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PROJECT 2
"3GPP2"

Test Data Service Option (TDSO) for cdma2000 Spread Spectrum Systems

(Ballot Resolution Version)

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FOREWORD

This document specifies procedures for the Test Data Service Option (TDSO). The TDSO is used to allow verification of the physical layer performance frame error rate (FER) and PDU error rate (PER) of cdma2000 physical channels.

The document is organized into the following sections:

- Chapter 1 defines the terms and notations used in this document.
- Chapter 2 outlines the requirements of the TDSO and provides a general description of the TDSO.
- Chapter 3 describes the detailed procedures and operation of the mobile station and the base station for the TDSO.
- Annex A is an informative section that presents some TDSO call flow examples.
- Annex B is an informative section that presents some TDSO frame generation examples.
- Annex C is an informative section that presents some procedures for conducting a TDSO test. It also shows the use of the transmit counters and the receive counters for estimating the FER and PER for the Forward and Reverse Traffic Channels.
- Annex D is an informative section that presents the equations for calculating transition probabilities p and q based on average frame activity (D) and average burst length (B).

NOTES

- 1 1. “Base station” refers to the functions performed on the landline side, which are
2 typically distributed among a cell, a sector of a cell, and a mobile switching
3 center.
- 4 2. The following verbal forms: “Shall” and “shall not” identify requirements to be
5 followed strictly to conform to the specification and from which no deviation is
6 permitted. “Should” and “should not” indicate that one of several possibilities is
7 recommended as particularly suitable, without mentioning or excluding others;
8 that a certain course of action is preferred but not necessarily required; or that
9 (in the negative form) a certain possibility or course of action is discouraged but
10 not prohibited. “May” and “need not” indicate a course of action permissible
11 within the limits of the specification. “Can” and “cannot” are used for statements
12 of possibility and capability, whether material, physical, or causal.
- 13 3. Footnotes appear at various points in this specification to elaborate and further
14 clarify items discussed in the body of the specification.
- 15 4. Unless indicated otherwise, this document presents numbers in decimal form.
- 16 5. Binary numbers are distinguished in the text by the use of single quotation
17 marks. In some tables, binary values may appear without single quotation
18 marks if the table notation clearly specifies that values are binary. The character
19 ‘x’ is used to represent a binary bit of unspecified value. For example ‘xxx00010’
20 represents any 8-bit binary value such that the least significant five bits equal
21 ‘00010’.
- 22 6. Hexadecimal numbers (base 16) are distinguished in the text by use of the form
23 0xh...h where h...h represents a string of hexadecimal digits. For example,
24 0x2fa1 represents a number whose binary value is ‘10111110100001’ and
25 whose decimal value is 12193. Note that the exact number of bits in the binary
26 representation of a hexadecimal number strictly depends on the implementation
27 requirements for the variable being represented.
- 28 7. The following conventions apply to mathematical expressions in this
29 specification:
 - 30 • $\lfloor x \rfloor$ indicates the largest integer less than or equal to x: $\lfloor 1.1 \rfloor = 1, \lfloor 1.0 \rfloor = 1$.
 - 31 • $\lceil x \rceil$ indicates the smallest integer greater than or equal to x: $\lceil 1.1 \rceil = 2, \lceil 2.0 \rceil =$
32 2.
 - 33 • ROUND(x) indicates the integer that is closest to x: ROUND(1.2) = 1,
34 ROUND(1.9) = 2.
 - 35 • $|x|$ indicates the absolute value of x: $|-17| = 17, |17| = 17$.
 - 36 • min(x, y) indicates the minimum of x and y.
 - 37 • max(x, y) indicates the maximum of x and y.

- 1 • In figures, \times indicates multiplication. In formulas within the text,
 2 multiplication is implicit. For example, if $h(n)$ and $p_L(n)$ are functions, then
 3 $h(n) p_L(n) = h(n) \times p_L(n)$.
- 4 • $x \bmod y$ indicates the remainder after dividing x by y : $x \bmod y = x - (y \lfloor x/y \rfloor)$.
- 5 • $x \in \{ a, b, c \}$ indicates x is a member of the set comprised of elements a , b ,
 6 and c .
- 7 • The bracket operator, $[]$, isolates individual bits of a binary value. $VAR[n]$
 8 refers to bit n of the binary representation of the value of the variable VAR ,
 9 such that $VAR[0]$ is the least significant bit of VAR . The value of $VAR[n]$ is
 10 either 0 or 1.
- 11 • $x \approx y$ indicates that x is approximately equal to y .
- 12 8. The following conventions apply to expressions in the pseudo code in this
 13 specification:
- 14 • $x \& y$ represents the bit-wise AND operation between the binary
 15 representation of x and y : $31 \& 4 = 4 = '00100'$.
- 16 • $x \wedge y$ represents the bit-wise exclusive OR operation between the binary
 17 representation of x and y : $31 \wedge 4 = 27 = '11011'$.
- 18 • $x \gg k$ represents the bit-wise right shift of x by k bits with the vacated
 19 positions at the left filled with '0' bits: $61 \gg 3 = 7 = '000111'$.
- 20 • $x \ll k$ represents the bit-wise left shift of x by k bits with vacated positions
 21 at the right filled with '0' bits: $4 \ll 3 = 32 = '100000'$.
- 22 • $++$ represents an increment operator: $x++$ increments the value of x by 1.
- 23 • The symbols $(*$ and $*)$ are used to enclose comments.
- 24 9. This document applies only to base stations with P_REV equal to or greater than
 25 6, and to mobile stations with MOB_P_REV equal to or greater than 6.
- 26 10. This document supports systems operating in MC-MAP mode.

REFERENCES

1 The following standards contain provisions which, through reference in this text, constitute
2 provisions of this Specification. At the time of publication, the editions indicated were valid.
3 All standards are subject to revision, and parties to agreements based on this Specification
4 are encouraged to investigate the possibility of applying the most recent editions of the
5 standards indicated below.

6 —*Standards:*

- 7 1. Reserved.¹
- 8 2. *3GPP2 C.S0002-A, Physical Layer Standard for cdma2000 Spread Spectrum*
9 *Systems.*
- 10 3. *3GPP2 C.S0003-A, Medium Access Control Standard for cdma2000 Spread*
11 *Spectrum Systems.*
- 12 4. Reserved.²
- 13 5. *3GPP2 C.S0005-A, Upper Layer (Layer 3) Signaling Standard for cdma2000 Spread*
14 *Spectrum Systems.*

¹ Reserved for future use.

² Reserved for future use.

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**6. 3GPP2 C.P9003-A, Multi-Carrier Specification for Spread Spectrum on GSM MAP
(MC-MAP).**

1 GENERAL

1.1 Terms

Base Station (BS). A fixed station used for communicating with mobile stations. Depending on the context, the term base station may refer to a cell, a sector within a cell, or another part of the wireless system.

Blank-and-burst. The preemption of the traffic in an entire traffic channel frame by another form of traffic, typically signaling.

Data Block. The unit of data exchanged between the multiplex sublayer and the TDSO.

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

ESCAM. *Extended Supplemental Channel Assignment Message* (see [5]).

FER. Frame Error Rate.

Forward Dedicated Control Channel. A portion of a Radio Configuration 3 through 9 Forward Traffic Channel.

Forward Fundamental Channel. A portion of a Forward Traffic Channel.

Forward Supplemental Channel. A portion of a Radio Configuration 3 through 9 Forward Traffic Channel, which operates in conjunction with a Forward Fundamental Channel or Forward Dedicated Control Channel in that Forward Traffic Channel to provide higher data rate services.

Forward Traffic channel. One or more forward CDMA channels used to transport user and signaling traffic from the base station to the mobile station (see Forward Fundamental Channel, Forward Dedicated Control Channel, and Forward Supplemental Channel).

Frame. A basic timing interval in the system. For the traffic channel, a frame is 5 ms, 20 ms, 40 ms, or 80 ms long.

FSCAMM. *Forward Supplemental Channel Assignment Mini Message* (see [5]).

Fundamental Channel. A portion of a traffic channel, which includes a Forward Fundamental Channel and a Reverse Fundamental Channel.

Fundicated Frame. A TDSO frame carried in a fundicated data block.

Fundicated Channel. Fundamental Channel or a Dedicated Control Channel.

Fundicated Data Block. A data block carried on a Fundamental Channel or a Dedicated Control Channel.

Mobile Station (MS). A station that communicates with the base station.

Multiplex Format Indicator. A number that specifies the format of a MuxPDU [see 3].

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

- 1 **Multiplex Sublayer.** One of the conceptual layers of the system that multiplexes and
2 demultiplexes primary traffic, secondary traffic, and signaling traffic (see [3]).
- 3 **MuxPDU Type 1 Category.** The category of the received MuxPDU type 1 as defined in [3].
- 4 **MuxPDU Type 2 Category.** The category of the received MuxPDU type 2 as defined in [3].
- 5 **MuxPDU Type 3 Category.** The category of the received MuxPDU type 3 as defined in [3].
- 6 **MuxPDU Type 5 Category.** The category of the received MuxPDU type 5 as defined in [3].
- 7 **PER.** PDU Error Rate.
- 8 **Primary Traffic.** Data bits from a service that has the traffic type in the Service
9 Configuration Record set to Primary.
- 10 **Radio Configuration (RC).** A set of Forward Traffic Channel and Reverse Traffic Channel
11 transmission formats that are characterized by physical layer parameters such as
12 transmission rates, modulation characteristics, and spreading rate.
- 13 **Reverse Dedicated Control Channel.** A portion of a Radio Configuration 3 through 6
14 Reverse Traffic Channel.
- 15 **Reverse Fundamental Channel.** A portion of a Reverse Traffic Channel.
- 16 **Reverse Supplemental Channel.** A portion of a Radio Configuration 3 through 6 Reverse
17 Traffic Channel, which operates in conjunction with a Reverse Fundamental Channel or
18 Reverse Dedicated Control Channel in that Reverse Traffic Channel to provide higher data
19 rate services.
- 20 **Reverse Traffic channel.** One or more reverse CDMA channels on which data and
21 signaling are transmitted from a mobile station to a base station (see Reverse Dedicated
22 Control Channel, Reverse Fundamental Channel, and Reverse Supplemental Channel).
- 23 **RSCAMM.** *Reverse Supplemental Channel Assignment Mini Message* (see [5]).
- 24 **SCRM.** *Supplemental Channel Request Message* (see [5]).
- 25 **SCRMM.** *Supplemental Channel Request Mini Message* (see [5]).
- 26 **Secondary Traffic.** Data bits from a service that has the traffic type in the Service
27 Configuration Record set to Secondary.
- 28 **Service Option.** A service capability of the system. Service options may be applications
29 such as voice, data, or facsimile etc.
- 30 **Service Option Connection.** A particular instance or session in which the service defined
31 by a service option is used.
- 32 **Signaling Traffic.** Control messages that are carried between mobile station and the base
33 station on the Traffic Channel.
- 34 **System Time.** The time reference used by the system. System Time is synchronous to
35 Universal Coordinate Time (except for leap seconds) and uses the same time origin as GPS
36 time. All base stations use the same System Time (within a small margin of error). Mobile
37 stations use the same System Time, offset by the propagation delay from the base station to
38 the mobile station.

1 **TDSO.** Test Data Service Option.

2 **Traffic Channel.** One or more CDMA channels on which data and signaling are
3 transmitted between a mobile station and base station (see Forward Traffic Channel and
4 Reverse Traffic Channel).

5 **UHDM.** *Universal Handoff Direction Message* (see [5]).

6 **1.2 Notation**

7 The TDSO uses the notation as listed in Table 1.

8 **Table 1. Summary of test data service option notation**

Parameter	Section	Name/Description
$B(n)$	3.7.4	Actual circular buffer size
FRNG	3.7.2	State of the Forward Traffic Channel pseudo-random number generator
NUM_RAND	3.7.4	Number of pseudo-random number generations per frame to generate information bits in a data block or data blocks
$R(n)$	3.7.4	Needed circular buffer size
RRNG	3.7.2	State of the Reverse Traffic Channel pseudo-random number generator
x_n	3.7.2.3	Pseudo-random number generated by the linear congruential generator
$y_n(k)$	3.7.4	A 24-bit pseudo-random number used for the generation of circular buffer information bits
$y_n^{LE}(k)$	3.7.4	A number derived from $y_n(k)$ after storing it in little endian order
O_n	3.7.2	A 6-bit pseudo-random number used for determining the next byte offset in the circular buffer

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10

1 No text.

2 TEST DATA SERVICE OPTION

2.1 Overview

The following are the requirements of the cdma2000 Test Data Service Option:

- Connects the Service Option at the Multiplex Sublayer.
- Supports both forward and reverse links (asymmetric and symmetric).
- Does bit-wise comparison of the received frame with the locally generated/expected frame to detect the undetected bit errors that are not detected by frame quality bits.
- Maintains separate sets of error statistics for the FCH/DCCH and SCH(s) and responds with this information when queried by the base station.
- Defines a single service option, and sets up different RCs and service configurations on the two links through service negotiation.
- May include simultaneous primary and secondary traffic (for example, can run Markov service [SO 54] on the Fundamental Channel and TDSO on the Supplemental Channel).
- Can be carried by all RC combinations on the reverse/forward links as defined under cdma2000.
- Requires separate channel IDs to differentiate between the FCH, DCCH, and Supplemental Channel(s).
- Is able to handle multiframe interleaving over 40 ms and 80 ms intervals in the physical layer.
- Does not preclude a future extension to support flexible/variable rate.
- Allows two types of ON/OFF traffic models to be selectable:
 - Deterministic frame activity given by TX_ON and TX_OFF
 - Random frame activity with average frame activity D and average burst length B, in units of Physical Layer frames
- Supports two source types of bits for frame generation:
 - Selectable byte pattern
 - Pseudo-random bits
- Supports 5 ms FCH/DCCH frames testing using Layer 3 Signaling mini messages

1 **2.2 General Description**

2 TDSO provides for the generation of an arbitrary (preselected or random) data source for
3 transport over forward and reverse traffic channels while following an arbitrary (preselected
4 or random) transmission frame activity. The test is performed at a fixed data rate.

5 The mobile station and the base station generate TDSO data frames for the configured and
6 allocated traffic channels. The content of each frame is generated per a selectable byte
7 pattern or by employing a hybrid approach consisting of pseudo-randomly generated data
8 together with a circular buffer.

9 The frame generation processes are synchronized between the mobile station and the base
10 station. This permits the receiving station to reproduce the transmitted frames and
11 compare them to the received frames. The TDSO counts the number of various frame types
12 that were transmitted on a particular traffic channel. The TDSO also counts the number of
13 various frame types received on the traffic channel according to the information provided by
14 the multiplex sublayer and the result of the comparison between the frame received and the
15 locally generated replica. Frame error and bit error statistics can be calculated from these
16 counts.

17 The TDSO allows system signaling to take precedence.¹

¹ Dim-and-burst frames and blank-and-burst frames are excluded from FER or bit error rate calculations. Because the receiver can not predict when the transmitter transmits a dim-and-burst or blank-and-burst frame, the receiver may categorize a frame as dim-

1 **2.3 Service option number**

2 The TDSO described by this specification shall use service option number 32 (0x20).

3 **2.4 Required multiplex option support**

4 The TDSO shall transmit and receive traffic channel frames in accordance with the
5 requirements of the multiplex option or multiplex options configured for the service option.

6 **2.4.1 Multiplex option support for FCH/DCCH (for 20 ms FCH/DCCH frames only)**

7 On the FCH/DCCH physical channels, the TDSO shall support an interface with the
8 multiplex options indicated in Table 2.

9

and-burst or blank-and-burst when it is not (false alarm), or categorize a frame as not dim-and-burst or blank-and-burst when it is (miss). Therefore, the frame error statistics calculated by using only frame counts recorded in the receiver may not be exact. However, the error is very small and can usually be ignored.

Table 2. Multiplex option support for FCH or DCCH

	Multiplex Option	
	Forward RC = 1, 3, 4, 6, or 7	Forward RC = 2, 5, 8, or 9
	Reverse RC = 1, 3, or 5	Reverse RC = 2, 4, or 6
FCH/DCCH	0x1	0x2

When Multiplex Option 0x01 is used, MuxPDU Type 1 is used (see 2.5 for interface to multiplex option).

When Multiplex Option 0x02 is used, MuxPDU Type 2 is used (see 2.5 for interface to multiplex option)

2.4.2 Multiplex option support for SCH

On the SCH(s) physical channel(s), the TDSO shall support an interface with the multiplex options as indicated in Table 3.

Table 3. Multiplex options applicable to an SCH

SCH Rate	Maximum number of MuxPDUs in the physical layer SDU		Multiplex option						
			Forward RC = 3, 4, 6, or 7			Forward RC = 5, 8, or 9			
			Reverse RC = 3 or 5			Reverse RC = 4 or 6			
MuxPDU Type 1 or 2	MuxPDU Type 3		MuxPDU Type 1	MuxPDU Type 3		MuxPDU Type 2	MuxPDU Type 3		
	Single	Double		Single	Double		Single	Double	
1x	1			0x03			0x04		
2x		2	1		0x809	0x905		0x80a	0x906
4x		4	2		0x811	0x909		0x812	0x90a
8x		8	4		0x821	0x911		0x822	0x912
16x			8			0x921			0x922

The SCH rate is expressed in multiples of a base rate. For example, odd multiplex options have the base rate 9600 bps, a 2x SCH rate means twice of 9600 bps or 19200 bps. For Supplemental Channel rates lower than or equal to 16x, MuxPDU Type 1, 2 or 3 that is associated with the multiplex option as shown in Table 3 will be used. For Supplemental

1 Channel rates higher than 16x, the TDSO shall use MuxPDU Type 5, which is associated
2 with the Multiplex Option 0xf20.

3 The number of data blocks (either carried by MuxPDU Type 1, 2, or 3) in every SCH frame
4 is shown in Table 3 for different multiplex options. For SCH rates higher than 16x, there is
5 exactly one data block (carried by MuxPDU Type 5) in every SCH frame (see [3]). (see 2.5 for
6 interface to multiplex options)

7 **2.5 Interface to multiplex options**

8 TDSO frames can be carried as primary or secondary traffic.

9 A TDSO frame supplied to the multiplex sublayer as a fundicated data block (a data block
10 carried on an FCH or DCCH) is called a Fundicated TDSO frame. Similarly, a TDSO frame
11 supplied to the multiplex sublayer to be carried as a supplemental data block or data
12 blocks (data block(s) carried on an SCH0 or SCH1) is referred to as a Supplemental TDSO
13 frame.

14 **2.5.1 Primary traffic**

15 Normally, each TDSO frame supplied to the multiplex sublayer shall be one of the Rate 1,
16 Rate 2, Rate 3 or Blank (zero bits) frame types shown in Table 4. The number of bits per
17 data block supplied to the multiplex sublayer for each type of TDSO frame is shown in
18 Table 4. The maximum number of MuxPDUs (or data blocks) that can be carried in an SCH
19 TDSO frame is also shown in Table 3.

20 On command, the TDSO shall supply a Blank frame. A Blank frame contains no bits. Also
21 on command, the TDSO shall supply a non-blank Fundicated TDSO frame of x bits when
22 the multiplex sublayer requests for an x-bit data block. The first x bits of the generated
23 Fundicated TDSO frame shall be supplied to the multiplex sublayer.

24

1 **Table 4. Primary traffic types supplied by the TDSO to the multiplex sublayer**

TDSO frame type	Odd-numbered multiplex option (bits per data block)	Even-numbered multiplex option (bits per data block)	Can be supplied as a Fundicated TDSO frame	Can be supplied as a Supplemental TDSO frame
Rate 3 ¹	N/A	Variable	No	Yes
Rate 2	346	538	No	Yes ²
Rate 1	171	266	Yes	Yes ³
	170	266	No	Yes ⁴
Blank	0	0	Yes	Yes

¹ Applicable only to multiplex option 0xf20. Used when the TDSO supplies more than 4584 bits to the multiplex sublayer during a frame interval (20, 40, or 80 ms).

² Applicable only to multiplex options 0x905, 0x906, 0x909, 0x90a, 0x911, 0x912, 0x921, and 0x922.

³ Applicable only to multiplex options 0x3 and 0x4.

