech Service Option 17 for Wideband Spread Spectrum Communication Systems*, March 1998.
4. TIA/EIA/IS-733-1, *High Rate Speech Service Option 17 for Wideband Spread Spectrum Communication Systems – Addendum 1*.
5. TIA/EIA/IS-127, *Enhanced Variable Rate Codec, Speech Service Option 3 for Wideband Spread Spectrum Digital Systems*, January 1997.
6. TIA/EIA/IS-127-1, *Enhanced Variable Rate Codec, Speech Service Option 3 for Wideband Spread Spectrum Digital Systems - Addendum 1*, August 1998.
7. TIA/EIA/IS-127-2, *Enhanced Variable Rate Codec, Speech Service Option 3 for Wideband Spread Spectrum Digital Systems - Addendum 2*.

—*Standards:*

8. ITU-T Recommendation P.76, *Determination of Loudness Ratings; Fundamental Principles*, 1988.
9. ITU-T Recommendation P.78, *Subjective Testing Method for Determination of Loudness Ratings in Accordance with Recommendation P.76 : Telephone Transmission Quality Measurements Related to Speech Loudness : Study Group 12*, March 1993.
10. ITU-T Recommendation P.79, *Calculation of Loudness Ratings for Telephone Sets : Telephone Transmission Quality Measurements Related to Speech Loudness : Study Group 12*, March 1993.
11. EIA/IS-19-B, *Recommended Minimum Standards for 800-MHz Cellular Subscriber Units*, May 1988.
12. EIA/IS-20-A, *Recommended Minimum Standards for 800-MHz Cellular Land Stations*, May 1988.
13. TIA/EIA-660, *Uniform Dialing Procedures and Call Processing Treatment for Cellular Radio Telecommunications*, July 1996.
14. ICD-GPS-200, *NAVSTAR GPS Space Segment/Navigation User Interfaces*, Interface Control Document (ICD), Revision B, Unclassified, U.S. Air Force Space Division, Los Angeles Air Force Station, CA, July 1991.
15. IEEE Standard 269-1992, *IEEE Standard Methods for Measuring Transmission Performance of Analog and Digital Telephone Sets*, 1992.

- 1 16. TIA/EIA/IS-707-A, *Data Services Options for Spread Spectrum Digital Cellular*
2 *Systems*, April 1999.
- 3 17. TIA/EIA-126-C, *Mobile Station Loopback Service Option Standard*.
- 4 18. TSB46, *Recommended Minimum Procedures for Validation of Authentication of*
5 *IS-54-B Mobile Stations*, March 1993.
- 6 19. TSB51, *Cellular Radio-Telecommunications Intersystem Operations: Authentication,*
7 *Signaling Message Encryption and Voice Privacy*, May 1993.
- 8 20. TSB64, *IS-41-B Support for Dual-Mode Wideband Spread Spectrum Mobile Stations*,
9 January 1994.
- 10 21. *Total Access Communications System Mobile Station - Land Station Compatibility*
11 *Specification*, Issue 4, Amendment 1, Department of Trade and Industry,
12 Radiocommunications Division, London, October 1991.
- 13 22. RCR STD-36, *Analog Cellular Telecommunication System Based On TACS Method*,
14 October 1993.

15 —*Books:*

- 16 23. Knuth, Donald N., *The Art of Computer Programming*, 3 volumes, Reading, MA,
17 Addison-Wesley, 1998.
- 18 24. Park, Stephen K., and Miller, Keith W., "Random Number Generators: Good Ones
19 are Hard to Find," *Communications of the ACM*, vol. 31, no. 10, October 1988.

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2 COMMON ASPECTS

2.1 Verbal Forms

The following verbal forms are used in all cdma2000 standards. “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 (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.

2.2 Channel Naming Conventions

Many cdma2000 standards refer to logical channels, physical channels, or both. The following naming conventions apply to all cdma2000 standards.

2.2.1 Logical Channel Naming Convention

A logical channel name consists of three lower case letters followed by "ch" (channel). A hyphen is used after the first letter. Table 1 shows the naming conventions for the logical channels that are used in this family of standards.

Table 1. Naming Conventions for Logical Channels

First Letter	Second Letter	Third letter
f = Forward	d = Dedicated	t = Traffic
r = Reverse	c = Common	m = MAC
		s = Signaling

For example, the logical channel name for the Forward Dedicated Traffic Channel is f-dtch.

2.2.2 Physical Channel Naming Convention

Physical channels are represented by upper case abbreviations. As in the case of logical channels, the first letters in the names of the channels indicate the direction of the channel (i.e., forward or reverse). Table 2 shows the names and meanings of all the physical channels designated in cdma2000.

