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Data Service Options for Spread Spectrum Systems: Introduction and Service Guide

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1 INTRODUCTION AND SERVICE GUIDE

1.1 General Description

This standard describes data services available on spread spectrum systems. It is organized into a series of related recommendations, some of which address functions common to all CDMA2000[®] ¹ data services, and others which describe a specific data service.

The recommendations included in this series are:

Data Service Options for Spread Spectrum Systems:
Introduction and Service Guide

Data Service Options for Spread Spectrum Systems:
Radio Link Protocol Type 1

Data Service Options for Spread Spectrum Systems:
AT Command Processing and the R_m Interface

Data Service Options for Spread Spectrum Systems:
Async Data and Fax Services

Data Service Options for Spread Spectrum Systems:
Packet Data Services

Data Service Options for Spread Spectrum Systems:
STU-III Services

Data Service Options for Spread Spectrum Systems:
Analog Fax Service

Data Service Options for Spread Spectrum Systems:
Radio Link Protocol Type 2

Data Service Options for Spread Spectrum Systems:
High Speed Packet Data Services

Data Service Options for Spread Spectrum Systems:
Radio Link Protocol Type 3

Data Service Options for Spread Spectrum Systems:
Service Option 34

Data Service Options for Spread Spectrum Systems:
Service Options 33 and 66

Data Service Options for Spread Spectrum Systems: cdma2000 ISDN
Interworking Service Option 37

¹ CDMA2000[®] is the trademark for the technical nomenclature for certain specifications and standards of the Organizational Partners (OPs) of 3GPP2. Geographically (and as of the date of publication), CDMA2000[®] is a registered trademark of the Telecommunications Industry Association (TIA-USA) in the United States.

1 A recommendation may be referred to by its designation (e.g., IS-707-A.1) or by its relative
2 chapter number (e.g., Chapter 1 means IS-707-A.1, Chapter 2 means IS-707-A.2, etc.).

3 This chapter provides an overview of the document's content, describes the simplified
4 network reference model applicable to data services, introduces the data services, and
5 discusses intersystem support for data services. Chapter 2 defines the Radio Link Protocol
6 used by some data services to transport octets between the mobile station (MS) and
7 BS/MS. Chapter 3 is concerned with AT Command processing and the R_m interface.
8 Chapter 4 defines asynchronous (hereafter called async) data service and Group-3
9 facsimile (hereafter called fax) service. Chapter 5 details a packet data bearer service
10 compatible with many packet data networks. Chapter 6 describes a service that carries
11 secure communications from U.S. Government digital STU-III terminals. Chapter 7 details
12 how service is provided to analog fax machines connected to a spread spectrum system.
13 Chapter 8 defines Radio Link Protocol Type 2 that uses the services defined in
14 TIA/EIA-95-B to allow increased transmission speeds. Chapter 9 describes a packet data
15 bearer service that provides higher rates (greater than the rates possible using chapter 5)
16 by using RLP Type 2 and other services defined in TIA/EIA-95-B.

17 The following verbal forms are used throughout all chapters. **Shall** and **shall not** identify
18 requirements to be followed strictly to conform to the standard and from which no
19 deviation is permitted. **Should** and **should not** indicate that one of several possibilities is
20 recommended as particularly suitable, without mentioning or excluding others; that a
21 certain course of action is preferred but not necessarily required; or that (in the negative
22 form) that a certain possibility or course of action is discouraged but not prohibited. **May**
23 and **may not** indicate a course of action permissible within the limits of the standard. **Can**
24 and **cannot** are used for statements of possibility and capability, whether material,
25 physical, or causal.

26 **1.2 Revision History**

27 Revision A includes corrections in chapters 3 and 4. In addition, it supports the following
28 new capabilities:

- 29 • Chapter 2 contains procedures to support multiple user data encryption modes.
- 30 • Chapter 3 contains support for procedures supporting service switching as
31 described in chapter 4.
- 32 • Chapter 4 contains procedures to support service switching from a service option
33 other than async data or fax to an async data or fax service option.
- 34 • Chapter 5 contains support for packet zone reconnection control.
- 35 • Chapters 7, 8, and 9 are new.