⁴ Applicable only to multiplex options 0x0809, 0x80a, 0x811, 0x812, 0x821, and 0x822.

2 The multiplex sublayer in the mobile station categorizes every received MuxPDU(s) in the
 3 Traffic Channel frame and supplies the MuxPDU category and accompanying bits, if any, to
 4 TDSO. When the multiplex format indicator is supplied by the mux sublayer, the value of
 5 the multiplex format indicator shall be used as the MuxPDU category. Table 5 lists the
 6 categories (and corresponding TDSO frame types) supplied by the multiplex sublayer when
 7 TDSO is carried as primary traffic.

8 **Table 5. Primary traffic frame types supplied by the multiplex layer to TDSO**

TDSO frame type	Odd-numbered multiplex options			Even-numbered multiplex options		
	Bits per data block	Categories for fundicated MuxPDU	Categories for supplemental MuxPDU	Bits per data block	Categories for fundicated MuxPDU	Categories for supplemental MuxPDU
Rate 3	N/A	N/A	N/A	Variable	N/A	2
Rate 2	346	N/A	5	538	N/A	5
Rate 1	171	1	1	266	1	1
	170	N/A	4	266	N/A	4
Blank	0	5,14	2	0	5, 9, 14, 17, 21, 23, 25	2
Null	0	15	N/A	0	27	N/A

9

2.5.2 Secondary traffic

Normally, each TDSO frame supplied to the multiplex sublayer shall be one of the Rate 1, Rate 2, Rate 3, or Blank frame types shown in Table 6. The number of bits per data block supplied to the multiplex sublayer for each type of TDSO frame shall also be as shown in Table 6. The maximum number of MuxPDUs that can be carried in a SCH TDSO frame is also shown in Table 3.

On command, TDSO shall generate a Blank TDSO frame. A Blank TDSO frame contains no bits. Also on command, TDSO shall supply a non-blank Fundicated TDSO frame of x bits when the multiplex sublayer requests for an x-bit data block. The first x bits of the generated Fundicated TDSO frame shall be supplied as a data block to the multiplex sublayer.

Table 6. Secondary traffic frames supplied by TDSO to the multiplex sublayer

TDSO frame type	Odd-numbered multiplex option (bits per data block)	Even-numbered multiplex option (bits per data block)	Can be supplied as a Fundicated TDSO frame	Can be supplied as a Supplemental TDSO frame
Rate 3 ¹	N/A	Variable	No	Yes
Rate 2	346	538	No	Yes ²
Rate 1	168	262	Yes	Yes ³
	170	266	No	Yes ⁴
Blank	0	0	Yes	Yes

¹ Applicable only to Multiplex Option 0xf20. Used when TDSO supplies more than 4584 bits to the multiplex sublayer during a frame interface (20, 40, or 80 ms).

² Applicable only to Multiplex Options 0x905, 0x906, 0x909, 0x90a, 0x911, 0x912, 0x921, and 0x922.

³ Applicable only to Multiplex Options 0x3 and 0x4.

⁴ Applicable only to Multiplex Options 0x809, 0x80a, 0x811, 0x812, 0x821, and 0x822.

The multiplex sublayer in the mobile station categorizes every MuxPDU in the received Traffic Channel frame and supplies the MuxPDU category and accompanying bits, if any, to TDSO. When the multiplex format indicator is supplied by the mux sublayer, the value of the multiplex format indicator shall be used as the MuxPDU category. Table 7 lists the categories (and corresponding TDSO frame types) supplied by the multiplex sublayer when the TDSO is carried as secondary traffic.

Table 7. Secondary traffic frames supplied by multiplex sublayer to the TDSO

TDSO frame type	Odd-numbered multiplex options			Even-numbered multiplex options		
	Bits per data block	Categories for fundicated MuxPDU	Categories for supplemental frames	Bits per data block	Categories for fundicated MuxPDU	Categories for supplemental MuxPDU
Rate 3	N/A	N/A	N/A	Variable	N/A	2
Rate 2	346	N/A	5	538	N/A	5
Rate 1	168	14	2	262	9	2
	170	N/A	4	266	N/A	4
Blank	0	1-8	1	0	1-5, 11-14, 19-21, 24	1
Null	0	15	N/A	0	27	N/A

2.6 TDSO frame transmission and reception

When primary or secondary traffic is carried on SCH(s) and/or FCH/DCCH, the content of each frame is generated in one of two ways, as negotiated between the two ends. The test stream can consist of a selectable repeated byte pattern (by default set to all '1's) or a pseudo-randomly generated data stream from a circular buffer. The two ends are synchronized to the content of test data transmitted (expected) in a particular frame. This permits the receiving station to reproduce the transmitted frames and compare them to the received frames. When a pseudo-random data stream is used, data blocks for all frames are generated by copying the bits from the circular buffer to the data blocks, starting at a random offset for each TDSO frame. The random offset is synchronized between the mobile station and the base station.

The TDSO counts the number of various frame types received on the FCH/DCCH and/or SCH separately according to the MuxPDU category information provided by the multiplex sublayer and the result of the comparison between the frames received and the locally generated replica. FER and PER characteristics can be calculated from these counts for each physical channel.

There can be instances of transmission power headroom running out in either the base station or mobile station (causing the transmitter to not transmit on a given traffic channel for a particular frame), which leads to the physical layer reporting an erasure at the receiver. For the TDSO, no special mechanism is used to account for the inaccuracies that can occur in the FER (PER) calculation due to this. No transmission by the physical channel is considered to be a channel and/or implementation limitation.

2.6.1 Transmitted frames

If configured to operate over Fundicated Channels (FCH or DCCH) that use 20 ms frames, if the frame activity is "ON", the service option shall supply exactly one Fundicated data block

1 to the multiplex sublayer every 20 ms. The data block contains a header (channel ID and
2 PDU sequence number) followed by the service option information bits.

3 Unless otherwise commanded, the service option shall supply a Rate 1 or blank data block
4 as listed in Table 4 and Table 6 when carrying primary or secondary traffic, respectively. On
5 command, the service option shall supply a blank data block. Also on command, the
6 service option shall supply a data block with the number of bits that the multiplex sublayer
7 requests, by truncating the generated data block if necessary.

8 If configured to operate over Supplemental Channels (SCH0 and/or SCH1), if the frame
9 activity is "ON", the service option shall supply one or N data blocks to the multiplex
10 sublayer for each Supplemental Channel every frame interval (20 ms, 40 ms, or 80 ms),
11 where N is the maximum number of data blocks (or MuxPDUs) in a physical layer SDU for
12 a connected multiplex option, as shown in Table 3. The data blocks contain a header
13 (channel ID and PDU sequence number) followed by the service option information bits.

14 Unless otherwise commanded, the service option shall supply Rate 1, Rate 2, Rate 3, or
15 Blank Supplemental frames, as listed in Table 4 and Table 6, when carrying primary or
16 secondary traffic, respectively. A single data block is passed to the multiplex sublayer for
17 the SCH when the connected multiplex option is 0xf20.

18 2.6.2 Received frames

19 The multiplex sublayer in the receiving station categorizes every received MuxPDU(s) in the
20 fundicated and supplemental frame (see [3]), and supplies the MuxPDU type and
21 accompanying bits, if any, to the TDSO. The MuxPDU types that are supplied are indicated
22 in Table 4 and Table 6 for primary and secondary traffic operations, respectively.

23 2.7 Interface to Layer 3 Signaling when testing 5 ms FCH/DCCH frames

24 When testing 5 ms FCH/DCCH frames, TDSO generates requests to Layer 3 Signaling to
25 send mini messages as opposed to sending TDSO frames as described in the 20 ms frame
26 length case. The same frame activity model will be used for each 5 ms frame to determine
27 whether to request Layer 3 Signaling to send a mini message or not during that frame.
28 Since TDSO has no control of timing in Layer 3 Signaling, the mini message may actually
29 be transmitted at a later 5 ms frame.

30 To test the Forward 5 ms FCH/DCCH frames, the TDSO in the base station shall request
31 Layer 3 Signaling to transmit *Forward Supplemental Channel Assignment Mini Message*
32 (FSCAMM), according to the frame activity. The base station shall fill the FSCAMM in
33 accordance with 3.6.3.2. The base station should count the number of 5 ms frames
34 transmitted, which includes all the transmitted and retransmitted 5 ms Layer 3 Signaling
35 messages. The mobile station keeps a reception counter (see [3]) of the number of good 5
36 ms frames received (e.g., MUX1_FOR_FCH_5_ms when Multiplex Option 0x01 is used on a
37 Forward Fundamental Channel).

38 To test the Reverse 5 ms FCH/DCCH frames, the TDSO in the mobile station shall request
39 Layer 3 Signaling to transmit *Supplemental Channel Request Mini Messages* (SCRMM),
40 according to the frame activity. The mobile station shall fill the SCRMM_REQ_BLOB in the

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1 SCRMM in accordance with 3.6.3.1. The base station should count the number of good
2 5 ms frames received, which includes all the good transmitted and retransmitted 5 ms
3 Layer 3 Signaling messages. The mobile station keeps a transmission counter (see [3]) of
4 the number of 5 ms frames transmitted (e.g., MUX1_REV_FCH_5_ms when Multiplex
5 Option 0x01 is used on a Reverse Fundamental Channel).

6

1 No text.

3 TDSO PROCEDURES AND DESCRIPTION

3.1 Negotiation and activation of service option

The mobile stations and base stations that conform to cdma2000 are required to support service configuration and negotiation as described in [5].

3.1.1 Mobile station requirements

The TDSO shall be negotiated and connected using the service configuration and negotiation procedures defined in [5]. For the TDSO, the mobile station shall not propose a service configuration whose attributes are inconsistent with the valid service configuration attribute for the service option. For a mobile station operating in MC-41 mode, the mobile station shall indicate the preferred Forward RC and Reverse RC in the FOR_RC_PREF field and the REV_RC_PREF field, respectively, in the *Page Response Message* and *Origination Message*. For a mobile station operating in MC-MAP mode (see [6]), the mobile station shall indicate the preferred Forward RC and Reverse RC in the FOR_RC_PREF field and the REV_RC_PREF field, respectively, in the *MC-MAP RRC Connection Request Message*. When proposing the TDSO, the mobile station shall not accept a service configuration whose attributes are inconsistent with the valid service configuration attributes for the service option as listed in Table 8. The default service configuration for the TDSO shall be as shown in the valid service configuration detailed in Table 8.

1

Table 8. Valid service configuration attributes for test data service option

Service configuration attribute	Valid selections¹
Forward Multiplex Option	0x01 ² or 0x02 ³
Reverse Multiplex Option	0x01 ⁴ or 0x02 ⁵
Forward Transmission Rates	For the FCH, Rates 1, 1/2, 1/4, and 1/8 enabled. For the DCCH, Rate 1 enabled, Rates 1/2, 1/4, and 1/8 not enabled.
Reverse Transmission Rates	For the FCH, Rates 1, 1/2, 1/4, and 1/8 enabled. For the DCCH, Rate 1 enabled, Rates 1/2, 1/4, and 1/8 not enabled.
Forward Traffic Type	Primary ⁶ or Secondary Traffic
Reverse Traffic Type	Should be identical to the Forward Traffic Type
Forward FCH Radio Configuration	RC 1, 2, 3, 4, 5, 6, 7, 8, or 9
Reverse FCH Radio Configuration	RC 1, 2, 3, 4, 5, or 6
Forward DCCH Radio Configuration	RC 3, 4, 5, 6, 7, 8, or 9
Reverse DCCH Radio Configuration	RC 3, 4, 5, or 6
Forward SCH Radio Configuration	RC 3, 4, 5, 6, 7, 8, or 9
Reverse SCH Radio Configuration	RC 3, 4, 5 or 6
Forward SCH Frame Size	20 ms, 40 ms, or 80 ms
Reverse SCH Frame Size	20 ms, 40 ms, or 80 ms
Forward Supplemental Channel Multiplex Option	0x921, 0x911, 0x909, 0x905, 0x821, 0x811, 0x809, 0x03 0x922, 0x912, 0x90a, 0x906, 0x822, 0x812, 0x80a, 0x04 0xf20
Reverse Supplemental Channel Multiplex Option	0x921, 0x911, 0x909, 0x905, 0x821, 0x811, 0x809, 0x03 0x922, 0x912, 0x90a, 0x906, 0x822, 0x812, 0x80a, 0x04 0xf20

¹ See [5] for a description of the selections.

²Applies when Forward RC is 1, 3, 4, 6 or 7.

³Applies when Forward RC is 2, 5, 8 or 9.

⁴Applies when Reverse RC is 1, 3 or 5.

⁵Applies when Reverse RC is 2, 4 or 6.

⁶ Selections in bold represent the default configurations for the TDSO.

2

1 If the mobile station originates or accepts a TDSO call, then the mobile station shall perform the
2 following:

- 3 • If the TDSO call is mobile station terminated, then the mobile station shall initiate an auto-
4 answer before entering the *Waiting for Mobile Station Answer Substate*.¹
- 5 • The mobile station shall connect the TDSO at the action time specified in the *Service*
6 *Connect Message*, the *General Handoff Direction Message*, or the *Universal Handoff Direction*
7 *Message* containing the TDSO service option connection, and shall initialize the service
8 option as specified in Section 3.4.1 in this document. While the service option is connected,
9 the TDSO shall process the received frames as specified in 3.6.2 and generate and supply
10 frames for transmission as specified in 3.7.

11 3.1.1.1 Supplemental channel allocation

12 The mobile station may request high-speed operation on the Supplemental Channel(s) by sending
13 one of the following messages to the base station at an implementation-defined time:

¹ For the purposes of this specification, the term “auto-answer” shall have the following meaning: While in the *Waiting for Mobile Station Answer Substate* of the *Mobile Station Control on the Traffic Channel State*, the mobile station shall automatically send a *Connect Order* to the base station as a message requiring acknowledgment without waiting for the user to explicitly command the call to be answered. The mobile station shall enter the *Conversation Substate*.

- 1 • *Supplemental Channel Request Message (SCRM)*
- 2 • *Supplemental Channel Request Mini Message (SCRMM)*

3 If a *Supplemental Channel Request Message* is used, the mobile station shall:

- 4 • Assemble the SCRM_REQ_BLOB (see Table 9)
- 5 • Set the DURATION field in the SCRM_REQ_BLOB to '11111111'
- 6 • Include the SCRM_REQ_BLOB in the REQ_BLOB field in the *Supplemental Channel Request Message*
- 7
- 8 • Set the SIZE_OF_REQ_BLOB field in the *Supplemental Channel Request Message* to the
- 9 number of octets in the SCRM_REQ_BLOB

10 If a *Supplemental Channel Request Mini Message* is used, the mobile station shall:

- 11 • Assemble the SCRMM_REQ_BLOB (see Table 10) and include it in the REQ_BLOB field in the
- 12 *Supplemental Channel Request Mini Message*
- 13 • Set the DURATION field in the SCRMM_REQ_BLOB to '1111'
- 14 • Include the SCRMM_REQ_BLOB in the REQ_BLOB field in the *Supplemental Channel*
- 15 *Request Mini Message*

16 After the mobile station sends the *Supplemental Channel Request Message* or *Supplemental*
 17 *Channel Request Mini Message*, the base station may respond with an allocation message (ESCAM,
 18 RSCAMM, FSCAMM or UHDM). The mobile station shall not repeat the request sooner than one
 19 second after the request was sent. If the mobile station receives an UHDM, ESCAM, FSCAMM, or
 20 RSCAMM that changes the transmission rates available to the mobile station on the Supplemental
 21 Channel, the mobile station shall:

- 22 • If the start time indicated by the FOR_SCH_START_TIME or REV_SCH_START_TIME fields
- 23 coincides with the synchronization frame, at the synchronization frame, the TDSO shall
- 24 commence using the same test parameters for the channel that was used before the rate
- 25 change took effect.
- 26 • If the start time indicated by the FOR_SCH_START_TIME or REV_SCH_START_TIME fields
- 27 does not coincide with the synchronization frame, the TDSO shall:
 - 28 - Supply one or more data blocks at the new rate, filled with all 1 bits with a 100% frame
 - 29 activity (that is, continuously) to the multiplex sublayer for the SCH(s) until the next
 - 30 synchronization frame, at which time, the TDSO shall commence using the same test
 - 31 parameters for the channel that was used before the rate change took effect.
 - 32 - When supplying data blocks filled with all 1 bits, TDSO shall fill the data blocks with
 - 33 whole number of octets of 1 bits and pad any remaining bits with 0 bits. TDSO shall
 - 34 replace the first 5 bits of the data block by the header as depicted in Table 30.

35 If the mobile station receives a UHDM, an ESCAM, a RSCAMM, or a FSCAMM that deallocates the
 36 current Supplemental Channel(s):

- 1 • The mobile station shall continue transmitting the TDSO traffic over the Fundicated
2 Channels without any reinitialization.
- 3 • The mobile station may request high-speed operation on the Supplemental Channel(s) by
4 sending a *Supplemental Channel Request Message* or, if permitted by the base station, a
5 *Supplemental Channel Request Mini Message* to the base station at an implementation-
6 defined time.

3.1.1.1.1 SCRM_REQ_BLOB format

Table 9. SCRM_REQ_BLOB format

Field	Length (bits)	Definition
DURATION_UNIT	3	The mobile station shall set this field to one less than the number of 20 ms intervals in a single duration period.
NUM_REQ	3	The mobile station shall set this field to the number of service request records in the SCRM_REQ_BLOB.
RESERVED	2	The mobile station shall set this field to '00'.
Followed by NUM_REQ occurrences of the following service request record:		
SR_ID	3	The mobile station shall set this field to the service reference identifier associated with the service option.
PREFERRED_RATE	4	The mobile station shall set this field to the Reverse Supplemental Channel Rate (according to Table 11) that it prefers to use for this reverse high-speed operation for this service option.
DURATION	9	The mobile station shall set this field to the number of duration periods that the mobile station requires reverse high-speed operation for this service option. A value of '111111111' indicates a request for an infinite duration.

3.1.1.1.2 SCRMM_REQ_BLOB format

Table 10. SCRMM_REQ_BLOB format

Field	Length (bits)	Definition
SR_ID	3	The mobile station shall set this field to the service reference identifier associated with this service option.
PREFERRED_RATE	4	The mobile station shall set this field to the Reverse Supplemental Channel Rate (according to Table 11) that it prefers to use for this reverse high-speed operation for this service option.
DURATION	4	The mobile station shall set this field to the number of 20 ms intervals (according to Table 12) that the mobile station requires reverse high-speed operation at the PREFERRED_RATE for this service option.
RESERVED	5	The mobile station shall set this field to '00000'.

1 **Table 11. Encoding of the PREFERRED_RATE field**

PREFERRED_RATE field value (binary)	Requested reverse supplemental channel rate (kbps) for RC using Nx9.6	Requested reverse supplemental channel rate (kbps) for RC using Nx14.4
'0000'	9.6	14.4
'0001'	19.2	28.8
'0010'	38.4	57.6
'0011'	76.8	115.2
'0100'	153.6	230.4
'0101'	307.2	460.8
'0110'	Reserved	518.4
'0111'	614.4	1036.8
'1000'-'1111'	Reserved	Reserved

2 **Table 12. Encoding of the DURATION field**

DURATION field value (binary)	Number of 20 ms intervals
'1111'	Infinite

3 **3.1.1.2 CDMA-CDMA hard handoff scenario**

4 While in a TDSO call, if the mobile station receives a *Universal Handoff Direction Message* signaling
5 a hard handoff in which the active set, frame offset, or frequency assignment changes, upon
6 performing the hard handoff, the mobile station shall:

- 7 • At the action time associated with the message, reinitialize the TDSO to supply data blocks
8 with all 1 bits at a 100% frame activity to the multiplex sublayer for the FCH/DCCH
9 channels (depending on the channel configuration).
- 10 • If a supplemental channel assignment is included, at the start time indicated by the
11 FOR_SCH_START_TIME or REV_SCH_START_TIME fields, reinitialize the TDSO to supply one
12 or more data blocks at the new rate filled with all 1 bits with a 100% frame activity to the
13 multiplex sublayer for the SCH(s).
- 14 • When supplying data blocks filled with all 1 bits, TDSO shall fill the data blocks with whole
15 number of octets of 1 bits and pad any remaining bits with 0 bits. TDSO shall replace the
16 first 5 bits of the data block by the header as depicted in Table 30.
- 17 • After the hard handoff, the mobile station shall propose the test parameters that were in
18 effect before the hard handoff to the base station in a control directive using the *Service*
19 *Option Control Message*.