Table 2. Conventions for Physical Channel Naming

Channel Name	Physical Channel
F/R-FCH	Forward/Reverse Fundamental Channel
F/R-DCCH	Forward/Reverse Dedicated Control Channel

F/R-SCCH	Forward/Reverse Supplemental Code Channel
F/R-SCH	Forward/Reverse Supplemental Channel
F-PCH	Paging Channel
F-QPCH	Quick Paging Channel
R-ACH	Access Channel
F/R-CCCH	Forward/Reverse Common Control Channel
F/R-PICH	Forward/Reverse Pilot Channel
F-APICH	Dedicated Auxiliary Pilot Channel
F-TDPICH	Transmit Diversity Pilot Channel
F-ATDPICH	Auxiliary Transmit Diversity Pilot Channel
F-SYNCH	Sync Channel
F-CPCCH	Common Power Control Channel
F-CACH	Common Assignment Channel
R-EACH	Enhanced Access Channel
F-BCCH	Broadcast Control Channel

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2 For example, the physical channel name for the Forward Fundamental Channel is F-FCH.

3 **2.3 Definitions of Terms**4 Each cdma2000 volume contains a definition of terms proper to that volume. Every
5 attempt has been made to use the same definitions for the same terms across the family of
6 volumes.7 **2.4 Constants**8 Table 3 lists the constants defined in various cdma2000 volumes and identifies the
9 standard in which the constant is defined.

10

Table 3 cdma2000 Constants

Constant	Standard
N _{1m}	TIA/EIA/IS-2000-4 [4]
N _{2m}	TIA/EIA/IS-2000-5 [5]
N _{3m}	[5] TIA/EIA/IS-2000-5

N4m	[5]TIA/EIA/IS-2000-5
N5m	[5]TIA/EIA/IS-2000-5
N6m	[5]TIA/EIA/IS-2000-5
N7m	[5]TIA/EIA/IS-2000-5
N8m	[5]TIA/EIA/IS-2000-5
N9m	[5]TIA/EIA/IS-2000-5
N10m	[5]TIA/EIA/IS-2000-5
N11m	[5]TIA/EIA/IS-2000-5
N12m	[5]TIA/EIA/IS-2000-5
N13m	[5]TIA/EIA/IS-2000-5
N14m	TIA/EIA/IS-2000-4 [4]
N15m	TIA/EIA/IS-2000-4 [4]
T1b	[5]TIA/EIA/IS-2000-5
T2b	[5]TIA/EIA/IS-2000-5
T3b	[5]TIA/EIA/IS-2000-5
T4b	[5]TIA/EIA/IS-2000-5
T1m	TIA/EIA/IS-2000-4 [4]
T2m	TIA/EIA/IS-2000-4 [4]

T3m	TIA/EIA/IS-2000-4 [4]
T4m	TIA/EIA/IS-2000-4 [4]
T5m	TIA/EIA/IS-2000-5 [5]
T20m	TIA/EIA/IS-2000-5 [5]
T21m	TIA/EIA/IS-2000-5 [5]
T30m	TIA/EIA/IS-2000-5 [5]
T31m	TIA/EIA/IS-2000-5 [5]
T32m	TIA/EIA/IS-2000-5 [5]
T33m	TIA/EIA/IS-2000-5 [5]
T34m	TIA/EIA/IS-2000-5 [5]
T35m	TIA/EIA/IS-2000-5 [5]
T36m	TIA/EIA/IS-2000-5 [5]
T37m	TIA/EIA/IS-2000-5 [5]
T38m	TIA/EIA/IS-2000-5 [5]
T39m	TIA/EIA/IS-2000-5 [5]
T40m	TIA/EIA/IS-2000-5 [5]
T41m	TIA/EIA/IS-2000-5 [5]
T42m	TIA/EIA/IS-2000-5 [5]

T50m	[5]TIA/EIA/IS-2000-5
T51m	[5]TIA/EIA/IS-2000-5
T52m	[5]TIA/EIA/IS-2000-5
T53m	[5]TIA/EIA/IS-2000-5
T54m	[5]TIA/EIA/IS-2000-5
T55m	[5]TIA/EIA/IS-2000-5
T56m	[5]TIA/EIA/IS-2000-5
T57m	[5]TIA/EIA/IS-2000-5
T58m	[5]TIA/EIA/IS-2000-5
T59m	[5]TIA/EIA/IS-2000-5
T60m	[5]TIA/EIA/IS-2000-5
T61m	[5]TIA/EIA/IS-2000-5
T62m	[5]TIA/EIA/IS-2000-5
T63m	[5]TIA/EIA/IS-2000-5
T64m	[5]TIA/EIA/IS-2000-5
T65m	[5]TIA/EIA/IS-2000-5
T66m	[5]TIA/EIA/IS-2000-5
T68m	[5]TIA/EIA/IS-2000-5

T69m	[5]TIA/EIA/IS-2000-5
T70m	[5]TIA/EIA/IS-2000-5
T71m	[5]TIA/EIA/IS-2000-5
T72m	[5]TIA/EIA/IS-2000-5
T73m	[5]TIA/EIA/IS-2000-5
T74m	[5]TIA/EIA/IS-2000-5
T75m	TIA/EIA/IS-2000-4 [4]
T76m	TIA/EIA/IS-2000-4 [4]
T77m	TIA/EIA/IS-2000-4 [4]