36 **1.3 Terms**

37 Each chapter contains a section defining the terms used in the chapter. The following
38 defines terms used in this chapter.

39 **AT Command.** Any of the commands in the command set interface between data terminal
40 equipment (DTE) and data circuit terminating equipment (DCE).

1 **Base Station (BS).** A station that provides the means for MSs to access network services
2 using radio.

3 **BS/MSC.** The base station and mobile switching center considered as a single functional
4 entity.

5 **IWF.** An interworking function provides information conversion. A data service IWF
6 provides functions needed for a mobile station to communicate with data terminal
7 equipment connected to the network.

8 **Mobile Switching Center (MSC).** The MSC switches MS originated or MS terminated
9 traffic. An MSC is usually connected to at least one BS. It may connect to the other
10 public networks (PSTN, ISDN, etc.), other MSCs in the same network, or MSCs in different
11 networks.

12 **Mobile Station (MS).** A wireless terminal used by subscribers to access network services
13 over a radio interface. MSs include portable units (e.g., hand-helds), units installed in
14 vehicles, and somewhat paradoxically, fixed location MSs. The MS is the interface
15 equipment used to terminate the radio path at the subscriber.

16 **Mobile Termination 0 (MT0).** A self-contained data capable mobile termination that does
17 not support an external interface.

18 **Mobile Termination 2 (MT2).** A mobile termination that provides a non-ISDN (R_m) user
19 interface (e.g., CCITT V series or CCITT X series).

20 **Radio Configuration.** A set of Forward Traffic Channel and Reverse Traffic Channel
21 transmission formats that are characterized by physical layer parameters such as
22 transmission rates, modulation characteristics and spreading rate. See
23 TIA/EIA/IS-2000-2.

24 **Terminal Equipment 2 (TE2).** A data terminal that provides a non-ISDN (R_m) user-
25 network interface (e.g., CCITT V series or CCITT X series).

26 **1.4 References**

27 In this standard, any reference to a procedure defined in another standard will cite the
28 earliest version of the referenced standard in which the procedure is defined.

29 Each chapter contains a references section which identifies the documents referenced in
30 the chapter. The following applies to this chapter.

31 1.4.1 Informative References

32 The following references do not contain provisions of this standard. At the time of
33 publication, the editions indicated were valid.

34 **ANSI/TIA/EIA-617** *Inband DCE Control for Asynchronous DTE-DCE Interfaces.*

35 **TIA/EIA/IS-634-A** *MSC-BS Interface for Public Wireless Communications Systems, 1998.*

36 **TIA/EIA/IS-658** *Data Services Interworking Function Interface for Wideband Spread
37 Spectrum Systems, 1996.*

38 **TIA/EIA/IS-728** *Intersystem Link Protocol (ISLP), 1997.*

1 **TIA/EIA/IS-737** *Intersystem Operations Support for Data Services, 1997.*

2 **TSB100** *TR-45 Wireless Network Reference Model.*

3 1.4.2 Normative References

4 The following references contain provisions which, through reference in this text,
5 constitute provisions of this standard.

6 **TIA/EIA-95-B** *Mobile Station-Base Station Compatibility Standard for Dual-Mode
7 Spread Spectrum System.*

8 **TIA/EIA/IS-99** *Data Services Option Standard for Wideband Spread Spectrum Digital
9 Cellular System, 1995.*

10 **TIA/EIA/IS-657** *Packet Data Service Options for Wideband Spread Spectrum Systems,
11 1996.*

12 **TSB58** *Administration of Parameter Value Assignments for TIA/EIA Spread
13 Spectrum Standards.*

14 **1.5 Stylistic Conventions**

15 Subcommittee TIA TR-45.5 has developed and enhanced this standard over a number of
16 years, using multiple versions of word processing tools and guidelines. Because of this,
17 there may be stylistic inconsistencies between some of the chapters in the standard.

18 In particular, in TIA/EIA/IS-707-A, the editor has used the automatic table and figure
19 numbering capabilities of the word processing software in the new chapters. This allows
20 automatic update of references to those tables and figures without manual intervention.
21 The editor has also used the ability of the word processing software to automatically begin
22 a major section on an odd page. This may cause the word processing software to produce a
23 blank page before the major section, when the previous section's text ends on an odd page.
24 However, it allows text insertion and deletion without requiring corresponding manual
25 insertion or deletion of manually produced blank pages preceding a major section.