3.1.1.3 Soft handoff scenario

While in a TDSO call, if the mobile station receives a *Universal Handoff Direction Message* signaling a soft handoff with a new rate for forward or reverse supplemental channel (F/R-SCH). The mobile shall begin transmitting at the new rate specified in the message. For further details please see section 3.1.1.1.

3.1.2 Base station requirements

The TDSO shall be negotiated and connected using the service configuration and negotiation procedures defined in [5]. For the TDSO, the base station shall not propose a service configuration whose attributes are inconsistent with the valid service configuration attribute for the service option. The base station shall not accept a service configuration whose attributes are inconsistent with the valid service configuration attributes for the service option as shown in Table 8. The base station should not propose a reverse RC that is different than the one proposed by the mobile station.

The base station controls both the forward and reverse high-speed operation by allocating Supplemental Channels for an infinite duration. Allocation is specified in the ESCAM, FSCAMM, RSCAMM, or UHDM. When sending ESCAM for assigning Reverse Supplemental Channel assignments, the base stations shall set REV_SCH_DTX_DURATION to '1111' to allow indefinite DTX on the Reverse Supplemental Channel.

3.2 Synchronization frame

The Forward and Reverse Traffic Channels (F/R-FCH or F/R-DCCH, F/R-SCH0 and F/R-SCH1) are each subdivided into independent segments of 10.24 seconds each. This corresponds to every:

- 2048 frames for physical channels (FCH, DCCH) with 5 ms frame length
- 512 frames for physical channels (FCH, DCCH or SCH) with 20 ms frame length
- 256 frames for Supplemental Channels with a 40 ms frame length
- 128 frames for a Supplemental Channel with an 80 ms frame length

The first frame of a segment is called the synchronization frame. All pseudo-random number generators (except the PN generators which generate random frame activity) associated with the channel are reinitialized prior to TDSO frame processing for each synchronization frame. All service option initialization and control operations also take effect prior to TDSO frame processing for a synchronization frame for each physical channel.

3.2.1 Forward Traffic Channels

For the Forward Traffic Channels (F-FCH, F-DCCH, F-SCH0, and F-SCH1), the synchronization frames shall be those frames for which the least significant nine bits of the System Time in frames (as defined in [2]) are equal to the least significant nine bits of the bit-wise exclusive-OR of the least significant 32-bits Public Long Code Mask (PLCM_32) of the mobile station and the value 0x2aaaaaaa.

3.2.2 Forward Supplemental Channels

For 40 ms and 80 ms frame length operation on the Forward Supplemental Channels, however, the synchronization frame time as calculated for the Forward Traffic Channels above may not coincide with the beginning of the frame period for these channels. In that case, the circular buffer shall still be generated using the same generator as for other forward channels (F-FCH/DCCH) for the 20 ms frame length. However, the beginning of the next frame period on the Forward Supplemental Channel that is closest in time to the frame as calculated above for Forward Traffic Channels shall be treated as the first frame of the next 10.24-second test segment for the Forward Supplemental Channel.

3.2.3 Reverse Traffic Channels

For the Reverse Traffic Channels (R-FCH, R-DCCH, R-SCH0, and R-SCH1), the synchronization frames shall be those frames for which the least significant nine bits of the System Time in frames (as defined in [2]) are equal to the least significant nine bits of the bit-wise exclusive-OR of the least significant 32-bits Public Long Code Mask (PLCM_32) of the mobile station and the value 0x55555555.

3.2.4 Reverse Supplemental Channels

For 40 ms and 80 ms frame length operation on the Reverse Supplemental Channels, however, the synchronization frame time as calculated for the Reverse Traffic Channels above may not coincide with the beginning of the frame period for these channels. In that case, the circular buffer shall still be generated using the same generator as for other reverse channels (R-FCH/DCCH) for the 20 ms frame length. However, the beginning of the next frame period on the Reverse Supplemental Channel closest in time to the frame as calculated above for Reverse Traffic Channels shall be treated as the first frame of the next 10.24-second test segment for the Reverse Supplemental Channel.

3.3 Counters

The mobile station and the base station shall support the transmit counters listed in Table 13 and Table 14 for the Fundicated and Supplemental Channels, respectively.

Table 13. Transmit frame counters on the fundicated channel

Generated frame type	Transmitted frame type	Counter name
Rate 1	Rate 1 with no signaling	TDSO_E1_T1
Rate 1	Rate 1 with dim-and-burst signaling	TDSO_E1_TD
Rate 1	Rate 1 with blank-and-burst signaling	TDSO_E1_TB
Blank	Blank	TDSO_EB_TB
Blank	Anything other than blank	TDSO_EB_TO

Table 14. Transmitted frame counters on the Supplemental Channel

SCH-generated frame type (kbps)	Transmitted frame type (kbps)	Counter name
N x 9.6 or N x 14.4 ¹	N x 9.6 or N x 14.4	TDSO_ENx_TNx
N x 9.6 or N x 14.4 ¹	Blank	TDSO_ENx_TB
Blank	Blank	TDSO_EB_TB

¹N can take the values 1, 2, 4, 8, 16, 18, 32, 36, 64, or 72 depending on the connected SCH transmission rate. The SCH frame consists of one or more data blocks of type Rate 1, Rate 2, or Rate 3 as determined by the connected multiplex option.

1 The mobile station and the base station shall support the receive counters listed in Table 15 and
 2 Table 16.

3 **Table 15. Receive frame counters maintained for the FCH/DCCH**

Expected frame type	Received frame type	Counter name
Rate 1	Error-free Rate 1 frame with no dim-and-burst	TDSO_E1_R1
Rate 1	Rate 1 with bit errors detected by the service option	TDSO_E1_RERR
Rate 1	Dim-and-burst frame	TDSO_E1_RD
Rate 1	Other rate frame	TDSO_E1_RO
Rate 1	Blank-and-burst	TDSO_E1_RB
Rate 1	Rate 1 physical layer frame with insufficient physical layer frame quality ¹	TDSO_E1_RFL
Rate 1	Insufficient frame quality (erasure)	TDSO_E1_RE
Null	Null	TDSO_EN_RN
Null	Blank	TDSO_EN_RB
Null	Other	TDSO_EN_RO

¹ Categorized by Multiplex Option 0x01 only.

4 **Table 16. Receive frame counters on the Supplemental Channel**

SCH expected frame type	Received frame type	Counter name
N x 9.6 or N x 14.4	Error-free N x 9.6 or N x 14.4 frame	TDSO_ENx_RNx
N x 9.6 or N x 14.4	N x 9.6 or N x 14.4 frame with bit errors detected by the service option	TDSO_ENx_RERR
N x 9.6 or N x 14.4	Insufficient frame quality (erasure)	TDSO_ENx_RE
N x 9.6 or N x 14.4	Blank	TDSO_ENx_RB
Blank	Blank	TDSO_EB_RB
Blank	Anything other than blank	TDSO_EB_RO

5

6

1 The mobile station and the base station shall support the counters in Table 17 for the calculation
 2 of PER on the Supplemental Channels.

3 **Table 17. Receive PDU counters maintained for the Supplemental Channels**

SCH expected rate	Received MuxPDU type	Bit counter name
3	Error-free Rate 3 MuxPDU	TDSO_E3_R3
3	Rate 3 MuxPDU with errors detected by the TDSO	TDSO_E3_RERR
3	Insufficient frame quality (erasure)	TDSO_E3_RE
2	Error-free Rate 2 MuxPDU	TDSO_E2_R2
2	Rate 2 MuxPDU with errors detected by the TDSO	TDSO_E2_RERR
2	Insufficient frame quality (erasure)	TDSO_E2_RE
1a ¹	Error-free Rate 1a MuxPDU	TDSO_E1a_R1a
1a	Rate 1a MuxPDU with errors detected by the TDSO	TDSO_E1a_RERR
1a	Insufficient frame quality (erasure)	TDSO_E1a_RE
1b ²	Error-free Rate 1b MuxPDU	TDSO_E1b_R1b
1b	Rate 1b MuxPDU with errors detected by the TDSO	TDSO_E1b_RERR
1b	Insufficient frame quality (erasure)	TDSO_E1b_RE

¹ Rate 1a corresponds to the Rate 1 type MuxPDU applicable only to multiplex options 0x3-0x4 as indicated in Table 3.

² Rate 1b corresponds to the Rate 1 type MuxPDU applicable only to multiplex options 0x809, 0x80a, 0x811, 0x812, 0x821, and 0x822 as indicated in Table 3.

4

5

1 The following buffers shall be capable of storing the frame counter values as shown in the following
2 tables.

3 **Table 18. Frame counter-value storage**

Channel	Buffer	Station	Counter-value storage type¹
R-FCH	RFCH_BUFFER	Mobile	Transmit
		Base	Receive
R-DCCH	RDCCH_BUFFER	Mobile	Transmit
		Base	Receive
F-FCH	FFCH_BUFFER	Mobile	Receive
		Base	Transmit
F-DCCH	FDCCH_BUFFER	Mobile	Receive
		Base	Transmit

¹ For more information on transmit frame counter values, refer to Table 13. For more information on receive frame counter values, refer to Table 15.

4 **Table 19. Frame counter-value storage for Supplemental Channels**

Channel	Buffer	Station	Counter-value storage type¹
R-SCH0	RSCH0_BUFFER	Mobile	Transmit
		Base	Receive
R-SCH1	RSCH1_BUFFER	Mobile	Transmit
		Base	Receive
F-SCH0	FSCH0_BUFFER	Mobile	Receive
		Base	Transmit
F-SCH1	FSCH1_BUFFER	Mobile	Receive
		Base	Transmit

¹For more information on transmit and receive frame counter values, refer to Table 14 and Table 16. For more information on receive PDU counter values, refer to Table 17.

5

6

3.4 Mobile station initialization and control operation

3.4.1 Service option initialization

If a TDSO initialization is required as a result of a signaling message on f-dsch, the mobile station shall consider the System Time in frames coinciding with the action time of the message (as defined in [5]) to be the effective initialization frame, EFF_FRAME.

For the Forward and Reverse Fundicated Traffic Channels (F/R-DCCH and/or F/R-FCH), the TDSO shall consider the System Time in frames that coincide with the action time of the *Service Connect Message* as the initialization frame.

For the Forward and Reverse Supplemental Channels (F/R-SCH0 and/or F/R-SCH1), the TDSO shall consider the System time in frames coinciding with the start time indicated by the FOR_SCH_START_TIME (for Forward Supplemental Channels) or REV_SCH_START_TIME (for Reverse Supplemental Channels) fields inside of the ESCAM, FSCAMM, RSCAMM, or UHDM that is the initialization frame.

The initialization frame may coincide with the synchronization frame on a physical channel. Until the first synchronization on a channel is achieved, the TDSO shall only use the default settings for the test parameters, that is, an all 1's data pattern with a continuous transmission every frame period (20 ms, 40 ms, or 80 ms) on that channel.

To perform TDSO initialization, the mobile station shall perform the following operations:

- Immediately prior to TDSO frame processing for the Reverse Traffic Channel (that is, R-FCH/R-DCCH/R-SCH0/R-SCH1) synchronization frame for which the System Time in frames falls in the range from EFF_FRAME to EFF_FRAME + FRAMES_PER_SEGMENT_1 inclusive, the mobile station shall set the counters associated with the Reverse Traffic Channels to zero.
 - For Reverse Fundicated Traffic Channels, the counters are RFCH_BUFFER and RDCCH_BUFFER
 - For Reverse Supplemental Channels, the counters are RSCH0_BUFFER and RSCH1_BUFFER
 - The value of FRAMES_PER_SEGMENT_1 shall be:
 - 511 for a 20 ms physical channel frame length
 - 255 for a 40 ms physical channel frame length
 - 127 for a 80 ms physical channel frame length

- 1 • Immediately prior to TDSO frame processing for the Forward Traffic Channel (that is,
2 F-FCH/F-DCCH/F-SCH0/F-SCH1) synchronization frame for which the System Time in
3 frames falls in the range from EFF_FRAME to EFF_FRAME + FRAMES_PER_SEGMENT_1
4 inclusive, the mobile station shall set the counters associated with the Forward Traffic
5 Channels to zero.
- 6 - For Forward Fundicated Traffic Channels, the counters are FFCH_BUFFER and
7 FDCCH_BUFFER
- 8 - For Forward Supplemental Channels, the counters are FSCH0_BUFFER and
9 FSCH1_BUFFER
- 10 - The value of FRAMES_PER_SEGMENT_1 shall be:
- 11 • 511 for a 20 ms physical channel frame length
- 12 • 255 for a 40 ms physical channel frame length
- 13 • 127 for a 80 ms physical channel frame length
- 14

3.4.2 Mobile station control operations

3.4.2.1 Control invocation

The mobile station can either propose or invoke service-option-specific functions for a TDSO call by sending a *Service Option Control Message* to the base station. When the mobile station sends the *Service Option Control Message*, it shall:

- Send it as a message requiring acknowledgment
- Set the CONTROL_CODE field in the message (see Table 33) to '00000000'

The mobile station can only propose values of test parameters for use during the test interval. The mobile shall be able to invoke the counter retrieval directives without any base station mediation.

3.4.2.2 Control directive

When the mobile station receives a *Service Option Control Message* with CTL_REC_TYPE in the range '0000000' – '00000100' inclusive (corresponding to FCH, DCCH, SCH0, or SCH1 physical channels) as indicated in Table 33, the mobile station shall consider the System Time in frames coinciding with the action time of the message to be the effective operation frame or initialization frame (also known as EFF_FRAME for the particular physical channel).

- Reverse Traffic Channel

Immediately prior to TDSO frame processing for the Reverse Traffic Channel synchronization frame for which the System Time in frames falls in the range from EFF_FRAME to EFF_FRAME + 511, inclusive, the mobile station shall perform the following:

- If the COPY_COUNTERS field is equal to '1', the mobile station shall copy the counters associated with the specified Reverse Traffic Channel to RFCH_BUFFER, RDCCH_BUFFER, RSCH0_BUFFER, and/or RSCH1_BUFFER as determined by the channel configuration (see Section 3.3 for more information).
- If the CLEAR_COUNTERS field is equal to '1', the mobile station shall set the counters associated with the specified Reverse Traffic Channel to zero (see Section 3.3 for more information).
- If the CHANNEL_DIRECTION field is equal to '00' or '10', the mobile station shall perform the following:
 - Initialize the local test variables associated with DATA_SOURCE to the value implied by its value in the message.
 - Initialize the local test variables associated with FRAME_ACTIVITY to the value implied by its value in the message.

1 • Forward Traffic Channel

2 Immediately prior to TDSO frame processing for the Forward Traffic Channel
3 synchronization frame for which the System Time in frames falls in the range from
4 EFF_FRAME to EFF_FRAME + 511, inclusive, the mobile station shall do the following:

- 5 - If the COPY_COUNTERS field is equal to '1', the mobile station shall copy the counters
6 associated with the specified Forward Traffic Channel to FFCH_BUFFER,
7 FDCCH_BUFFER, FSCH0_BUFFER and/or FSCH1_BUFFER (see Section 3.3 for more
8 information).
- 9 - If the CLEAR_COUNTERS field is equal to '1', the mobile station shall set the counters
10 associated with the specified Forward Traffic Channel to zero (see Section 3.3 for more
11 information).
- 12 - If the CHANNEL_DIRECTION field is equal to '00' or '01', the mobile station shall
13 perform the following:
- 14 • Initialize the local test variables associated with DATA_SOURCE to the value
15 implied by its value in the message.
 - 16 • Initialize the local test variables associated with FRAME_ACTIVITY to the value
17 implied by its value in the message.

18 Following a mobile station test control proposal (see Section 3.4.1 for a description), if a mobile
19 station receives a *Service Option Control Message* with CTL_REC_TYPE in the range '00000001' –
20 '00000100' inclusive (corresponding to FCH, DCCH, SCH0, or SCH1 physical channels) as listed in
21 Table 32, the mobile station shall perform the following:

- 22 • If the CONTROL_CODE field is set to '00000011', the mobile station may send another
23 proposal with the NUM_CIRC_BUF_FRAMES field set to a value less than or equal to the
24 value indicated in the corresponding field of the base station directive.
- 25 • If the CONTROL_CODE field is set to '00000110', the mobile station may send another
26 proposal with the FRAME_SOURCE field set to a value other than 10.

27 3.4.2.3 Counter retrieval

28 When the mobile station receives a *Service Option Control Message* with CTL_REC_TYPE in the
29 range of '00000101' – '00001000' (corresponding to FCH, DCCH, SCH0, or SCH1 physical channels)
30 as listed in Table 32, then:

- 31 • If the message is used to retrieve the 5 ms Transmitted Frame Counters or the 5 ms
32 Received Frame Counters, then at the first synchronization frame boundary, the mobile
33 station shall respond with the *Service Option Control Message* containing its response
34 shown in Table 40, corresponding to the VECT_COUNTER_ID fields (see Table 41) in the
35 received *Service Option Control Message*.

- Otherwise, at the action time associated with the message, the mobile station shall respond with the *Service Option Control Message* containing its response shown in Table 40 and Table 42, respectively, for the Fundicated and Supplemental Channels, corresponding to the VECT_COUNTER_ID fields (see Table 41 and Table 43) in the received *Service Option Control Message*.

3.5 Base station initialization and control operations

To perform TDSO initialization, if the FCH/DCCH are configured to use 5 ms frames, the base station shall send a *Service Option Control Message* no later than 1 second before the occurrence of the first synchronization frame after EFF_FRAME, in accordance with 3.5.3, to retrieve the values of the 5 ms frame counters in the mobile station (e.g., MUX1_FOR_FCH_5_ms). Base station control operations

3.5.1 Control invocation

The base station shall use the *Service Option Control Message* for invoking service option specific directives. When the base station sends the *Service Option Control Message*, it shall

- Send it as a message requiring acknowledgment
- Set the CONTROL_CODE field in the message (see Table 33) to '00000000'

When the mobile station proposes values of test parameters for use during the test interval, the base station shall decide whether or not to invoke the mobile-station-proposed test parameter settings through the *Service Option Control Message*.

The base station shall not send a control directive to the mobile station any later than one second before the occurrence of the synchronization frame on the channel for which the directive is intended.

3.5.2 Control directive

When the base station receives a *Service Option Control Message* with CTL_REC_TYPE in the range of '00000000' - '00000100' inclusive (corresponding to FCH, DCCH, SCH0, or SCH1 physical channels) as indicated in Table 32, the base station shall respond to the mobile station proposal as follows:

- If all of the fields in the mobile-station-proposed control directive (as indicated in Table 33) are within the acceptable range for the base station, the base station shall issue a Control Directive including the same values for the different fields (see Table 33) as proposed by the mobile station in a *Service Option Control Message*, while setting the CONTROL_CODE field (Table 34) in the message to a value of '00000010'.

- 1 • If the base station does not have the capability of supporting the value proposed by the
2 mobile station for the NUM_CIRC_BUF_FRAMES, it shall issue a Control Directive including
3 the same values for the different fields (see Table 33) as were proposed by the mobile
4 station, except for the NUM_CIRC_BUF_FRAMES field in a *Service Option Control Message*,
5 while setting the CONTROL_CODE field (Table 34) in the message to a value of '0000011'. In
6 the NUM_CIRC_BUF_FRAMES field of the message, the base station shall indicate the
7 maximum number of frames it can support for the circular buffer.
- 8 • If the base station does not have the capability of generating one frame per frame period as
9 requested by the mobile station through setting a value of '10' for the FRAME_SOURCE field,
10 it shall issue a Control Directive, including the same values for the different fields (see
11 Table 33), as proposed by the mobile station, except for the FRAME_SOURCE field in a
12 *Service Option Control Message*, while setting the CONTROL_CODE field (Table 34) in the
13 message to a value of '00000110'.
- 14 • If the base station is not able to recognize the fields in the mobile-proposed Control
15 Directive, it shall issue a Control Directive including the same values for the different fields
16 (see Table 33), as proposed by the mobile station in a *Service Option Control Message*, while
17 setting the CONTROL_CODE field (Table 34) in the message to a value of '00000101'.