26

2 NETWORK REFERENCE MODEL

2.1 Simplified Network Reference Model

The simplified network reference model shown in Figure 2.1-1 applies to all CDMA data services described herein. See the TR-45 Wireless Network Reference Model for a more complete model.

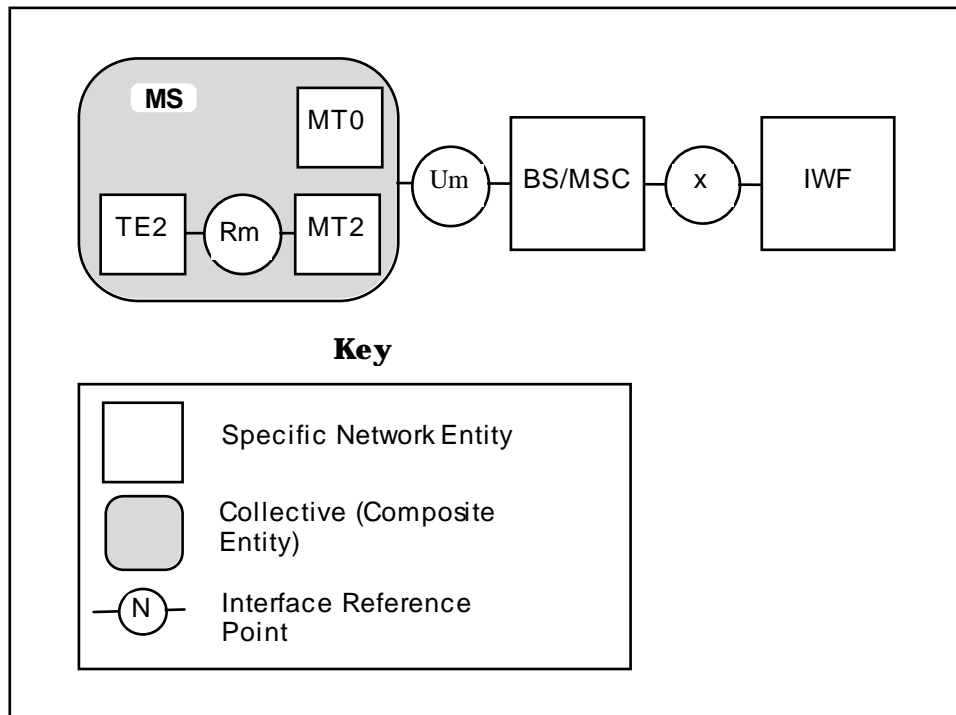


Figure 2.1-1. Simplified Network Reference Model for CDMA Data Services

In general, an MS may be implemented as an MT0 or MT2/TE2 pair. Where this standard differs for the two implementations, the standard uses the terms MT0 and MT2. Otherwise, the standard refers to either an MS or a mobile station.

2.2 Network Entities

The only network entity that is by definition a physical device is the MS. Each of the others may be a physical device, it may form part of a physical device, or it may be distributed over a number of physical devices.

BS/MSC

The base station and mobile switching center considered as a single functional entity. See base station and mobile switching center.

Interworking Function (IWF)

An interworking function provides information conversion for one or more network entities. It may have an interface to a single network entity, providing

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services to that entity, or it may have interfaces to each of two network entities that interface to each other, providing services to both.

Mobile Station (MS)

A wireless terminal used by subscribers to access network services over a radio interface. MSs include portable units (e.g., hand-helds), units installed in vehicles, and somewhat paradoxically, fixed location MSs. The MS is the interface equipment used to terminate the radio path at the subscriber.

Mobile Switching Center (MSC)

The MSC switches MS originated or MS terminated traffic. An MSC is usually connected to at least one BS. It may connect to the other public networks (PSTN, ISDN, etc.), other MSCs in the same network, or MSCs in different networks.

2.3 Reference Points

Reference Point U_m

Reference point U_m is the interface between the base station and the mobile station, which corresponds to the air interface.

Reference Point x

Reference point x represents any of a number of interfaces between an interworking function (IWF) and network entity. The following lists interface specifications which support CDMA data services.