18

3.5.3 Counter retrieval

When the base station receives a *Service Option Control Message* with CTL_REC_TYPE in the range of '00000101' – '00001000' inclusive (corresponding to FCH, DCCH, SCH0, or SCH1 physical channels) as listed in Table 32, then at the action time associated with the message, the base station shall respond with the *Service Option Control Message* containing its response, as shown in Table 40 and Table 42, respectively, for the Fundicated and Supplemental Channels, corresponding to the VECT_COUNTER_ID fields (see Table 41 and Table 43) in the received *Service Option Control Message*.

3.6 TDSO Frame processing

For an FCH/DCCH that is configured to use 5 ms frames, the service option shall perform transmit frame processing for 5 ms DCCH frames exactly once for every 5 ms frame of System Time while the service option is connected on the allocated FCH/DCCH in accordance with 3.6.3.

If 20 ms frames are used, the service option shall perform transmit and receive frame processing exactly once for every 20 ms frame of System Time while the service option is connected on the allocated physical channel(s) in accordance with 3.6.1 and 3.6.2, respectively.

If 40 ms (or 80 ms) SCH frames are used, the service option shall perform transmit and receive frame processing exactly once for every 40 ms (or 80 ms) frame of System Time while the service option is connected on the allocated SCH in accordance with 3.6.1 and 3.6.2, respectively.

3.6.1 Transmit frame processing

Transmit frame processing refers to F-FCH/F-DCCH/F-SCH Forward Traffic Channel frame processing in the base station or R-FCH/R-DCCH/R-SCH Reverse Traffic Channel frame processing in the mobile station. Transmit frame processing consists of the following:

- Generating data block(s)
- Supplying data block(s) to the multiplex sublayer for transmission
- Incrementing the corresponding counters

The service option shall generate the data blocks in accordance with 3.7. For Fundicated data frames (carried over FCH or DCCH), if the multiplex sublayer has requested a Blank data block, the service option shall supply a blank data block (data block containing no bits) to the multiplex sublayer. If the multiplex sublayer has requested a non-blank x-bit data block, the service option shall supply the first x bits of the generated data block to the multiplex sublayer and discard the rest of the generated data block. Otherwise, the service option shall supply the generated data block(s) to the multiplex sublayer, every physical channel frame.

For Supplemental data frames, if the multiplex sublayer has requested a Blank data block or Blank data blocks, the service option shall supply a data block or data blocks containing zero bits to the multiplex sublayer. Otherwise, the service option shall supply the generated data block(s) to the multiplex sublayer every SCH frame.

The service option shall increment the counters that are shown in Table 20 and Table 21, corresponding to the rate of the generated Fundicated and Supplemental frames and the command received from the multiplex sublayer.

Table 20. Counters for fundicated transmitted frames

Rate of generated frame	Multiplex sublayer command	Counter to increment
1	None	TDSO_E1_T1
1	Max Rate = Rate 1/2	TDSO_E1_TD
1	Blank	TDSO_E1_TB
Blank	None	TDSO_EB_TB
Blank	Maximum Rate = Rate 1/2 or Blank	TDSO_EB_TO

Table 21. Counters for supplemental transmitted frames

SCH rate of generated frame (kbps)	Multiplex sublayer command	Counter to increment
N x 9.6 or N x 14.4 ¹	None	TDSO_EN _x TN _x
N x 9.6 or N x 14.4	Blank	TDSO_EN _x TB
Blank	None	TDSO_EB_TB

¹ N can take the values 1, 2, 4, 8, 16, 18, 32, 36, 64, or 72 depending on the connected SCH transmission rate. The SCH frame consists of one or more data blocks of type Rate 1, Rate 2, or Rate 3 as determined by the connected multiplex option.

3.6.2 Receive frame processing

Receive frame processing refers to F-FCH/F-DCCH/F-SCH frame processing in the mobile station or R-FCH/R-DCCH/R-SCH frame processing in the base station. Receive frame processing consists of the following:

- Generating data block(s)
- Accepting data block(s) from the multiplex sublayer
- Comparing the rates and contents of the comparable data block(s)
- Incrementing the corresponding counters

For Fundicated Channel processing:

- The service option shall generate a data block in accordance with 3.7.
- The service option shall accept a received frame and the categorization of the MuxPDU(s) from the multiplex sublayer.

- If the categorization of the received MuxPDU corresponds to the rate of the generated data block, the service option shall compare the contents of the generated data block with the contents of the received data block, and shall determine whether or not they are identical; otherwise, TDSO shall not compare the contents to those of the generated data block.
- The service option shall increment the counter shown in Table 22 (when MuxPDU Type 1 is used) or Table 23 (when MuxPDU Type 2 is used) corresponding to the rate of the generated data block, the categorization of the received MuxPDU, and the result, if any, of the comparison of the data blocks.

Table 22. Counter updates for received fundicated frames when MuxPDU Type 1 is used

Rate of generated frame	Category of received MuxPDU for primary traffic	Category of received MuxPDU for secondary traffic	Data block comparison identical?	Counter to increment
1	1	14	Y	TDSO_E1_R1
1	1	14	N	TDSO_E1_RERR
1	2, 3, 4, 11, 12, 13	11, 12, 13	N/A	TDSO_E1_RD
1	6, 7, 8	N/A	N/A	TDSO_E1_RO
1	5, 14	1-8	N/A	TDSO_E1_RB
1	9	9	N/A	TDSO_E1_RFL
1	10	10	N/A	TDSO_E1_RE
Blank	15	15	N/A	TDSO_EN_RN
Blank	5, 14	1-8	N/A	TDSO_EN_RB
Blank	1-4, 6-13	9-14	N/A	TDSO_EN_RO

10

11

1 **Table 23. Counter updates for received fundicated frames when MuxPDU Type 2 is used**

Rate of generated frame	Category of received MuxPDU for primary traffic	Category of received MuxPDU for secondary traffic	Data block comparison identical?	Counter to increment
1	1	9	Y	TDSO_E1_R1
1	1	9	N	TDSO_E1_RERR
1	2-4, 6-8, 10, 12, 13, 15, 16, 18, 20, 22	6-8, 10, 15, 16, 18, 22	N/A	TDSO_E1_RD
1	5, 9, 14, 17, 21, 23, 25	1-5, 11-14, 19-21, 24	N/A	TDSO_E1_RB
1	26	26	N/A	TDSO_E1_RE
1	11, 19, 24	17, 23, 25	N/A	TDSO_E1_RO
Blank	27	27	N/A	TDSO_EN_RN
Blank	5, 9, 14, 17, 21, 23, 25	1-5, 11-14, 19-21, 24	N/A	TDSO_EN_RB
Blank	1-4, 6-8, 10-13, 15, 16, 18-20, 22, 24, 26	6-10, 15-18, 22, 23, 25, 26	N/A	TDSO_EN_RO

2
3 For Supplemental Channel processing:

- 4
- 5 • The service option shall generate one or more data blocks in accordance with 3.7 for every SCH frame.
 - 6 • The service option shall accept one or more data blocks, along with a categorization of each MuxPDU (see [3]), from the multiplex sublayer at every SCH frame, as dictated by the
 - 7 connected multiplex option.
 - 8
 - 9 • If the categorization of the received MuxPDU(s) corresponds to the rate of the corresponding
 - 10 generated frame, the service option shall compare the contents of the generated data
 - 11 block(s) with the contents of the received data block(s), and shall determine whether or not
 - 12 they are identical.
 - 13 • The service option shall increment the counter shown in Table 24 corresponding to the rate
 - 14 of the generated frame, the categorization of the received MuxPDU(s), and the result, if any,
 - 15 of the comparison of the two frames. These counters are employed in PER calculations on
 - 16 the Supplemental Channels.
 - 17 • If all of the data block(s) received within a frame interval are identical to the locally
 - 18 generated data block(s), the frame is declared error-free and the corresponding frame
 - 19 counter is incremented to reflect this as shown in Table 25. Otherwise, the frame error is
 - 20 noted in the appropriate counter. These counters are employed in FER calculations on the
 - 21 Supplemental Channels.
 - 22

1

Table 24. Counter updates for PDUs received on Supplemental Channels

Rate of generated data block	Category expected	Category of received MuxPDU	Data block comparison identical?	Counter to increment
3	2	2	Y	TDSO_E3_R3
3	2	2	N	TDSO_E3_RERR
3	2	1	N/A	TDSO_E3_RE
2	5	5	Y	TDSO_E2_R2
2	5	5	N	TDSO_E2_RERR
2	5	3	N/A	TDSO_E2_RE
1a	1(2) ¹	1(2)	Y	TDSO_E1a_R1a
1a	1(2)	1(2)	N	TDSO_E1a_RERR
1a	1(2)	3	N/A	TDSO_E1a_RE
1b	4	4	Y	TDSO_E1b_R1b
1b	4	4	N	TDSO_E1b_RERR
1b	4	3	N/A	TDSO_E1b_RE

¹ The category inside the parentheses is for secondary traffic.

2

3

Table 25. Counter updates for received frames on Supplemental Channels

Rate of generated frame	Category of each received MuxPDU (if carried as primary traffic)				Category of each received MuxPDU (if carried as secondary traffic) frame				Frame comparison identical?	Counter to increment
	MuxPDU Type in use				MuxPDU Type in use					
	1	2	3	5	1	2	3	5		
N x 9.6 or N x 14.4 ¹	1	1	4, 5	2	2	2	4, 5	2	Y	TDSO_ENx_RNx
N x 9.6 or N x 14.4	1	1	4, 5	2	2	2	4, 5	2	N	TDSO_ENx_RERR
N x 9.6 or N x 14.4	3	3	3	1	3	3	3	1	N/A	TDSO_ENx_RE
N x 9.6 or N x 14.4	2	2	4, 5	2	1	1	4, 5	2	N/A	TDSO_ENx_RB
Blank	2	2	4, 5	2	1	1	4, 5	2	N/A	TDSO_EB_RB
Blank	1,3	1,3	3	1	2, 3	2, 3	3	1	N/A	TDSO_EB_RO

¹ N can take the values 1, 2, 3, 4, 8, 16, 18, 32, 36, 64, or 72 depending on the allowed SCH transmission rate. The SCH frame consists of one or more data blocks of type Rate 1, Rate 2, or Rate 3 as determined by the connected multiplex option.

3.6.3 Transmit frame processing for 5 ms FCH/DCCH frames

3.6.3.1 Mobile Station Requirement

For R-FCH/DCCH 5 ms transmit frame processing in the mobile station, the TDSO shall request Layer 3 Signaling to transmit a SCRMM when TDSO decides to send a 5 ms frame based on the frame activity. If the R-SCH0 has already been assigned, the mobile station shall set the fields of the SCRMM_REQ_BLOB as follows:

- SR_ID set to the sr_id corresponding to the connected SO
- PREFERRED_RATE set to the currently connected R-SCH0 rate
- DURATION field set to '1111'

Otherwise, the mobile station should set the fields of the SCRMM_REQ_BLOB as follows:

- SR_ID set to the sr_id corresponding to the connected SO
- PREFERRED_RATE set to any valid R-SCH0 rate

- 1 • DURATION field set to '0000'

2 The mobile station counts and stores the number of transmitted or retransmitted 5 ms frames in
3 the counters (MUX1_REV_FCH_5_ms, MUX2_REV_FCH_5_ms, MUX1_REV_DCCH_5_ms and
4 MUX2_REV_DCCH_5_ms) as specified in [3].

5 Since TDSO has no control on timing in Layer 3 Signaling, the actual transmission of the mini
6 message may occur in a later frame.

7 3.6.3.2 Base Station Requirement

8 For F-FCH/DCCH 5 ms transmit frame processing in the base station, the TDSO shall request
9 Layer 3 Signaling to transmit an FSCAMM when TDSO decides to send a 5 ms frame based on the
10 frame activity. If the F-SCH0 has already been assigned, the base station should set the fields of
11 the FSCAMM as follows:

- 12 • FOR_SCH_ID set to '0'
- 13 • FOR_SCH_DURATION field set to '1111'
- 14 • SCCL_INDEX set to the Supplemental Channel Code list index corresponds to one currently
15 in use by F-SCH0.

16 Otherwise, the base station should set the fields of the FSCAMM as follows:

- 17 • FOR_SCH_ID set to '0'
- 18 • FOR_SCH_DURATION field set to '0000'
- 19 • SCCL_INDEX set to any Supplemental Channel Code list index that corresponds to F-
20 SCH0, if available. If there is no Supplemental Channel Code list index corresponds to F-
21 SCH0, SCCL_INDEX shall be set to any value, in which case the mobile station ignores the
22 SCCL_INDEX field.

23 The base station should count the number of transmitted or retransmitted 5 ms frames, which
24 includes the following:

- 25 • Any 5 ms frame carrying a mini message that is initiated by TDSO
- 26 • Any 5 ms frame carrying a mini message that is not initiated by TDSO
- 27 • A retransmitted 5 ms frame due to LAC retransmission

28 3.7 TDSO frame generation

29 Two different categories of traffic can be transported over the connected TDSO:

- 30 • Selectable byte pattern
- 31 • Pseudo-randomly generated bits

1 At the physical layer, by default, the TDSO is configured to generate primary traffic over the
2 Forward and Reverse Fundamental Channels using RC3. The default test mode for the TDSO
3 service option is the byte pattern 0xFF with a 100% frame activity.

4 For every 20 ms FCH/DCCH frame, when TDSO generates a TDSO frame, it shall generate a Rate
5 1 data block. For every SCH frame, when TDSO generates a TDSO frame, it shall generate one or
6 more Rate 1, Rate 2, or Rate 3 data blocks that are applicable to the connected SCH rate.

7 The actual size of the transmitted data block(s) during a TDSO frame depends on the multiplex
8 sublayer command.

9 3.7.1 Selectable byte pattern

10 When using this scheme, a single-byte pattern is used to fill the data block or data blocks that are
11 passed to the multiplex sublayer (up to a whole number of octets) during each TDSO frame interval
12 (20 ms, 40 ms, or 80 ms).

13 When the TDSO prepares a TDSO frame for a traffic channel, it shall perform the following:

- 14 • Fill up a Rate 1, Rate 2, or Rate 3 data block, whichever is applicable, with single-byte
15 pattern up to a whole number of octets. Pad the data block with '0' bits for any remaining
16 bits that are not filled. (e.g., a 171-bit Rate 1 has 21 full octets and 3 additional bits. The
17 additional remaining bits are filled by '0' bits.)
- 18 • Replace the first 5 bits of the data block by the header depicted in Table 30. This helps the
19 TDSO on the receive side to categorize the data blocks on a per-channel and per-PDU basis.

20 3.7.2 Pseudo-random number generation

21 Pseudo-random number generators are utilized for frame generation. These generators are
22 associated with a particular physical channel (forward or reverse) and are initialized at each
23 synchronization frame. The pseudo-random number generators are iterated one or more times for
24 every frame. Iterations of the pseudo-random number generators are used for information bit
25 generation, enough to fill two maximum rate physical layer frames (per the configured RC). The
26 bits are stored in circular buffers. The buffers are regenerated with a new seed of the System Time
27 frame number associated with a synchronization frame every 10.24 seconds.

28 For each physical channel, a TDSO uses two independent pseudo-random number generators. One
29 pseudo-random number generator is associated with the Forward Traffic Channel, while the other
30 is associated with the Reverse Traffic Channel. These pseudo-random number generators are
31 synchronized with their counterparts at the other end of the link, as shown in Figure 1. At
32 synchronization time, the pseudo-random number generator for the transmit side is used for
33 generating the circular buffer that serves as the data source for bits packed into data blocks each
34 frame period for the next test segment (10.24 seconds). The receive side pseudo-random number
35 generator, by emulating the frame generation process at the other end of the link, enables the
36 service option to verify if a data block(s) is received error-free.

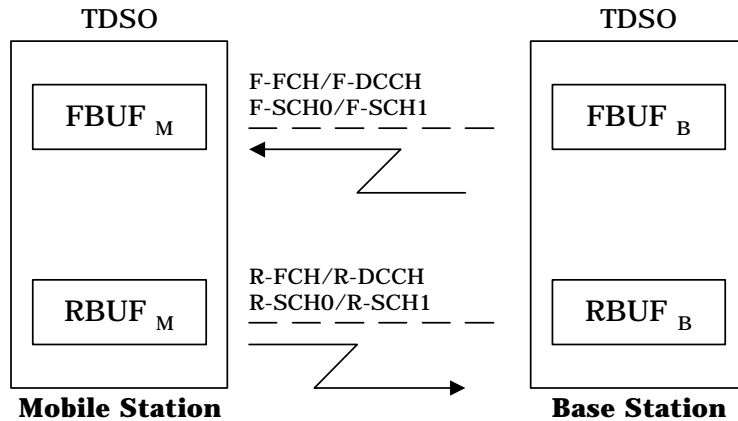


Figure 1. Synchronized operation of pseudo-random number generated buffers

On the transmit side, the bits from the circular buffer for a particular channel are packed serially into data blocks corresponding to the available MuxPDUs as determined by the connected multiplex option. The multiplex option indicates the size of the data block or data block(s), which is equal to the number of bits to be copied from the circular buffer to the last whole octet to form a data block or data blocks. Any remaining bits up to the data block size are filled with '0' bits. For every frame, TDSO shall generate a random offset, O_n , which shall be set to the 6 least significant bits of $RNG/128$ modulo $B(n)$, where $B(n)$ is the buffer size and RNG is the random number generator associated with the physical channel (see 3.7.3 for buffer sizes). If the frame activity is "On" at the current frame, TDSO shall copy the data bits from the circular buffer into the data block(s), starting at a reference point plus the offset, and then advance the reference point to the last byte that is copied. If the frame activity is "Off" at the current frame, TDSO shall not copy any bits from the circular buffer and TDSO shall advance the reference point by O_n . The reference point is reset to zero when the current frame is a synchronization frame. The receive side emulates the frame generation process at the other end by following the same process of building a frame (which consists of one or more data blocks) from the circular buffer each time from a different offset.

Depending on the frame activity or the $TX_ON_PERIOD/TX_OFF_PERIOD$, if the TDSO transmits the TDSO frame during the current frame, it shall perform the following:

- Replace the first 5 bits of the generated data block(s) with the header depicted in Table 30. This helps the TDSO on the receive side to categorize the data blocks on a per-channel and per-PDU basis.
- The TDSO shall pass the generated data block(s) to the multiplex sublayer. The TDSO shall supply the first x bits of the data block to the multiplex sublayer if the multiplex sublayer requests an x -bit data block, where x may be smaller than the number of bits in a Rate 1 data block.

The service option shall store the state of all the Forward Traffic Channel pseudo-random number generators, FRNG, and the state of the Reverse Traffic Channel pseudo-random number generators, RRNG.

1 3.7.2.1 Initialization

2 Before frame generation for every Forward Traffic Channel synchronization frame, the service
3 option shall initialize the Forward Traffic Channel pseudo-random number generator as follows:

```
4 {
5     a = 16807
6     m = 2147483647
7     FRNG = System Time in frames of the forward synchronization frame
8     FRNG = (FRNG ^ 0x2AAAAAAAA) & 0x7FFFFFFF
9     FRNG = (FRNG * a) mod m
10    FRNG = (FRNG * a) mod m
11    FRNG = (FRNG * a) mod m
12    FRNG = (FRNG * a) mod m
13 }
```

14 Before frame generation for every Reverse Traffic Channel synchronization frame, the service
15 option shall initialize the Reverse Traffic Channel pseudo-random number generator as follows:

```
16 {
17     a = 16807
18     m = 2147483647
19     RRNG = System Time in frames of the reverse synchronization frame
20     RRNG = (RRNG ^ 0x55555555) & 0x7FFFFFFF
21     RRNG = (RRNG * a) mod m
22     RRNG = (RRNG * a) mod m
23     RRNG = (RRNG * a) mod m
24     RRNG = (RRNG * a) mod m
25 }
```

26 3.7.2.2 Number production

27 Whenever a pseudo-random number is required for Forward Traffic Channel frame processing, the
28 service option shall use the current value of FRNG as the pseudo-random number and then shall
29 update FRNG as follows:

```
30 {
31     a = 16807
32     m = 2147483647
```

1 FRNG = (FRNG * a) mod m
2 }

3

4 Whenever a pseudo-random number is required for Reverse Traffic Channel frame processing, the
5 service option shall use the current value of RRNG as the pseudo-random number and then shall
6 update RRNG as follows:

7

8 {
9 a = 16807
10 m = 2147483647
11 RRNG = (RRNG * a) mod m
12 }

13

14 3.7.2.3 24-bit random number

15 The pseudo-random number generators that are used to fill the circular buffers (see Section 3.7.3
16 for more information) to determine the transitions between the two TDSO states for calculation of
17 frame activity (see Section 3.7.5 for more information) and to select the 6-bit byte offset in the
18 circular buffer (see Section 3.7.2 for more information) each frame period, all have the following
19 linear congruent relationship:

$$20 \quad x_n = a \times x_{n-1} \text{ mod } m,$$

21 where:

- 22 • a = $7^5 = 16807$
- 23 • m = $2^{31} - 1 = 2147483647$
- 24 • x_{n-1} and x_n are the successive outputs of the generator and are 31-bit integers

25 However, because of the better randomness properties of the most significant 24 bits within the
26 31-bit number and for ease of usage, especially for building circular buffers (31-bit number is not
27 octet-aligned), only the most significant 24 bits of these numbers are used throughout. That is, 24-
28 bit number = 31-bit PN number $\gg 7$

29 3.7.3 Circular buffer sizes

30 The sizes of the required buffers for generation of Fundicated and Supplemental (for each
31 Supplemental Channel) traffic frames for various radio configurations (RCs) on the forward/reverse
32 links are indicated in Table 26, Table 27, and Table 28. For convenience, the buffer sizes are based
33 on the maximum number of bits passed by the multiplex sublayer to the physical layer each frame
34 period (5 ms, 20 ms, 40 ms, or 80 ms) depending on the radio configuration.

1 **Table 26. Circular buffer sizes needed to generate fundicated channel data frames**

Reverse Radio Configuration (RC)	Forward Radio Configuration (RC)	Maximum bits/frame	Default circular buffer size 2 frames (bits)	Circular buffer size N frames (bits)
1, 3, 5	1, 3, 4, 6 or 7	172	2 x 172 = 344	N x 172
2, 4, 6	2, 5, 8 or 9	267	2 x 267 = 534	N x 267

2 **Table 27. Circular buffer sizes needed to generate reverse Supplemental Channel data**
3 **frames**

Radio configuration (RC)	Maximum bits/frame	Default circular buffer size 2 frames (bits)	Circular buffer size N frames (bits)
3	6, 120	2 x 6,120 = 12,240	N x 6,120
4	4, 584	2 x 4,584 = 9,168	N x 4,584
5	12, 264	2 x 12,264 = 24,528	N x 12,264
6	20, 712	2 x 20,712 = 41,424	N x 20,712

4 **Table 28. Circular buffer sizes needed to generate forward Supplemental Channel data**
5 **frames**

Radio configuration (RC)	Maximum bits/frame	Default circular buffer size 2 frames (bits)	Circular buffer size N frames (bits)
3	3,048	2 x 3,048 = 6,096	N x 3,048
4	6,120	2 x 6,120 = 12,240	N x 6,120
5	4,584	2 x 4,584 = 9,168	N x 4,584
6	6,120	2 x 6,120 = 12,240	N x 6,120
7	12,264	2 x 12,264 = 24,528	N x 12,264
8	9,192	2 x 9,192 = 18,384	N x 9,192
9	20,172	2 x 20,712 = 41,424	N x 20,712

6
7 The pseudo-random number generators used to fill the circular buffers have the following linear
8 congruent relationship:

9
$$x_n = a \times x_{n-1} \text{ mod } m,$$

10 where:

- 11 • $a = 7^5 = 16807$
12 • $m = 2^{31} - 1 = 2147483647$

- x_{n-1} and x_n are the successive outputs of the generator and are 31-bit integers

3.7.4 Information bit generation

For every Forward or Reverse Traffic Channel frame, the TDSO iterates the associated pseudo-random number generator for the Physical Channel (FCH/DCCH or SCH) one or more times, as specified in the following subsections. For every synchronization frame, the service option shall initiate the circular buffer. However, for ease of implementation, the actual number of random bits in a circular buffer that is generated for a radio configuration is rounded to an octet-aligned number of bits determined exactly by the minimum number of iterations conducted on the associated pseudo-random number generator to achieve the given buffer size.

To generate the circular buffer at any rate R(n):

- The service option shall generate a total of NUM_RAND pseudo-random numbers (as shown in Table 29) corresponding to actual circular buffer size B(n).
- Each 24-bit number $y_n(k)$, $1 \leq k \leq \text{NUM_RAND}$, shall be reshuffled and stored in the little-endian order as shown in Figure 2.
- The reshuffled number $y_n^{\text{LE}}(k)$ has the least significant byte of $y_n(k)$ in the most significant byte position and *vice versa*.

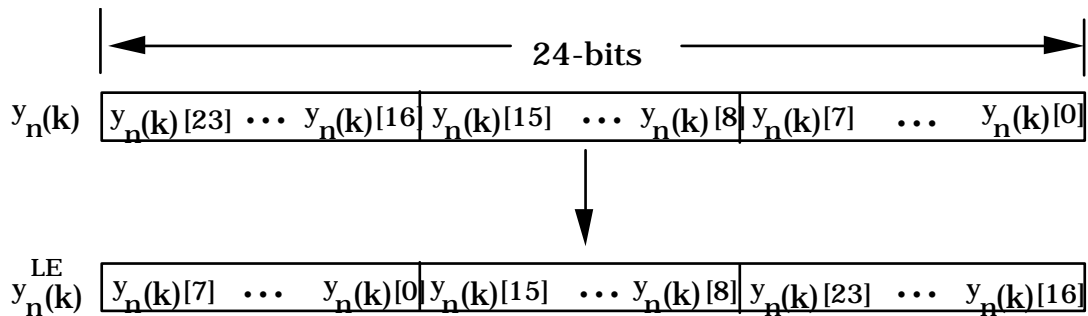


Figure 2. Reshuffling of $y_n(k)$ to generate $y_n^{\text{LE}}(k)$

For example, the 45-byte circular buffer (generated to accommodate a needed buffer size of 344 bits) shall be comprised of $y_n^{\text{LE}}(1)$ through $y_n^{\text{LE}}(15)$ as follows:

$y_n^{\text{LE}}(1), y_n^{\text{LE}}(2), y_n^{\text{LE}}(3) \dots y_n^{\text{LE}}(15)$

1 **Table 29. Procedure for generating the default circular buffers for RC>2 channels**

Needed circular buffer size R(n)	Minimum required number of 24-bit pseudo-random numbers NUM_RAND	Pseudo-random bits generated	Actual circular buffer size (bytes) B(n)
344	15	15 x 24 = 360	45
534	23	23 x 24 = 552	69
6096	254	254 x 24 = 6096	762
9168	382	382 x 24 = 9168	1146
12240	510	510 x 24 = 12240	1530
18384	766	766 x 24 = 18384	2298
24528	1022	1022 x 24 = 24528	3066
41424	1726	1726 x 24 = 41424	5178

2
3 Information-bit generation for an N-frame circular buffer follows the same method and principles
4 as described for the 2-frame circular buffer case.

5 3.7.5 Frame activity

6 If 5 ms FCH/DCCH frames are used, the TDSO shall decide whether or not to request Layer 3
7 Signaling to send a mini message for each 5 ms frame period based on the frame activity.

8 Otherwise, the TDSO passes the information bits to the multiplex sublayer according to a certain
9 ON/OFF frame activity. For each frame period (20 ms, 40 ms, or 80 ms) on a particular physical
10 channel, the TDSO may choose to pass data block(s) corresponding to a full-rate frame on that
11 channel or pass a blank data block to the multiplex sublayer. The TDSO shall support two
12 different schemes to pass data to the multiplex sublayer, as follows:

13 3.7.5.1 Deterministic frame activity

14 This scheme is governed by the values of the TX_ON_PERIOD and TX_OFF_PERIOD indicated in the
15 *Service Option Control Message*. The fields represent (in units of 5 ms, 20 ms, 40 ms, or 80ms,
16 depending on the target physical channel configuration) the pattern for passing data to the
17 multiplex sublayer.

18 If the channel is an FCH/DCCH configured to use 5 ms frames, the TDSO shall:

- 19 • Request Layer 3 Signaling to send an FSCAMM in the base station (or a SCRMM in the
20 mobile station) every 5 ms, for a duration of TX_ON_PERIOD.
- 21 • Not request an FSCAMM in the base station (or a SCRMM in mobile station) every 5 ms, for
22 a duration of TX_OFF_PERIOD.

23 Otherwise, the TDSO shall:

- 1 • Pass data blocks to the multiplex sublayer for a duration of TX_ON_PERIOD.
- 2 • Send blank data blocks for a duration of TX_OFF_PERIOD.

3 The ON/OFF cycle starts, with an ON cycle, at the synchronization frame and terminates at the
4 last frame before the next synchronization frame for that channel.

5 3.7.5.2 Random with a specified frame activity and burst length

6 This second scheme is more random. Its goal is to achieve a long-term average of a specified frame
7 activity (D) and a specified burst length (B), which is defined as the average consecutive "On"
8 period, for a channel. This goal is achieved by modeling the ON/OFF states by a two-state first
9 order Markov chain with transition probabilities p and q, as indicated in Figure 3. The values of p
10 and q are specified in the ON_TO_OFF_PROB field and the OFF_TO_ON_PROB field, respectively, in
11 the base-station control directive using the *Service Option Control Message* (see Table 33). The
12 value of D can be calculated based on p and q as follows:

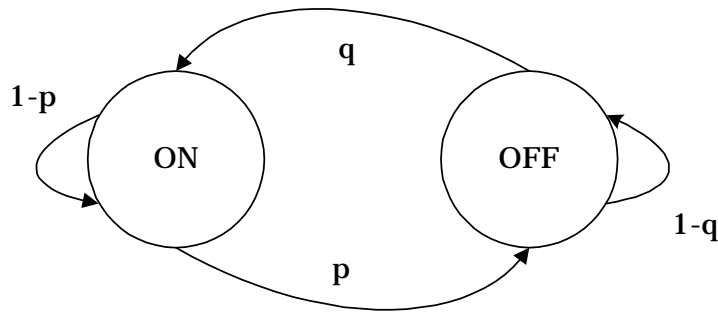
$$13 \quad D = q/(p+q),$$

14 where p is the transition probability from the "On" state to the "Off" state, and q is the transition
15 probability from the "Off" state to the "On" state,

16 The average consecutive "On" period in units of frames, B, can be calculated follows:

$$17 \quad B = 1/p$$

18 Procedures for calculating p and q based on some desired D and B are explained in Annex H.



19
20 **Figure 3. Two-state Markov chain representing ON/OFF transitions for TDSO**

21 A 24-bit pseudo-random number is used to drive the transitions between the two TDSO states
22 every frame period (5 ms, 20 ms, 40 ms, and 80 ms). For all 20 ms frame length-based physical
23 channels, the TDSO uses the same PN number generator, iterating every 20 ms to calculate the
24 transitions. If the operating Supplemental Channels are configured for 40 ms or 80 ms frame
25 lengths, a second PN number generator iterating every 40 ms or 80 ms, respectively, is used to
26 derive the TDSO state for the Supplemental Channels.

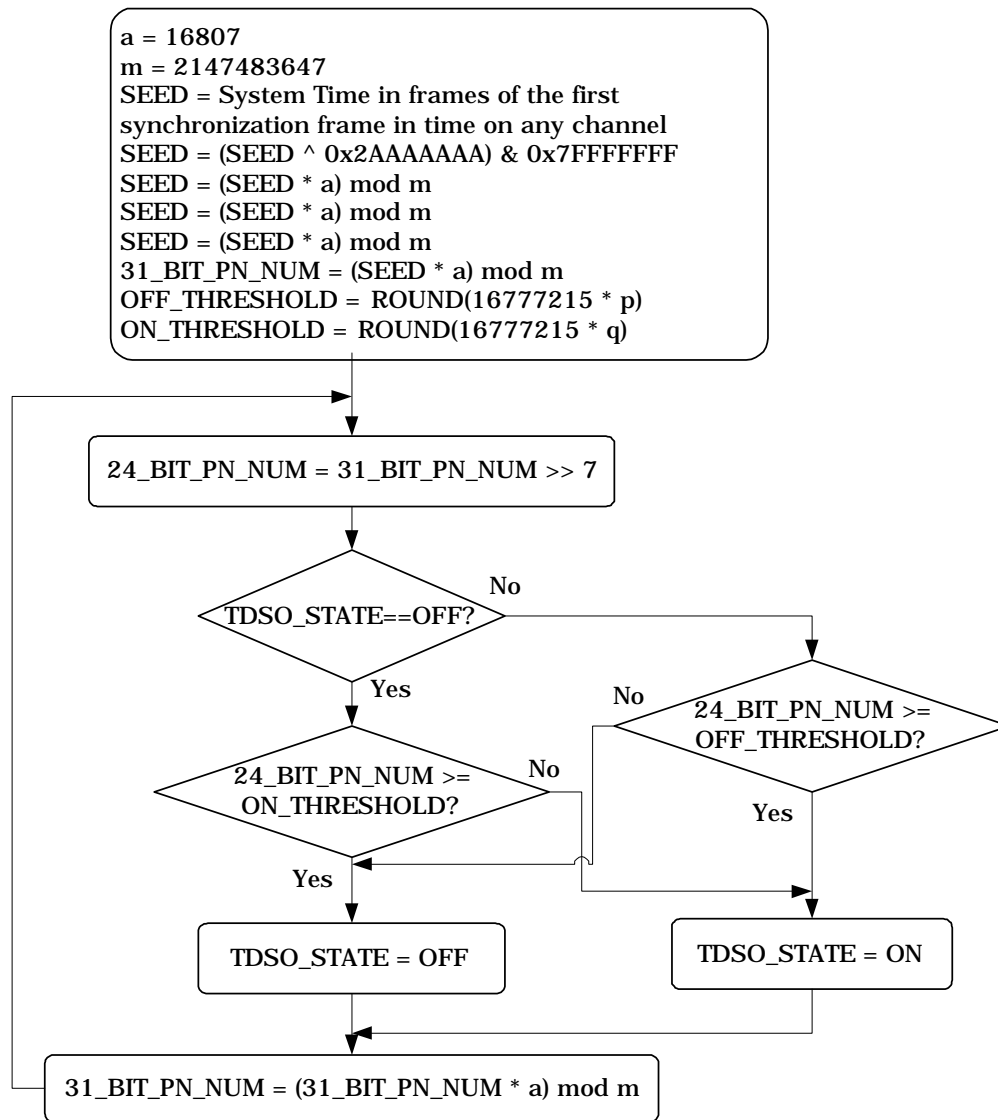
27 The PN generator for the 5 ms, 20 ms frame length channels shall be initialized at the first
28 synchronization frame time after the TDSO is initialized at the action time that is associated with

1 the *Service Connect Message*. For the 40 ms or 80 ms frame lengths, the associated PN number
2 generator shall be initialized at the first synchronization frame time after the TDSO is initialized on
3 the Supplemental Channel at the action time associated with the UHDM, ESCAM, FSCAMM, or
4 RSCAMM. When initialized, the state of the Markov chain shall be set to the "Off" state.

5 Normally, the state of the PN generators is maintained throughout the duration of the call without
6 any reinitialization at the synchronization frames. However, the PN generators are reinitialized if a
7 CDMA-CDMA hard handoff has been completed. In case of the latter, the reinitialization occurs at
8 the first synchronization frame after the handoff completion message. When reinitialized, the state
9 of the Markov chain shall be set to the "Off" state.

10 Section 3.7.2.3 describes how the 24-bit PN number is derived. The method that is followed in
11 choosing the TDSO state (ON or OFF) during a frame period is shown in Figure 4.

12 Immediately prior to the first synchronization frame of the TDSO call, the TDSO_STATE variable in
13 Figure 4 shall be set to "Off". After the first synchronization frame of a TDSO call, TDSO_STATE
14 shall be set to the ON/OFF state of the previous physical layer frame. If TDSO supplied non-blank
15 data block(s) (including those with all 1 bits) to the multiplex sublayer for transmission during the
16 previous physical layer frame, TDSO_STATE is set to "On" when evaluating the ON/OFF state of
17 the current physical layer frame. If TDSO supplied blank data block to the multiplex sublayer for
18 transmission during the previous physical layer frame, TDSO_STATE is set to "On" when
19 evaluating the ON/OFF state of the next physical layer frame.



1

2 **Figure 4. Flowchart illustrating TDSO state transitions for a D frame activity and B average**
 3 **"On" period in units of frames.**

4

3.7.6 Data block header and formats

In order to separate the calculation of FER on a per physical channel basis, a Channel ID must mark each data block that is supplied to the multiplex sublayer during each frame interval.

Also, a sequence number is needed to help compare multiple PDUs that carry individual data blocks received in a physical layer SDU with a locally generated frame.

The first 5 bits of each generated data block (including those with all 1's) are replaced by the header as shown in Table 30 for the FCH/DCCH and SCH Multiplex PDUs.

Table 30. Data block format

Field	Length (bits)	Definition
CHANNEL_ID	2	Channel ID of the underlying physical channel carrying the data block. Various channel codes are shown in Table 31.
PDU_SEQ_NUM	3	Sequence number of the data block within a physical layer SDU. For FCH/DCCH data blocks, this field is set to '000'. For SCH data blocks, this field is set as follows: It is set to '000' for the first data block (MuxPDU) in the SCH frame, '001' for the second data block in the SCH frame, and so on.
DATA	Variable up to the data block size	Data bits as generated according to the selected DATA_SOURCE algorithm.

Table 31. CHANNEL_ID type codes

CHANNEL_ID	Traffic channel
'00'	FCH
'01'	DCCH
'10'	SCH0
'11'	SCH1

1 **3.8 Message formats**

2 **3.8.1 Service Option Control Message**

3 If the base station or mobile station sends a *Service Option Control Message*, it shall set the
 4 CTL_REC_TYPE field to the value shown in Table 32 corresponding to the desired directive.

5 **Table 32. CTL_REC_TYPE codes**

CTL_REC_TYPE	Type of directive
'00000000'	Control Directive for all Physical Channels carrying TDSO traffic
'00000001'	Control Directive for FCH
'00000010'	Control Directive for DCCH
'00000011'	Control Directive for SCH0
'00000100'	Control Directive for SCH1
'00000101'	Counter Retrieval Directive for FCH
'00000110'	Counter Retrieval Directive for DCCH
'00000111'	Counter Retrieval Directive for SCH0
'00001000'	Counter Retrieval Directive for SCH1
'00001001'-'11111111'	Reserved

6

7

3.8.1.1 Control

When the mobile station sends a *Service Option Control Message* to propose control action or the base station sends a *Service Option Control Message* to invoke control action in a mobile station, it shall include the type-specific fields as specified in Table 33.

Table 33. Service Option Control Message type-specific fields

Field	Length (bits)	Definition
CTL_REC_TYPE (‘00000000’ - ‘00000100’)	8	Control record type field. The mobile station or base station shall set this field to a value between ‘00000000’ and ‘00000100’ to signify a control directive on all TDSO-configured channels or for a specific channel according to Table 32.
CONTROL_CODE	8	Control code field. The mobile station or base station shall set this field according to Table 34.
CHANNEL_DIRECTION	2	Channel direction field. This field indicates what channel direction this control directive is for. The base station or mobile station shall set this field according to Table 37.
COPY_COUNTERS	1	Copy counters field. If the mobile station and base station are to copy the counter values at the next synchronization frame, the base station shall set this field to ‘1’. Otherwise, the base station shall set this field to ‘0’.
CLEAR_COUNTERS	1	Clear counters field. If the mobile station and base station are to clear the counters at the next synchronization frame, the base station shall set this field to ‘1’. Otherwise, the base station shall set this field to ‘0’.
DATA_SOURCE	1	Data source field. The mobile station or base station shall set this field to the DATA_SOURCE value shown in Table 35 corresponding to the type of traffic that is desired to be generated during the test call.
FRAME_SOURCE	2	Frame source field. Through this field, the base station or mobile station defines the source to be used for filling up the data frames for the particular channel. The various options are indicated in Table 38. If DATA_SOURCE is set to ‘0’, the value of FRAME_SOURCE is not applicable and hence FRAME_SOURCE can be set to any value.