TIA/EIA/IS-658 *Data Services Interworking Function Interface for Wideband Spread Spectrum Systems*

TIA/EIA/IS-634-A *MSC-BS Interface for Public Wireless Communications Systems*

3 CDMA DATA SERVICES

3.1 Service Options For Data Services

3.1.1 Service Option Format

CDMA data services are identified by Service Options. A Service Option is composed of three fields, the Proprietary Indicator, the Service Option Revision, and the Base Service Option Number (see TSB58), as shown in Figure 3.1.1-1. The base data service (e.g., fax) is identified by the Base Service Option Number. The data service feature set is identified by the Service Option Revision. The first feature set for any base data service is assigned Service Option Revision 0, the next is assigned Service Option Revision 1, and so on, up to Service Option Revision 7.

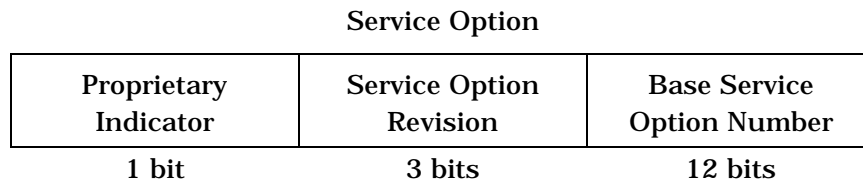


Figure 3.1.1-1. Service Option Format

3.1.2 Assigned Service Options

Table 3.1.2-1 lists the Service Options used by CDMA data services.

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Table 3.1.2-1. Service Options for CDMA Data Services

CDMA data service	Service Option	Base Service Option Number	Service Option Revision	Oldest Defining Document
async	4	4	0	TIA/EIA/IS-99
	4100	4	1	TIA/EIA/IS-707.4
	12	12	0	TIA/EIA/IS-707.4
fax	5	5	0	TIA/EIA/IS-99
	4101	5	1	TIA/EIA/IS-707.4
	13	13	0	TIA/EIA/IS-707.4
packet data bearer	7	7	0	TIA/EIA/IS-657
	4103	7	1	TIA/EIA/IS-707.5
	8	8	0	TIA/EIA/IS-657
	4104	8	1	TIA/EIA/IS-707.5
	15	15	0	TIA/EIA/IS-707.5
	16	16	0	TIA/EIA/IS-707.5
STU-III	10	10	0	TIA/EIA/IS-707.6
	11	11	0	TIA/EIA/IS-707.6
analog fax	20	20	0	TIA/EIA/IS-707-A.7
	21	21	0	TIA/EIA/IS-707-A.7
high speed packet data bearer	22	22	0	TIA/EIA/IS-707-A.9
	23	23	0	TIA/EIA/IS-707-A.9
	24	24	0	TIA/EIA/IS-707-A.9
	25	25	0	TIA/EIA/IS-707-A.9
	26	26	0	TIA/EIA/IS-707-A.9
	27	27	0	TIA/EIA/IS-707-A.9
	28	28	0	TIA/EIA/IS-707-A.9
	29	29	0	TIA/EIA/IS-707-A.9
cdma2000 packet data bearer	33	33	0	TIA-707-B.12
	34	34	0	TIA-707-B.11

2

3.1.3 Service Options Used Over Radio Configurations

4 In IS-2000 the terminology of Rate Set (RS) has been changed to Radio Configuration (RC).
5 IS-2000 signaling allows the mobile station to specify a service option, a preferred RC and

supported RCs. If the transmission rates that are used by a service option are indicated in the RC, then that service option may be used over the RC. IS-707 RS to IS-2000 RC mapping for the reverse CDMA channel and forward CDMA channel are shown in Table 3.1.3-1 and Table 3.1.3-2.

Table 3.1.3-1 Reverse CDMA Channel Rate to Radio Configuration Mapping

Rate Set	Radio Configuration
1	1, 3, 5
2	2, 4, 6

Table 3.1.3-2 Forward CDMA Channel Rate to Radio Configuration Mapping

Rate Set	Radio Configuration
1	1, 3, 4, 6, 7
2	2, 5, 8, 9

Table 3.1.3-3 shows for each service type the service options, Radio Link Protocol (RLP), multiplex options and radio configurations that may be used.