Field	Length (bits)	Definition
FRAME_ACTIVITY	1	<p>Frame activity field.</p> <p>The base station or mobile station shall set this field to the FRAME_ACTIVITY value shown in Table 36 corresponding to the desired burstiness in the traffic that is to be generated during the test call.</p>
TEST_OPTIONS	8	<p>TDSO Test Options.</p> <p>The base station or mobile station shall set this field according to</p> <p>Table 39.</p>
NUM_CIRC_BUF_FRAMES	0 or 8	<p>Number of full-rate frames in the circular buffer field.</p> <p>The mobile station or base station shall set this field to indicate the desired size of the circular buffer frames. This field is present only if the FRAME_SOURCE field is set to '01'. If the control directive is a mobile station proposal and the base station cannot support the proposed buffer size, the base station shall set this field to the maximum number of frames it can support during that call for that channel.</p>
ON_TO_OFF_PROB	0 or 8	<p>"On" state to "Off" state transition probability field.</p> <p>This frame is only present if the FRAME_ACTIVITY field has a value of 1. The base station or mobile station shall set this field to the</p> <p>ROUND(Desired "On" to "Off" state transition probability * 100). The valid range for this field is between '00000000' and '01100100'.</p>
OFF_TO_ON_PROB	0 or 8	<p>"Off" state to "On" state transition probability field.</p> <p>This frame is only present if the FRAME_ACTIVITY field has a value of 1. The base station or mobile station shall set this field to the</p> <p>ROUND(Desired "Off" to "On" state transition probability * 100). The valid range for this field is between '00000000' and '01100100'.</p>
TX_ON_PERIOD	0 or 8	<p>Transmission on period field.</p> <p>This frame is only present if the FRAME_ACTIVITY field has a value of 0. The base station or mobile station shall set this field to the desired number of adjacent frame periods (20 ms, 40 ms, or 80 ms). The TDSO shall supply non-blank data frames to the multiplex sublayer before passing blank frames to it for the number of frame periods indicated by the TX_OFF_PERIOD field.</p>

Field	Length (bits)	Definition
TX_OFF_PERIOD	0 or 8	Transmission off period field. This frame is only present if the FRAME_ACTIVITY field has a value of '0'. The base station or mobile station shall set this field to the desired number of adjacent frame periods (20 ms, 40 ms, or 80 ms). The TDSO shall supply blank frames to the multiplex sublayer after passing non-blank frames to it for the number of frame periods indicated by the TX_ON_PERIOD field.
DATA_PATTERN	0 or 8	Data pattern field. This frame is only present if the DATA_SOURCE field has a value of '0'. The mobile station or base station shall set this field to the selectable byte pattern to be used for the test corresponding to the type of traffic that is generated during the test call.

1

2

Table 34. CONTROL_CODE codes

CONTROL_CODE	Meaning
'00000000'	Mobile station proposed control directive
'00000001'	Base station control directive
'00000010'	Base station control directive based on mobile station proposal
'00000011'	Base station control directive based on mobile station proposal (number of frames in circular buffer not supported - NUM_CIRC_BUF_FRAMES field indicates maximum number of frames base station can support)
'00000100'	Base station control directive based on mobile station proposal (message cannot be handled by the current base station configuration)
'00000101'	Base station control directive based on mobile station proposal (message structure not acceptable)
'00000110'	Base station control directive based on mobile station proposal (unable to support a value of '10' for the FRAME_SOURCE field as indicated in Table 38, that is, cannot generate 1 frame each frame period)
'00000111' - '11111111'	Reserved

3

4

Table 35. DATA_SOURCE codes

DATA_SOURCE	Traffic pattern
'0'	Selectable data pattern
'1'	Pseudo-random bits

Table 36. FRAME_ACTIVITY codes

FRAME_ACTIVITY	Type
'0'	Deterministic frame activity
'1'	Random frame activity

Table 37. CHANNEL_DIRECTION codes

CHANNEL_DIRECTION	Channel types
'00'	Both forward and reverse link directions
'01'	Forward link direction only
'10'	Reverse link direction only
'11'	Reserved

Table 38. FRAME_SOURCE codes

FRAME_SOURCE	Circular buffer composition
'00'	2 full-rate frames
'01'	N full-rate frames
'10'	New frame every frame period (20 ms, 40 ms, or 80 ms). The mobile station or base station shall generate a new 1-frame circular buffer to fill up the frame to be transmitted every frame period in accordance with the procedures described in 3.7.4.
'11'	Reserved

Table 39. TEST_OPTIONS codes

TEST_OPTIONS	TDSO Test Options
'00000000' - '11111111'	Reserved

3.8.1.2 Counter retrieval

When the base station or mobile station sends a *Service Option Control Message* to retrieve counter values from the other end for any of the Fundicated Channels (FCH/DCCH), it shall include the type-specific fields as specified in Table 40.

Table 40. Type-specific fields in a Service Option Control Message used for counter retrieval on the FCH/DCCH

Field	Length (bits)	Definition
CTL_REC_TYPE ('00000101' or '00000110')	8	Control record type field. The mobile station or base station shall set this field to '00000101' to signify a counter retrieval directive on the FCH and '00000110' to signify a counter retrieval directive on the DCCH.
VECT_COUNTER_ID	8	Vector counter identification field. The base station or mobile station shall set this field to correspond to the value shown in Table 41 for the Fundicated Channels and in corresponding to the desired vector of counter values.

Table 41. VECT_COUNTER_ID codes for FCH/DCCH

VECT_COUNTER_ID	Vector name
'00000000'	FER Counters Response
'00000001'	Receive Expected Counters Response
'00000010'	Transmitted Counters Response
'00000011'	5 ms Frame Transmitted counters
'00000100'	5 ms Frame Received counters
'00000101'- '11111111'	Reserved

1 When the base station or mobile station sends a *Service Option Control Message* to retrieve counter
 2 values from the other end for the SCHs, it shall include the type-specific fields as specified in Table
 3 42.

4 **Table 42. Type-specific fields in a *Service Option Control Message* used for counter retrieval**
 5 **from the mobile station for SCHs**

Field	Length (bits)	Definition
CTL_REC_TYPE (‘00000111’ or ‘00001000’)	8	Control record type field. The base station or mobile station shall set this field to signify a counter retrieval directive on the Supplemental Channels. For the SCH0 and SCH1 channels, the field shall be set to ‘00000111’ and ‘00001000’, respectively.
VECT_COUNTER_ID	8	Vector counter identification field. The base station or mobile station shall set this field to correspond to the value shown in Table 43 corresponding to the desired vector of counter values.

6
 7 **Table 43. VECT_COUNTER_ID codes for SCHs**

VECT_COUNTER_ID	Vector name
‘00000000’	FER Counters Response
‘00000001’	PER
‘00000010’	Transmitted Counters Response
‘00000011’ - ‘11111111’	Reserved

8
 9 **3.8.1.3 Counter responses on the Fundicated Channels**

10 **3.8.1.3.1 FER Counters Response**

11 When the mobile station or base station sends a FER Counters Response for the FCH or DCCH
 12 channels, it shall include the following type-specific fields in the *Service Option Control Message*:

Table 44. Type-specific fields in a *Service Option Control Message* corresponding to FER Counters Response on FCH/DCCH

Field	Length (bits)	Definition
CTL_REC_TYPE (<i>'00000101'</i> or <i>'00000110'</i>)	8	Control record type field. The mobile station or base station shall set this field to <i>'00000101'</i> when responding to an FCH Control directive and <i>'00000110'</i> for DCCH.
VECT_COUNTER_ID (<i>'00000000'</i>)	8	Vector counter identification field. The mobile station or base station shall set this field to <i>'00000000'</i> .
TDSO_E1_R1	24	Counter for Rate 1 data blocks received error free. The mobile station shall set this field to the value of TDSO_E1_R1 stored in the FFCH_BUFFER or FDCCH_BUFFER modulo 2^{24} . The base station shall set this field to the value of TDSO_E1_R1 stored in the RFCH_BUFFER or RDCCH_BUFFER modulo 2^{24} .
TDSO_E1_RBAD	24	Number of Rate 1 data blocks received in error. The mobile station shall compute this value using counter values stored in the FFCH_BUFFER or FDCCH_BUFFER as follows: $\text{TDSO_E1_RBAD} = (\text{TDSO_E1_RERR} + \text{TDSO_E1_RD} + \text{TDSO_E1_RE} + \text{TDSO_E1_RO} + \text{TDSO_E1_RB} + \text{TDSO_E1_RFL}) \bmod 2^{24}$ The base station shall compute this value using counter values stored in the RFCH_BUFFER or RDCCH_BUFFER as follows: $\text{TDSO_E1_RBAD} = (\text{TDSO_E1_RERR} + \text{TDSO_E1_RD} + \text{TDSO_E1_RE} + \text{TDSO_E1_RO} + \text{TDSO_E1_RB} + \text{TDSO_E1_RFL}) \bmod 2^{24}$
TDSO_EN_RN	24	Counter for blank frames received as null frames. The mobile station shall set this field to the value of TDSO_EN_RN stored in the FFCH_BUFFER or FDCCH_BUFFER modulo 2^{24} . The base station shall set this field to the value of TDSO_EN_RN stored in the RFCH_BUFFER/RDCCH_BUFFER modulo 2^{24} .

Field	Length (bits)	Definition
TDSO_EN_RBAD	24	<p>Number of null data blocks received in error.</p> <p>The mobile station shall compute this value using counter values stored in the FFCH_BUFFER or FDCCH_BUFFER as follows: $TDSO_EN_RBAD = (TDSO_EN_RB + TDSO_EN_RO) \text{ mod } 2^{24}$.</p> <p>The base station shall compute this value using counter values stored in the RFCH_BUFFER or RDCCH_BUFFER as follows: $TDSO_EN_RBAD = (TDSO_EN_RB + TDSO_EN_RO) \text{ mod } 2^{24}$.</p>
TDSO_Ex_RBAD	24	<p>Number of bad overall data blocks.</p> <p>The mobile station shall compute this value using counter values stored in the FFCH_BUFFER or FDCCH_BUFFER as follows: $TDSO_Ex_RBAD = (TDSO_E1_RBAD + TDSO_EN_RB + TDSO_EN_RO) \text{ mod } 2^{24}$.</p> <p>The base station shall compute this value using counter values stored in the RFCH_BUFFER or RDCCH_BUFFER as follows: $TDSO_Ex_RBAD = (TDSO_E1_RBAD + TDSO_EN_RB + TDSO_EN_RO) \text{ mod } 2^{24}$.</p>

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1 3.8.1.4 Receive Expected Counters Response

2 When the mobile station or base station sends a Receive Expected Counters Response, it shall
3 include the following type-specific fields in *the Service Option Control Message*:

4 **Table 45. Type-specific fields in a *Service Option Control Message* corresponding to Receive**
5 **Expected Counters Response on FCH/DCCH**

Field	Length (bits)	Definition
CTL_REC_TYPE (<i>'00000101'</i> or <i>'00000110'</i>)	8	Control record type field. The mobile station shall set this field to <i>'00000101'</i> when responding to an FCH Control directive and <i>'00000110'</i> for DCCH.
VECT_COUNTER_ID (<i>'00000001'</i>)	8	Vector counter identification field. The mobile station shall set this field to <i>'00000001'</i> .
TDSO_E1_R1	24	Counter for Rate 1 frames received error-free. The mobile station shall set this field to the value of TDSO_E1_R1 stored in the FFCH_BUFFER or FDCCH_BUFFER, modulo 2^{24} . The base station shall set this field to the value of TDSO_E1_R1 stored in the RFCH_BUFFER or RDCCH_BUFFER, modulo 2^{24} .
TDSO_E1_RD	24	Counter for the number of dim-and-burst frames received given that the expected data block was Rate 1. The mobile station shall set this field to the value of TDSO_E1_RD stored in the FFCH_BUFFER or FDCCH_BUFFER, modulo 2^{24} . The base station shall set this field to the value of TDSO_E1_RD stored in the RFCH_BUFFER or RDCCH_BUFFER, modulo 2^{24} .
TDSO_E1_RO	24	Counter for the number of any other frames received (excluding dim-and-burst types) given that the expected data block was Rate 1. The mobile station shall set this field to the value of TDSO_E1_RO stored in the FFCH_BUFFER or FDCCH_BUFFER, modulo 2^{24} . The base station shall set this field to the value of TDSO_E1_RO stored in the RFCH_BUFFER or RDCCH_BUFFER, modulo 2^{24} .

Field	Length (bits)	Definition
TDSO_E1_RB	24	<p>Counter for the number of blank-and-burst frames received given that the expected data block was Rate 1.</p> <p>The mobile station shall set this field to the value of TDSO_E1_RB stored in the FFCH_BUFFER or FDCCH_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_E1_RB stored in the RFCH_BUFFER or RDCCH_BUFFER, modulo 2^{24}.</p>
TDSO_E1_RFL ¹	24	<p>Counter for the number of Rate 1 frames with bit errors received (a categorization only applicable with the Multiplex option²) given that the expected data block was Rate 1.</p> <p>The mobile station shall set this field to the value of TDSO_E1_RFL stored in the FFCH_BUFFER or FDCCH_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_E1_RFL stored in the RFCH_BUFFER or RDCCH_BUFFER, modulo 2^{24}.</p>
TDSO_E1_RE	24	<p>Counter for the number of frames received with Insufficient frame quality (erasure) given that the expected data block was Rate 1.</p> <p>The mobile station shall set this field to the value of TDSO_E1_RE stored in the FFCH_BUFFER or FDCCH_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_E1_RE stored in the RFCH_BUFFER or RDCCH_BUFFER, modulo 2^{24}.</p>
TDSO_E1_RERR	24	<p>Counter for the number of Rate 1 frames received with bit errors (detected by the TDSO) given that the expected data block was Rate 1.</p> <p>The mobile station shall set this field to the value of TDSO_E1_RERR stored in the FFCH_BUFFER or FDCCH_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_E1_RERR stored in the RFCH_BUFFER or RDCCH_BUFFER, modulo 2^{24}.</p>
TDSO_EN_RN	24	<p>Counter for the number of null frames received given that the expected data block was also null.</p> <p>The mobile station shall set this field to the value of TDSO_EN_RN stored in the FFCH_BUFFER or FDCCH_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_EN_RN stored in the RFCH_BUFFER or RDCCH_BUFFER, modulo 2^{24}.</p>

Field	Length (bits)	Definition
TDSO_EN_RB	24	<p>Counter for the number of blank frames received given that the expected data block was null.</p> <p>The mobile station shall set this field to the value of TDSO_EN_RB stored in the FFCH_BUFFER or FDCCH_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_EN_RB stored in the RFCH_BUFFER or RDCCH_BUFFER, modulo 2^{24}.</p>
TDSO_EN_RO	24	<p>Counter for the number of other categories of MuxPDU received given that the expected frame was null.</p> <p>The mobile station shall set this field to the value of TDSO_EN_RO stored in the FFCH_BUFFER or FDCCH_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_EN_RO stored in the RFCH_BUFFER or RDCCH_BUFFER, modulo 2^{24}.</p>

¹ The counter does not get incremented for Multiplex Option 2.

² This counter does not get incremented with Multiplex Option 2.

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3.8.1.5 Transmitted Counters Response

When the mobile station or base station sends a Transmitted Counters Response, it shall include the following type-specific fields in *the Service Option Control Message*:

Table 46. Type-specific fields in a *Service Option Control Message* corresponding to Transmitted Counters Response on FCH/DCCH

Field	Length (bits)	Definition
CTL_REC_TYPE (<i>'00000101'</i> or <i>'00000110'</i>)	8	Control record type field. The mobile station or base station shall set this field to <i>'00000101'</i> when responding to an FCH control directive and <i>'00000110'</i> for DCCH.
VECT_COUNTER_ID (<i>'00000010'</i>)	8	Vector counter identification field. The mobile station or base station shall set this field to <i>'00000010'</i> .
TDSO_E1_T1	24	Counter for Rate 1 frames transmitted with no dim-and-burst or blank-and-burst given that the generated data block was Rate 1. The mobile station shall set this field to the value of TDSO_E1_T1 stored in the RFCH_BUFFER or RDCCH_BUFFER, modulo 2^{24} . The base station shall set this field to the value of TDSO_E1_T1 stored in the FFCH_BUFFER or FDCCH_BUFFER, modulo 2^{24} .
TDSO_E1_TD	24	Counter for the number of dim-and-burst frames transmitted, given that the generated data block was Rate 1. The mobile station shall set this field to the value of TDSO_E1_TD stored in the RFCH_BUFFER or RDCCH_BUFFER, modulo 2^{24} . The base station shall set this field to the value of TDSO_E1_TD stored in the FFCH_BUFFER or FDCCH_BUFFER, modulo 2^{24} .
TDSO_E1_TB	24	Counter for the number of blank-and-burst frames transmitted, given that the generated data block was Rate 1. The mobile station shall set this field to the value of TDSO_E1_TB stored in the RFCH_BUFFER or RDCCH_BUFFER, modulo 2^{24} . The base station shall set this field to the value of TDSO_E1_TB stored in the FFCH_BUFFER or FDCCH_BUFFER, modulo 2^{24} .

Field	Length (bits)	Definition
TDSO_EB_TB	24	<p>Counter for the number of blank-and-burst frames transmitted, given that the generated data block was blank.</p> <p>The mobile station shall set this field to the value of TDSO_EB_TB stored in the RFCH_BUFFER or RDCCH_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_EB_TB stored in the FFCH_BUFFER or FDCCH_BUFFER, modulo 2^{24}.</p>
TDSO_EB_TO	24	<p>Counter for the number of other frame types transmitted, given that the generated data block was blank (basically, the counter for the event when the TDSO wants to transmit a blank and the multiplex sublayer also requests a blank frame for the particular frame period).</p> <p>The mobile station shall set this field to the value of TDSO_EB_TO stored in the RFCH_BUFFER or RDCCH_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_EB_TO stored in the FFCH_BUFFER or FDCCH_BUFFER, modulo 2^{24}.</p>

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2 3.8.1.6 5 ms Frame Transmitted Counters Response

3 When the mobile station sends a 5 ms Frame Transmitted Counters Response, it shall include the
4 following type-specific fields in the *Service Option Control Message*:

5 **Table 47. Type-specific fields in a *Service Option Control Message* corresponding to 5 ms**
6 **Frame Transmitted Counters Response on FCH/DCCH**

Field	Length (bits)	Definition
CTL_REC_TYPE (<i>'00000101'</i> or <i>'00000110'</i>)	8	<p>Control record type field.</p> <p>The mobile station or base station shall set this field to <i>'00000101'</i> when responding to an FCH control directive and <i>'00000110'</i> for DCCH.</p>
VECT_COUNTER_ID (<i>'00000011'</i>)	8	<p>Vector counter identification field.</p> <p>The mobile station shall set this field to <i>'00000011'</i>.</p>

Field	Length (bits)	Definition
TDSO_MUX1_5ms_T1	24	<p>Counter for 5 ms transmitted.</p> <p>If CTL_REC_TYPE is set to '00000101', the mobile station shall set this field to the value of MUX1_REV_FCH_5_ms (see [5]) stored in mobile station, modulo 2^{24}, at the ACTION_TIME specified by this <i>Service Option Control Message</i>.</p> <p>Otherwise, the mobile station shall set this field to the value of MUX1_REV_DCCH_5_ms (see [5]) stored in mobile station, modulo 2^{24}, at ACTION_TIME specified by this <i>Service Option Control Message</i>.</p>
TDSO_MUX2_5ms_T1	24	<p>Counter for 5 ms transmitted.</p> <p>If CTL_REC_TYPE is set to '00000101', the mobile station shall set this field to the value of MUX2_REV_FCH_5_ms (see [5]) stored in mobile station, modulo 2^{24}, at the ACTION_TIME specified by this <i>Service Option Control Message</i>.</p> <p>Otherwise, the mobile station shall set this field to the value of MUX2_REV_DCCH_5_ms (see [5]) stored in mobile station, modulo 2^{24}, at ACTION_TIME specified by this <i>Service Option Control Message</i>.</p>

1 3.8.1.7 5 ms Frame Received Counters Response

2 When the mobile station sends a 5 ms Frame Received Counters Response, it shall include the
 3 following type-specific fields in the *Service Option Control Message*:

4 **Table 48. Type-specific fields in a *Service Option Control Message* corresponding to 5 ms**
 5 **Frame Received Counters Response on FCH/DCCH**

Field	Length (bits)	Definition
CTL_REC_TYPE ('00000101' or '00000110')	8	<p>Control record type field.</p> <p>The mobile station or base station shall set this field to '00000101' when responding to an FCH control directive and '00000110' for DCCH.</p>
VECT_COUNTER_ID ('00000100')	8	<p>Vector counter identification field.</p> <p>The mobile station shall set this field to '00000100'.</p>

Field	Length (bits)	Definition
TDSO_MUX1_5ms_R 1	24	Counter for 5 ms received. If CTL_REC_TYPE is set to '00000101', the mobile station shall set this field to the value of MUX1_FOR_FCH_5_ms (see [5]) stored in mobile station, modulo 2^{24} , at the ACTION_TIME specified by this <i>Service Option Control Message</i> . Otherwise, the mobile station shall set this field to the value of MUX1_FOR_DCCH_5_ms (see [5]) stored in mobile station, modulo 2^{24} , at ACTION_TIME specified by this <i>Service Option Control Message</i> .
TDSO_MUX2_5ms_R 1	24	Counter for 5 ms received. If CTL_REC_TYPE is set to '00000101', the mobile station shall set this field to the value of MUX2_FOR_FCH_5_ms (see [5]) stored in mobile station, modulo 2^{24} , at the ACTION_TIME specified by this <i>Service Option Control Message</i> . Otherwise, the mobile station shall set this field to the value of MUX2_FOR_DCCH_5_ms (see [5]) stored in mobile station, modulo 2^{24} , at ACTION_TIME specified by this <i>Service Option Control Message</i> .