Table 3.1.3-3 Supported Data Service Options and IS-2000 Radio Configurations

Type of Service	Async, Fax	Analog Fax	Packet Data	Packet Data	Packet Data
Supported Service Options	4, 5, 12, 13, 4100, 4101	20, 21	7, 8, 15, 16, 4103, 4104	22-29	33, 34
Supported RLP	RLP1	RLP1	RLP1	RLP2	RLP3
Supported Multiplex Options	0x1, 0x2	0x1, 0x2	0x1, 0x2	0x1-0x10	0x1, 0x2, 0x11 or greater
Supported Radio Configurations	IS-95: RC1, RC2 IS-2000: RC>2	IS-95: RC1, RC2 IS-2000: RC>2	IS-95: RC1, RC2 IS-2000: RC>2	IS-95-B: RC1, RC2	IS-2000: RC>2

3.2 Async and Fax Services

Base Service Option Numbers 4, 5, 12, and 13 provide a modem emulation service for async and fax applications. Base Service Option Numbers 4 and 12 support async

1 applications. Base Service Option Numbers 5 and 13 support fax applications. Chapter 4
 2 presents the procedures and requirements for these services.

3 3.2.1 Service Revision Guide

4 Table 3.2.1-1 provides a guide for the various async service revisions.

5 Table 3.2.1-2 provides a guide for the various fax service revisions.

7 **Table 3.2.1-1. Async Service Revision Guide**

Base Service Option Number	Service Option Revision	Companion IS-707 Chapters	M	M									Notes
			P	P	R	R	P	S	S	S	S		
			X	X	S	S	R	E	I	O	S		
			1	2	1	2	I	C	G	N	N		
4	0	None	Y	n	Y	n	Y	n	y	y	n		
4	1	2, 3	Y	y	Y	y	Y	y	n	y	y	1, 2	
12	0	2, 3	y	Y	y	Y	Y	y	n	n	y		

9 **Table 3.2.1-2. Fax Service Revision Guide**

Base Service Option Number	Service Option Revision	Companion IS-707 Chapters	M	M								Notes
			P	P	R	R	P	S	S	S		
			X	X	S	S	R	E	I	O	S	
			1	2	1	2	I	C	G	N	N	
5	0	None	Y	n	Y	n	Y	n	y	y	n	
5	1	2, 3	Y	y	Y	y	Y	n	n	y	y	1, 2
13	0	2, 3	y	Y	y	Y	Y	n	n	n	y	

10 **Notes**

- 11 1. 'Speaker on' operation using signaling traffic to carry RLP frames is no
 12 longer allowed. Instead, RLP frames are carried as secondary traffic
 13 during the time that voice service uses primary traffic.
- 14 2. Handling of multi-line responses that are carried using
 15 ANSI/TIA/EIA-617 has been clarified. Examples illustrating the
 16 handling of multi-line responses when using AT command reflection are
 17 included in Chapter 3, Appendix A.

18 **Legend**

- 19 MPX1 Multiplex Option 1
- 20 MPX2 Multiplex Option 2
- 21 RS1 Rate Set 1 (9600, 4800, 2400, 1200)
- 22 RS2 Rate Set 2 (14400, 7200, 3600, 1800)
- 23 PRI Primary Traffic
- 24 SEC Secondary Traffic
- 25 SIG Signaling Traffic
- 26 SN Service Negotiation

1	SON	Service Option Negotiation
2	y	Attribute supported
3	n	Attribute not supported
4	Y	Attribute supported and the default
5		

3.3 Packet Data Bearer Service

Base Service Option Numbers 7, 8, 15, and 16 provide a packet data bearer service compatible with many packet data networks. Base Service Option Numbers 7 and 15 support Internet Protocol (IP) and Connectionless Network Protocol (CLNP) networks. Base Service Option Numbers 8 and 16 support the Cellular Digital Packet Data (CDPD) network. Chapter 5 presents the procedures and requirements for these services.

3.3.1 Service Revision Guide

Table 3.3.1-1 provides a guide for the various packet data bearer service revisions.