1 3.8.2 Counter responses on the Supplemental Channels

2 3.8.2.1 FER Counters Response

3 When the mobile station or base station sends an FER Counters Response, it shall include the
4 following type-specific fields in the *Service Option Control Message*:

5 **Table 49. Type-specific fields in a *Service Option Control Message* corresponding to FER**
6 **Counters Response on SCH(s)**

Field	Length (bits)	Definition
CTL_REC_TYPE (<i>'00000111'</i> - <i>'00001000'</i>)	8	Control record type field. The mobile station shall set this field to <i>'00000111'</i> or <i>'00001000'</i> , respectively, when responding to an SCH0 or SCH1 control directive.
VECT_COUNTER_I D (<i>'00000000'</i>)	8	Vector counter identification field. The mobile station or base station shall set this field to <i>'00000000'</i> .

Field	Length (bits)	Definition
TDSO_ENx_RNx	24	<p>Counter for Nx9.6 or Nx14.4 frames received error-free.</p> <p>The mobile station shall set this field to the value of TDSO_ENx_RNx stored in the FSCH0_BUFFER or FSCH1_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_ENx_RNx stored in the RSCH0_BUFFER or RSCH1_BUFFER, modulo 2^{24}.</p>
TDSO_ENx_RBAD	24	<p>Number of bad frames received instead of Nx9.6 or Nx14.4 frames.</p> <p>The mobile station shall compute this value using counter values stored in the FSCH0_BUFFER or FSCH1_BUFFER as follows: $TDSO_ENx_RBAD = (TDSO_ENx_RERR + TDSO_ENx_RE + TDSO_ENx_RB) \bmod 2^{24}$.</p> <p>The base station shall compute this value using counter values stored in the RSCH0_BUFFER or RSCH1_BUFFER as follows: $TDSO_ENx_RBAD = (TDSO_ENx_RERR + TDSO_ENx_RE + TDSO_ENx_RB) \bmod 2^{24}$.</p>
TDSO_EB_RB	24	<p>Counter for blank frames received as blank frames.</p> <p>The mobile station shall set this field to the value of TDSO_EB_RB stored in the FSCH0_BUFFER or FSCH1_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_EB_RB stored in the RSCH0_BUFFER or RSCH1_BUFFER, modulo 2^{24}.</p>
TDSO_EB_RBAD	24	<p>Number of bad frames received instead of blank frames.</p> <p>The mobile station shall compute this value using counter values stored in the FSCH0_BUFFER or FSCH1_BUFFER as follows: $TDSO_EB_RBAD = (TDSO_EB_RO) \bmod 2^{24}$.</p> <p>The base station shall compute this value using counter values stored in the RSCH0_BUFFER or RSCH1_BUFFER as follows: $TDSO_EB_RBAD = (TDSO_EB_RO) \bmod 2^{24}$.</p>

Field	Length (bits)	Definition
TDSO_Ex_RBAD	24	<p>Number of bad overall frames.</p> <p>The mobile station shall compute this value using counter values stored in the FSCH0_BUFFER or FSCH1_BUFFER as follows: $TDSO_E1_RBAD = (TDSO_ENx_RBAD + TDSO_EB_RO) \text{ mod } 2^{24}$.</p> <p>The base station shall compute this value using counter values stored in the RSCH0_BUFFER or RSCH1_BUFFER as follows: $TDSO_E1_RBAD = (TDSO_ENx_RBAD + TDSO_EB_RO) \text{ mod } 2^{24}$.</p>

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2 3.8.2.2 PER Counters Response

3 When the mobile station or base station sends a PER Counters Response, it shall include the
4 following type-specific fields in *the Service Option Control Message*:

5 **Table 50. Type-specific fields in a *Service Option Control Message* corresponding to PER**
6 **Counters response on SCH(s)**

Field	Length (bits)	Definition
CTL_REC_TYPE (<i>'00000111'</i> or <i>'00001000'</i>)	8	<p>Control record type field.</p> <p>The mobile station shall set this field to <i>'00000111'</i> or <i>'00001000'</i>, respectively, when responding to an SCH0 or SCH1 control directive.</p>
VECT_COUNTER_ID (<i>'00000001'</i>)	8	<p>Vector counter identification field.</p> <p>The mobile station shall set this field to <i>'00000001'</i>.</p>
TDSO_E3_R3	24	<p>Counter for Rate 3 frames received error-free.</p> <p>The mobile station shall set this field to the value of TDSO_E3_R3 stored in the FSCH0_BUFFER or FSCH1_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_E3_R3 stored in the RSCH0_BUFFER or RSCH1_BUFFER, modulo 2^{24}.</p>

Field	Length (bits)	Definition
TDSO_E3_RERR	24	<p>Counter for Rate 3 frames received with errors detected by the TDSO.</p> <p>The mobile station shall set this field to the value of TDSO_E3_RERR stored in the FSCH0_BUFFER or FSCH1_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_E3_RERR stored in the RSCH0_BUFFER or RSCH1_BUFFER, modulo 2^{24}.</p>
TDSO_E3_RE	24	<p>Counter for expected Rate 3 frames received as erasures.</p> <p>The mobile station shall set this field to the value of TDSO_E3_RE stored in the FSCH0_BUFFER or FSCH1_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_E3_RE stored in the RSCH0_BUFFER or RSCH1_BUFFER, modulo 2^{24}.</p>
TDSO_E2_R2	24	<p>Counter for Rate 2 frames received error-free.</p> <p>The mobile station shall set this field to the value of TDSO_E2_R2 stored in the FSCH0_BUFFER or FSCH1_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_E2_R2 stored in the RSCH0_BUFFER or RSCH1_BUFFER, modulo 2^{24}.</p>
TDSO_E2_RERR	24	<p>Counter for Rate 2 frames received with errors detected by the TDSO.</p> <p>The mobile station shall set this field to the value of TDSO_E2_RERR stored in the FSCH0_BUFFER or FSCH1_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_E2_RERR stored in the RSCH0_BUFFER or RSCH1_BUFFER, modulo 2^{24}.</p>
TDSO_E2_RE	24	<p>Counter for expected Rate 2 frames received as erasures.</p> <p>The mobile station shall set this field to the value of TDSO_E2_RE stored in the FSCH0_BUFFER or FSCH1_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_E2_RE stored in the RSCH0_BUFFER or RSCH1_BUFFER, modulo 2^{24}.</p>

Field	Length (bits)	Definition
TDSO_E1a_R1a	24	<p>Counter for Rate 1a frames received error-free.</p> <p>The mobile station shall set this field to the value of TDSO_E1a_R1a stored in the FSCH0_BUFFER or FSCH1_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_E1a_R1a stored in the RSCH0_BUFFER or RSCH1_BUFFER, modulo 2^{24}.</p>
TDSO_E1a_RERR	24	<p>Counter for Rate 1a frames received with errors detected by the TDSO.</p> <p>The mobile station shall set this field to the value of TDSO_E1a_RERR stored in the FSCH0_BUFFER or FSCH1_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_E1a_RERR stored in the RSCH0_BUFFER or RSCH1_BUFFER, modulo 2^{24}.</p>
TDSO_E1a_RE	24	<p>Counter for expected Rate 1a frames received as erasures.</p> <p>The mobile station shall set this field to the value of TDSO_E1a_RE stored in the FSCH0_BUFFER or FSCH1_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_E1a_RE stored in the RSCH0_BUFFER or RSCH1_BUFFER, modulo 2^{24}.</p>
TDSO_E1b_R1b	24	<p>Counter for Rate 1b frames received error-free.</p> <p>The mobile station shall set this field to the value of TDSO_E1b_R1b stored in the FSCH0_BUFFER or FSCH1_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_E1b_R1b stored in the RSCH0_BUFFER or RSCH1_BUFFER, modulo 2^{24}.</p>
TDSO_E1b_RERR	24	<p>Counter for Rate 1b frames received with errors detected by the TDSO.</p> <p>The mobile station shall set this field to the value of TDSO_E1b_RERR stored in the FSCH0_BUFFER or FSCH1_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_E1b_RERR stored in the RSCH0_BUFFER or RSCH1_BUFFER, modulo 2^{24}.</p>

Field	Length (bits)	Definition
TDSO_E1b_RE	24	<p>Counter for expected Rate 1b frames received as erasures.</p> <p>The mobile station shall set this field to the value of TDSO_E1b_RE stored in the FSCH0_BUFFER or FSCH1_BUFFER, modulo 2^{24}.</p> <p>The base station shall set this field to the value of TDSO_E1b_RE stored in the RSCH0_BUFFER or RSCH1_BUFFER, modulo 2^{24}.</p>

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1 3.8.2.3 Transmitted Counters Response

2 When the mobile station or base station sends a Transmitted Counters Response, it shall include
3 the following type-specific fields in the *Service Option Control Message*:

4 **Table 51. Type-specific fields in a *Service Option Control Message* corresponding to**
5 **Transmitted Counters response on SCH(s)**

Field	Length (bits)	Definition
CTL_REC_TYPE (<i>'00000111'</i> or <i>'00001000'</i>)	8	Control record type field. The mobile station shall set this field to <i>'00000111'</i> or <i>'00001000'</i> , respectively, when responding to an SCH0 or SCH1 control directive.
VECT_COUNTER_ID (<i>'00000010'</i>)	8	Vector counter identification field. The mobile station shall set this field to <i>'00000010'</i> .
TDSO_ENx_TNx	24	Counter for Rate Nx9.6 or Rate Nx14.4 frames transmitted with no blank command from the multiplex sublayer. The mobile station shall set this field to the value of TDSO_ENx_TNx stored in the RSCH0_BUFFER or RSCH1_BUFFER, modulo 2^{24} .
TDSO_ENx_TB	24	Counter for the number of blank frames transmitted given that the generated frame was Rate Nx9.6 or Rate Nx14.4. The mobile station shall set this field to the value of TDSO_ENx_TB stored in the RSCH0_BUFFER or RSCH1_BUFFER, modulo 2^{24} .
TDSO_EB_TB	24	Counter for the number of blank frames transmitted, given that the generated frame was blank. The mobile station shall set this field to the value of TDSO_EB_TB stored in the RSCH0_BUFFER or RSCH1_BUFFER, modulo 2^{24} .
TDSO_EB_TO	24	Counter for the number of other frame types transmitted given that the generated frame was blank (basically, the counter for the event when the TDSO wants to transmit a blank and the multiplex sublayer also requests a blank frame for the particular frame period). The mobile station shall set this field to the value of TDSO_EB_TO stored in the RSCH0_BUFFER or RSCH1_BUFFER, modulo 2^{24} .

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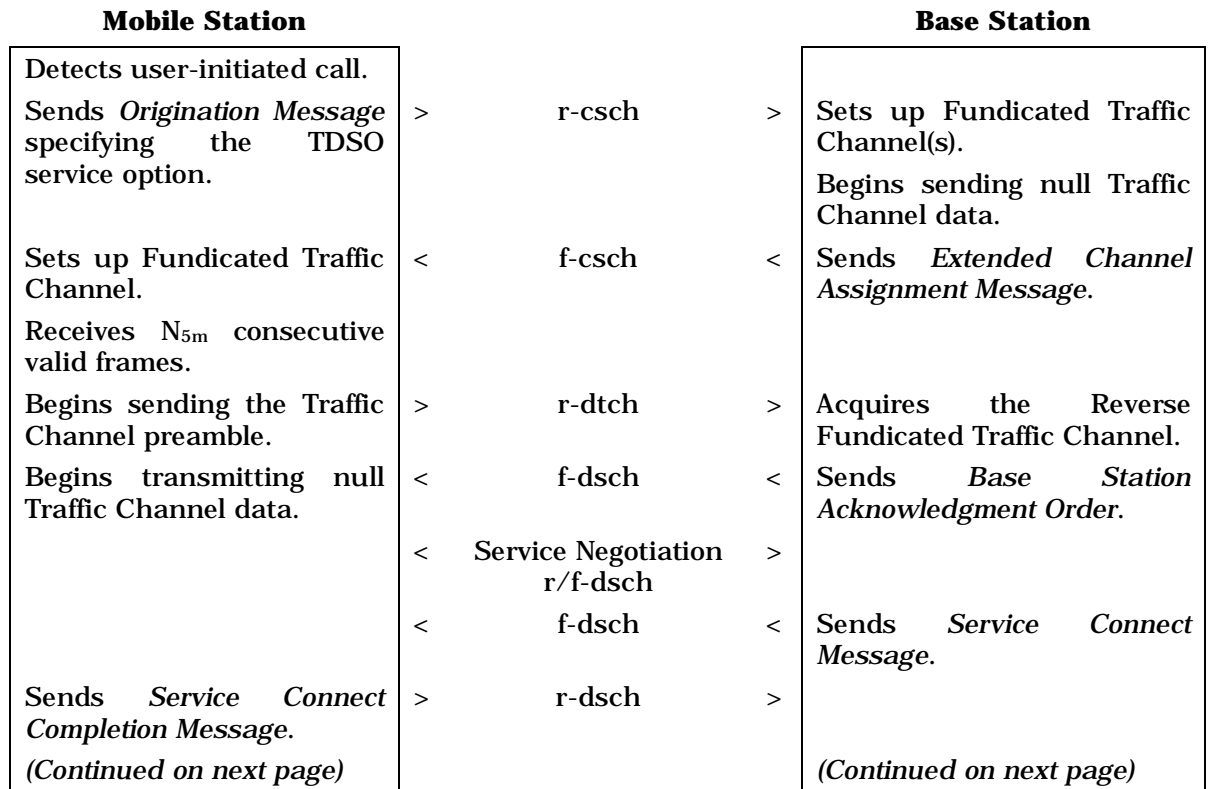
- 1 No text.

1 ANNEX A TDSO Call Flow Examples (for a system operating in MC-41 mode)

2 This annex contains examples of TDSO call flows using service negotiation. Figure 5 to Figure 9
 3 use the following convention:

- 4 • All messages are received without error.
- 5 • Acknowledgments are not shown.

6



7 **Figure 5. Mobile station origination example with transmission on DCCH/FCH/SCH (part 1**
 8 **of 2)**

9

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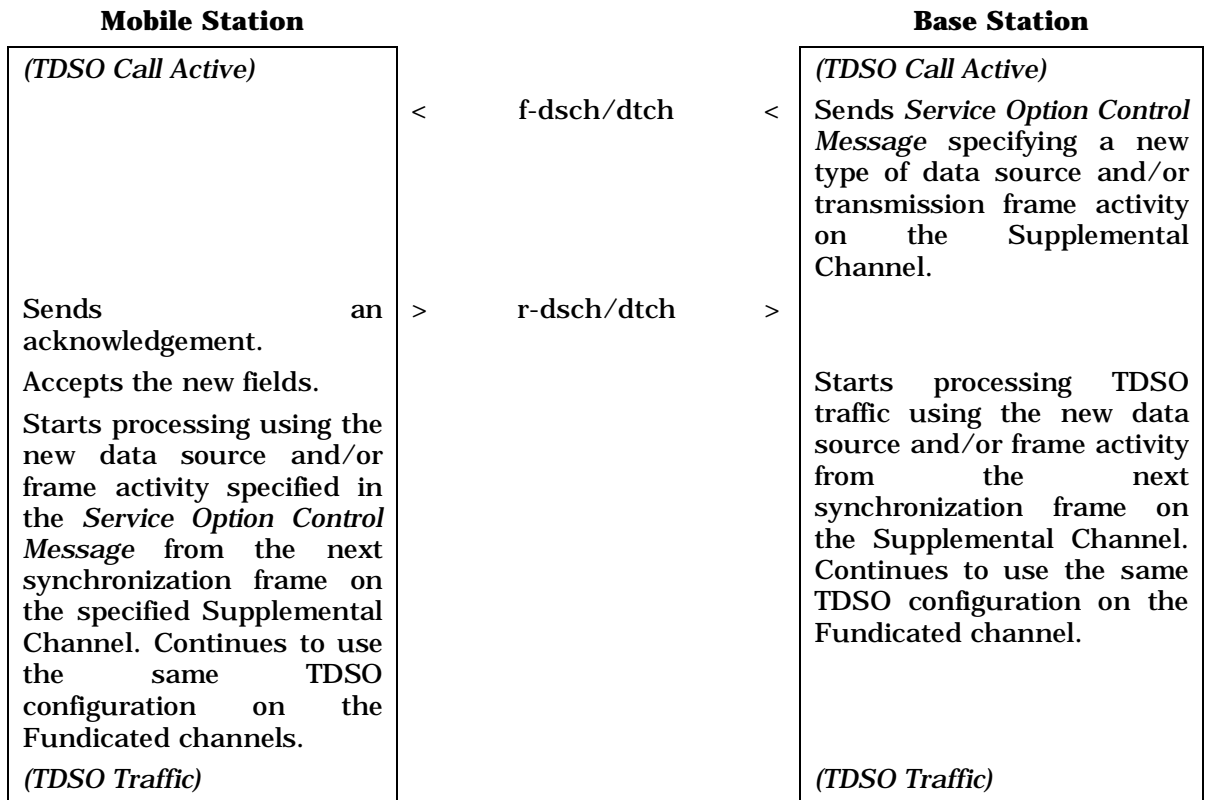
Mobile Station		Base Station
<p>Enters the <i>Conversation Substate</i>, and connects the TDSO service option at the action time specified in the <i>Service Connect Message</i>. Generates Rate 1 frames (by default all 1s) from the time of service option connection to the frame prior to the first synchronization frame. At the first synchronization frame, resynchronizes the TDSO.</p>	< dsch/dtch >	<p>Connects and initializes the TDSO service option following the action time specified in the <i>Service Connect Message</i>.</p>
<p>Sends <i>Supplemental Channel Request Message</i> and continues transmitting on the Reverse Traffic Channel.</p>	> r-dsch >	
	< f-dsch/f-dtch >	<p>Allocates Supplemental Channel(s) through ESCAM, FSCAMM, RSCAMM, or UHDM.</p>
<p>Connects the TDSO at the action time specified in the SCH allocation message. Generates Rate 1 frames (by default all 1s) from the time of service option connection to the frame prior to the first synchronization frame. At the first synchronization frame resynchronizes the TDSO. Continues transmitting on the Reverse Fundicated Channels.</p>	< dsch/dtch >	<p>Connects and initializes the TDSO service option following the action time specified in the ESCAM, FSCAMM, RSCAMM, or UHDM. Continues transmission on the Forward Fundicated Channels.</p>
<i>(TDSO Traffic)</i>		<i>(TDSO Traffic)</i>