Table 3.3.1-1. Packet Data Bearer Service Revision Guide

Base Service Option Number	Service Option Revision	Companion IS-707 Chapters	M	M	R	R	P	S	S	S	Notes	
			P X 1	P X 2	R S 1	R S 2	P R I	S E C	S I G	S O N		
7, 8	0	None	Y	n	Y	n	Y	n	n	y	n	
7, 8	1	2, 3	Y	y	Y	y	Y	y	n	y	y	1, 2, 3
15, 16	0	2, 3	y	Y	y	Y	Y	y	n	n	y	

Notes

1. Includes optional zone-based reconnection and optional BS control of a packet data dormant timer.
2. Established the 'packet data service type' concept.
3. Packet data inactivity timer mandatory within MS with a minimum value of 20 seconds.

Legend

- MPX1 Multiplex Option 1
- MPX2 Multiplex Option 2
- RS1 Rate Set 1 (9600, 4800, 2400, 1200)
- RS2 Rate Set 2 (14400, 7200, 3600, 1800)
- PRI Primary Traffic
- SEC Secondary Traffic
- SIG Signaling Traffic
- SN Service Negotiation
- SON Service Option Negotiation
- y Attribute supported
- n Attribute not supported
- Y Attribute supported and the default

3.4 STU-III Service

Base Service Option Numbers 10 and 11 provide a secure traffic bearer service for digital U.S. Government STU-III terminals. Chapter 6 presents the procedures and requirements for these services.

3.4.1 Service Revision Guide

Table 3.4.1-1 provides a guide for the various secure traffic bearer service revisions.

Table 3.4.1-1. Secure Traffic Bearer Service Revision Guide

Base Service Option Number	Service Option Revision	Companion IS-707 Chapters	M	M	R	R	P	S	S	S	Notes
			P	P	S	S	R	E	I	O	
			X	X	1	2	I	C	G	N	
10	0	2, 3	Y	y	Y	y	Y	n	n	n	y
11	0	2, 3	Y	y	Y	y	Y	n	n	n	y

Notes

Legend

MPX1	Multiplex Option 1
MPX2	Multiplex Option 2
RS1	Rate Set 1 (9600, 4800, 2400, 1200)
RS2	Rate Set 2 (14400, 7200, 3600, 1800)
PRI	Primary Traffic
SEC	Secondary Traffic
SIG	Signaling Traffic
SN	Service Negotiation
SON	Service Option Negotiation
y	Attribute supported
n	Attribute not supported
Y	Attribute supported and the default

3.5 Analog Fax Service

Base Service Option Numbers 20 and 21 provide a fax service that allows connection of an analog fax machine to a spread spectrum system. Chapter 7 presents the procedures and requirements for this service.

3.5.1 Service Revision Guide

Table 3.5.1-1 provides a guide for the various analog fax service revisions.

Table 3.5.1-1. Analog Fax Service Revision Guide

Base Service Option Number	Service Option Revision	Companion IS-707 Chapters	M P X 1	M P X 2	R S 1	R S 2	P R I	S E C	S I G	S O N	S N	Notes
20	0	2, 3	Y	y	Y	y	Y	n	n	n	y	
21	0	2, 3	y	Y	y	Y	Y	n	n	n	y	

Notes**Legend**

MPX1	Multiplex Option 1
MPX2	Multiplex Option 2
RS1	Rate Set 1 (9600, 4800, 2400, 1200)
RS2	Rate Set 2 (14400, 7200, 3600, 1800)
PRI	Primary Traffic
SEC	Secondary Traffic
SIG	Signaling Traffic
SN	Service Negotiation
SON	Service Option Negotiation
y	Attribute supported
n	Attribute not supported
Y	Attribute supported and the default

3.6 High Speed Packet Data Bearer Service

Base Service Option Numbers 22 through 29 provide a packet data bearer service compatible with many packet data networks. Base Service Option Numbers 22 through 25 support Internet Protocol (IP) and Connectionless Network Protocol (CLNP) networks. Base Service Option Numbers 26 through 29 support the Cellular Digital Packet Data (CDPD) network. Chapter 9 presents the procedures and requirements for these services.

3.6.1 Service Revision Guide

Table 3.6.1-1 provides a guide for the various high speed packet data bearer service revisions.

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Table 3.6.1-1. High Speed Packet Data Bearer Service Revision Guide

Base Service Option Number	Service Option Revision	Companion IS-707 Chapters	MPX F	MPX R	RS1	RS2	P R I	S E C	S I G	S O N	S N	Notes
22, 26	0	3, 8	7	1	F,R	n	Y	y	n	n	y	
23, 27	0	3, 8	7	2	F	R	Y	y	n	n	y	
24, 28	0	3, 8	8	1	R	F	Y	y	n	n	y	
25, 29	0	3, 8	8	2	n	F,R	Y	y	n	n	y	

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Notes

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Legend

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MPXF Default Forward Multiplex Option

6

MPXR Default Reverse Multiplex Option

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RS1 Rate Set 1 (9600, 4800, 2400, 1200)

8

RS2 Rate Set 2 (14400, 7200, 3600, 1800)

9

F Used in the forward direction

10

R Used in the reverse direction

11

PRI Primary Traffic

12

SEC Secondary Traffic

13

SIG Signaling Traffic

14

SN Service Negotiation

15

SON Service Option Negotiation

16

y Attribute supported

17

n Attribute not supported

18

Y Attribute supported and the default

19

1

2 No text.

3

4 INTERSYSTEM SUPPORT

4.1 Protocol Architecture

Figure 4.1-1 shows a general model of the protocol architecture for any CDMA circuit-switched data service during intersystem operation (intersystem operation for packet data services is still under study). Intersystem data service support is described in TIA/EIA/IS-737. RLP terminates at the Serving BS/MSC. IWF access occurs at the Anchor BS/MSC. Between the Serving and Anchor systems, the data service octets are carried by an intersystem link protocol (ISLP). ISLP is described in TIA/EIA/IS-728.

The Serving BS/MSC relay function between RLP on the U_m interface and the ISLP adaptation layer passes each data service octet transparently, in sequence. The Anchor BS/MSC relay function between the IWF access function and the ISLP adaptation layer passes each data service octet transparently, in sequence. The ISLP adaptation layer accepts data service octets from the relay function in the Serving BS/MSC or Anchor BS/MSC. It then assembles them, in sequence, into blocks of data octets for transmission by ISLP. ISLP calls each block an ISLP SDU (service data unit). The ISLP adaptation layer accepts ISLP SDUs from ISLP and disassembles them into data service octets for delivery, in sequence, to the relay function.

For async and fax, the ISLP adaptation layer is functionally equivalent to that described in TIA/EIA/IS-658 (see Section 2.3). For STU-III, it is functionally equivalent to the SLAL (STU-III L Interface Adaptation Layer, see 2.2.2 of chapter 6).

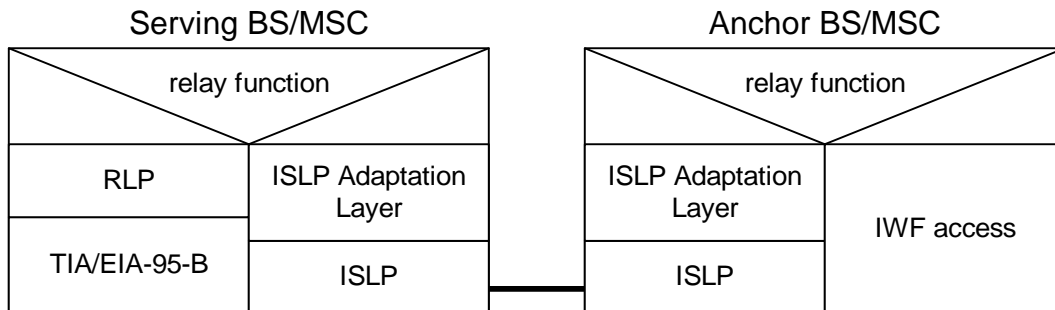


Figure 4.1-1. Intersystem Protocol Architecture

4.2 Intersystem Requirements

The size of the ISLP SDU produced by the ISLP adaptation layer shall not exceed 1508 octets. This provides balance between the need to minimize buffer allocation in the adaptation layer and the need to minimize transmission delay between the Serving and Anchor systems.

1

2 No text.

3