2

3 **Figure 6. Mobile station origination example with transmission on DCCH/FCH/SCH (part 2**
 4 **of 2)**

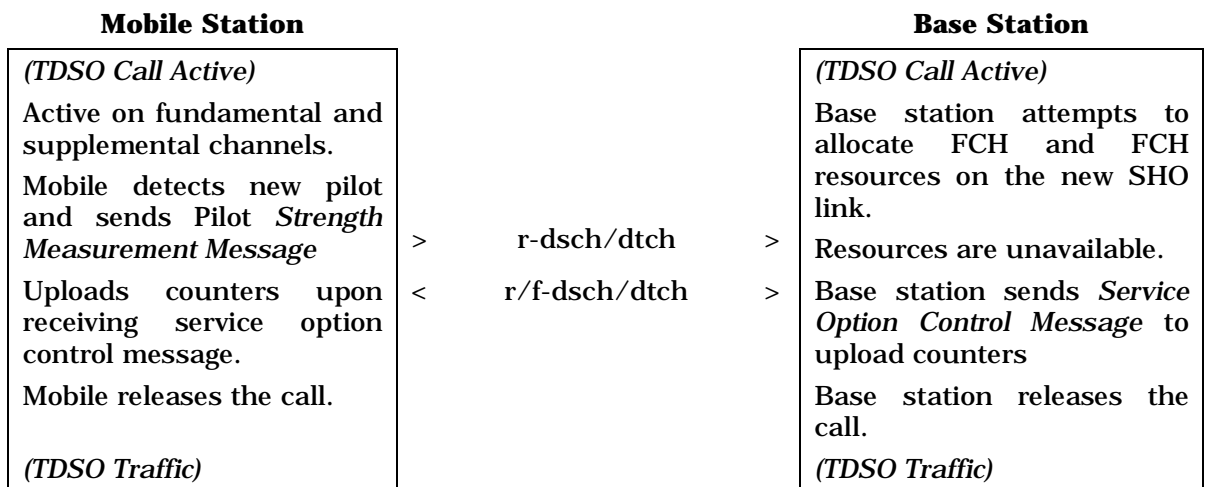
5

1



2

Figure 7. Base station commanded test parameters change



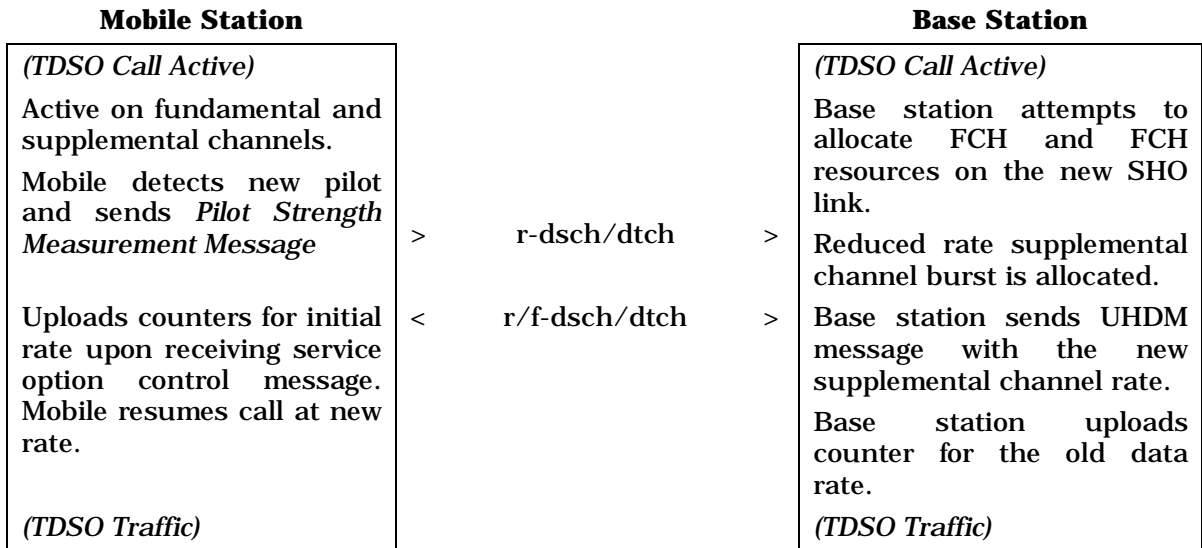
3

Figure 8. Soft handoff: resources not available.

4

5

1



2

Figure 9. Soft handoff: reduced rate available.

3

1 No text.

1 ANNEX B TDSO Operation Examples

2 B.1 A TDSO scenario

3 This annex provides two examples of TDSO test scenarios. Assume the following:

- 4 • The TDSO is configured to carry primary traffic over the FCH in both forward and reverse
5 directions and on SCH0 in only the forward direction.
- 6 • The mobile station and base station are configured to support the RC3 configuration for the
7 test setup.
- 8 • The TDSO is passing pseudo-randomly generated data blocks to the mux sublayer per
9 Multiplex Option 0x01 on the FCH (that is, one MuxPDU Type 1 data block can be passed
10 to the multiplex sublayer every 20 ms).
- 11 • SCH0 is configured for 20 ms frame length, has been allocated to support 19.2 kbps, and
12 carries TDSO-generated pseudo-random data bits per Multiplex Option 0x809 format (that
13 is, two single-sized MuxPDU Type 3 data blocks can be supplied to the multiplex sublayer
14 every 20 ms).
- 15 • p is equal to 0.7 and q is equal to 0.3. Then, $D = q/(p+q) = 0.3$, $B = 1/p \approx 1.4$,
16 $OFF_THRESHOLD = ROUND(16777215 * p) = 11744051$ and $ON_THRESHOLD =$
17 $ROUND(16777215 * q) = 5033164$.
- 18 • The TDSO option has been running for some time and, at the first synchronization frame
19 after the TDSO was initialized (corresponding to the action time associated with the *Service*
20 *Connect Message*), the 31_BIT_PN_NUM, which supplies the 24_BIT_PN_NUM to drive the
21 TDSO_STATE transitions (see 3.7.5), was initialized and iterated as illustrated in Figure 4
22 once every frame period after that. Assume the 31_BIT_PN_NUM has a current value equal
23 to 0x682dff0c and the current Markov chain is in the "Off" state.

24

1 B.2 Fundamental Channel TDSO process

2 Assume that in this stated mode the TDSO is about to transmit frame number 0xab89efad on the
 3 Forward Fundamental Traffic Channel (F-FCH) to a mobile station with the least-significant 32 bits
 4 of Public Long-Code Mask (PLCM) equal to 0x9F000307. Since the least significant 9 bits of
 5 (0xab89efad xor 0x2aaaaaaaa) equal 0x107, and the least significant 9 bits of the PLCM are 0x0107,
 6 it is time to resynchronize the F-FCH TDSO process. The pseudo-random number generator
 7 associated with F-FCH is initialized with F-FRNG (FRNG for the Forward Fundamental Channel)
 8 set equal to the 31 least-significant bits of (0xab89efad xor 0x2aaaaaaaa) = 0x01234507 as follows
 9 (see 3.7.2.1):

11	01234507	(F-FRNG: starting value for the Synchronization Frame)
12	3288cf26	(F-FRNG: 1st iteration)
13	33d7e1b5	(F-FRNG: 2nd iteration)
14	22234caa	(F-FRNG: 3rd iteration)
15	3b7e3e68	(F-FRNG: 4th iteration)

16
 17 After reinitialization, the Forward Fundamental Traffic Channel TDSO service option would
 18 compute $y_n(1) = \text{FRNG}/128 = 0x3b7e3e68/128 = 0x76fc7c$. The least-significant 6 bits of $y_n(1)$, O_n ,
 19 is equal to 0x3c, or 60. $O_n \bmod B(n)$ (see Table 29) for the values of $B(n)$, for RC3 $B(n) = 45$
 20 determines the byte offset in the circular buffer (where to begin copying data bits into blocks for
 21 the multiplex sublayer).

22 For the synchronization frame, the offset is taken with respect to the first-generated byte in the
 23 circular buffer; whereas for subsequent System Time frames, the byte address next to that of the
 24 last-packed byte from the previous frame serves as the reference. The TDSO always advances this
 25 pointer in the circular buffer according to the value of O_n , irrespective of whether any data bits
 26 were actually passed to the multiplex sublayer during that frame period as determined by the
 27 value of 24_BIT_PN_NUM.

28 For the F-FCH, the TDSO generates 45 bytes (two TDSO frames) through random number
 29 iterations. These bytes are put together, starting with the same 24-bit number that was used to
 30 determine the offset.

32	F-FRNG = 0x3b7e3e68,	$y_n(1) = 0x76fc7c$
33	F-FRNG = 0x5d333c5b,	$y_n(2) = 0xba6678$
34	F-FRNG = 0x4ebfaa2a,	$y_n(3) = 0x9d7f54$
35	F-FRNG = 0x093cd3ca,	$y_n(4) = 0x1279a7$
36	F-FRNG = 0x78747782,	$y_n(5) = 0xf0e8ef$
37	F-FRNG = 0x26523596,	$y_n(6) = 0x4ca46b$

1 F-FRNG = 0x5f3c1e81, $y_n(7) = 0xbe783d$
2 F-FRNG = 0x63f6d7ff, $y_n(8) = 0xc7edaf$
3 F-FRNG = 0x62ded99e, $y_n(9) = 0xc5bdb3$
4 F-FRNG = 0x14a146c8, $y_n(10) = 0x29428d$
5 F-FRNG = 0x682dff0c, $y_n(11) = 0xd05bfe$
6 F-FRNG = 0x23c3a243, $y_n(12) = 0x478744$
7 F-FRNG = 0x00d1ef0d, $y_n(13) = 0x01a3de$
8 F-FRNG = 0x56a53ee6, $y_n(14) = 0xad4a7d$
9 F-FRNG = 0x7ac49a7a, $y_n(15) = 0xf58934$

10
11 Each 24-bit number $y_n(k)$ is written to the frame buffer in little-endian fashion. So 0x76fc7c
12 becomes the byte stream 0x7c 0xfc 0x76. The little-endian version of the next 24-bit number,
13 0xba6678, is written immediately after the first number.

14 The circular buffer to be used to generate data blocks for the F-FCH for the next 512 frames is
15 thus organized as follows:

16
17 →7c fc 76 78 66 ba 54 7f 9d a7 79 12 ef e8 f0 6b a4 4c 3d 78 be af ed c7 b3 bd c5 8d 42 29
18 fe 5b d0 44 87 47 de a3 01 7d 4a ad 34 89 f5→

19
20 Following the procedure outlined in Figure 4, the new pseudo-random number generator is as
21 follows, assuming the current value of the PN generator for the TDSO state model is 0x682dff0c:

22 31_BIT_PN_NUM = (0x682dff0c * a) mod m = 0x23c3a243

23 24_BIT_PN_NUM = 31_BIT_PN_NUM >> 7 = 0x478744 = 4687684

24 As the value of 24_BIT_PN_NUM is less than the ON_THRESHOLD, the TDSO_STATE turns to ON
25 and, therefore, TDSO shall pass a Rate 1 frame to the multiplex sublayer during the current frame
26 period.

27 The starting offset for the first frame in the 512-frame segment is given by $O_n \bmod B(n)$, which, in
28 this case, is $60 \bmod 45 = 15$. Therefore, the TDSO will generate a Rate 1 (171-bit) frame that can
29 be supplied to the mux sublayer. The frame will be comprised of 21 octets from the circular buffer
30 beginning at the 15th byte offset in the circular buffer followed by 3 zero bits as shown:

31
32 6b a4 4c 3d 78 be af ed c7 b3 bd c5 8d 42 29 fe 5b d0 44 87 47 '000'

33

1 Since this frame is to be carried over the Fundamental Channel, the first 5 bits of the first octet are
 2 replaced by '00000', the CHANNEL_ID code, and PDU_SEQ_NUM for the FCH as shown in Table 30
 3 and Table 31. Therefore, the final data block passed to the multiplex sublayer is as follows:

4
 5 03 a4 4c 3d 78 be af ed c7 b3 bd c5 8d 42 29 fe 5b d0 44 87 47 '000'

6
 7 For the next TDSO frame, the pseudo-random numbers $y_n(1)$ is as follows:

8 F-FRNG $y_n(1)$

9 0x0179fe8e 0x02f3fd

10 Following the procedure outlined in Figure 4, the new pseudo-random number generator is as
 11 follows:

12
 13 $31_BIT_PN_NUM = (0x23c3a243 * a) \bmod m = 0x00d1ef0d$

14 $24_BIT_PN_NUM = 31_BIT_PN_NUM \gg 7 = 0x1a3de = 107486$

15
 16 As the value of 24_BIT_PN_NUM is less than the ON_THRESHOLD, the TDSO_STATE turns to ON
 17 and, therefore, TDSO shall pass a Rate 1 frame to the multiplex sublayer during the current frame
 18 period.

19 The 6 least-significant bits of $y_n(1)$, O_n , is $0x3d = 61$. $O_n \bmod 45 = 16$ is used to indicate the byte
 20 offset in the circular buffer. The offset is taken with respect to the byte address next to the last
 21 packed byte from the frame generated in the previous 20 ms period, that is, with respect to the
 22 byte 0xde in the buffer.

23 The TDSO service option will generate and supply a Rate 1 frame using 21 octets from the circular
 24 buffer followed by 3 zero bits. The complete data block looks like the following:

25
 26 7f 9d a7 79 12 ef e8 f0 6b a4 4c 3d 78 be af ed c7 b3 bd c5 8d '000'

27
 28 After replacing the first 5 bits with '00000' corresponding to the data block header for FCH, the
 29 data block supplied to the multiplex sublayer, as a data block, is as follows:

30
 31 07 9d a7 79 12 ef e8 f0 6b a4 4c 3d 78 be af ed c7 b3 bd c5 8d '000'

32
 33 The byte offset pointer advances to the byte immediately after 0x8d, that is, 42 for the next frame.

34 A while later, frame number 0xab89f052 is about to be generated for the Reverse Fundamental
 35 Traffic Channel. Since the least-significant nine bits of $(0xab89f052 \text{ xor } 0x55555555)$ equal 0x107,

1 and the least-significant nine bits of the PLCM are 0x0107, it is time to resynchronize the Reverse
 2 Traffic Channel TDSO process. The associated pseudo-random number generator is initialized with
 3 F-RRNG set equal to the 31 least-significant bits of (0xab89f052 xor 0x55555555) = 0x7edca507 as
 4 follows (see 3.7.2.1):

5
 6 7edca507 (F-RRNG starting value for the Synchronization Frame)
 7 47d6afa2 (F-RRNG: 1st iteration)
 8 5fa4d986 (F-RRNG: 2nd iteration)
 9 3fc51d78 (F-RRNG: 3rd iteration)
 10 2611d1fd (F-RRNG: 4th iteration)

11
 12 The Reverse Fundamental Traffic Channel TDSO first computes $y_n(1) = \text{RRNG}/128 =$
 13 $0x2611d1fd/128 = 0x4c23a3$. For the R-FCH, the TDSO generates 45 bytes (two TDSO frames)
 14 through random number iterations. These bytes are put together, starting with the same 24-bit
 15 number that was used to determine the offset above.

16
 17 F-RRNG = 0x2611d1fd, $y_n(1) = 0x4c23a3$
 18 F-RRNG = 0x5bf14c91, $y_n(2) = 0xb7e299$
 19 F-RRNG = 0x3ed9f2bf, $y_n(3) = 0x7db3e5$
 20 F-RRNG = 0x56cff9d5, $y_n(4) = 0xad9ff3$
 21 F-RRNG = 0x701b3b79, $y_n(5) = 0xe03676$
 22 F-RRNG = 0x0bddbe6f, $y_n(6) = 0x17bb7c$
 23 F-RRNG = 0x0b016f7f, $y_n(7) = 0x1602de$
 24 F-RRNG = 0x0b3f007e, $y_n(8) = 0x167e00$
 25 F-RRNG = 0x553955f6, $y_n(9) = 0xaa72ab$
 26 F-RRNG = 0x273ab530, $y_n(10) = 0x4e756a$
 27 F-RRNG = 0x7f4d766e, $y_n(11) = 0xfe9aec$
 28 F-RRNG = 0x369a710d, $y_n(12) = 0x6d34e2$
 29 F-RRNG = 0x5574287c, $y_n(13) = 0xaae850$
 30 F-RRNG = 0x3d0e10b8, $y_n(14) = 0x7a1c21$
 31 F-RRNG = 0x666bbf58, $y_n(15) = 0xccd77e$

32
 33 The circular buffer to be used to generate data blocks for the R-FCH for the next 512 frames is
 34 thus organized as follows:

1
 2 →a3 23 4c 99 e2 b7 e5 b3 7d f3 9f ad 76 36 e0 7c bb 17 de 02 16 00 7e 16 ab 72 aa 6a 75
 3 4e ec 9a fe e2 34 6d 50 e8 aa 21 1c 7a 7e d7 cc→
 4

5 The 31_BIT_PN_NUM has gone through 164 iterations since the synchronization time for the
 6 Forward Traffic Channel was reached. The current value of the 32_BIT_PN_NUM = 0x4de9620.

7 Following the procedure outlined in Figure 4, the new pseudo-random number generator is as
 8 follows, assuming the current value of the PN generator for the TDSO state model is 0x4de9620:

$$9$$

$$10 \quad 31_BIT_PN_NUM = (0x4de9620 * a) \bmod m = 0x3152115f$$

$$11 \quad 24_BIT_PN_NUM = 31_BIT_PN_NUM \gg 7 = 0x62a422 = 6464546$$

12
 13 As the value of 24_BIT_PN_NUM is greater than the ON_THRESHOLD, the TDSO_STATE stays in OFF
 14 and, therefore, TDSO shall pass a blank data block (0 bits) to the multiplex sublayer during the
 15 current frame period.

16 The starting offset for the first frame in the 512-frame segment is given by the 6 least-significant
 17 bits of $y_n(1)$, $O_n \bmod B(n)$, which in this case is equal to $0x23 \bmod 45$ or 19.

18 Even though no frame shall be built in this frame period, the pointer associated with the starting
 19 offset for the next frame shall be incremented by 19, that is, the reference byte address for the next
 20 frame in the circular buffer is that of byte 02 in the buffer.

21 For the next TDSO frame, the pseudo-random numbers $y_n(1)$ is as follows:

$$22$$

$$23 \quad \text{F-RRNG} \quad y_n(1)$$

$$24 \quad 0x2bdf5ef0 \quad 0x57bebd$$

25
 26 Following the procedure outlined in Figure 4, the new pseudo-random number generator is as
 27 follows:

$$28$$

$$29 \quad 31_BIT_PN_NUM = (0x3152115f * a) \bmod m = 0x2f28d45$$

$$30 \quad 24_BIT_PN_NUM = 31_BIT_PN_NUM \gg 7 = 0x5e51a = 386330$$

31
 32 As the value of 24_BIT_PN_NUM is less than the ON_THRESHOLD, the TDSO_STATE turns to ON,
 33 therefore, it shall pass a Rate 1 frame to the multiplex sublayer during the current frame period.

1 The 6 least-significant bits of $y_n(1)$, O_n , is $0x3d = 61$. $O_n \bmod 45 = 16$ is used to indicate the byte
2 offset in the circular buffer. The offset is taken with respect to the byte address of byte 02 in the
3 buffer as stored in the previous frame.

4 The TDSO service option will generate and supply a Rate 1 frame using 21 octets from the circular
5 buffer followed by 3 zero bits. The packet derived from the circular buffer thus looks like this:

6
7 6d 50 e8 aa 21 1c 7a 7e d7 cc a3 23 4c 99 e2 b7 e5 b3 7d f3 '000'

8
9 However, the first 5 bits are to be replaced by '00000' for the FCH. Therefore, the data block
10 supplied to the mux sublayer is:

11
12 09 50 e8 aa 21 1c 7a 7e d7 cc a3 23 4c 99 e2 b7 e5 b3 7d f3 '000'

13
14 The reference byte address for the next frame in the circular buffer is that of byte 9f in the buffer.
15

1 B.3 Supplemental Channel TDSO process

2 Assume that in this stated mode the TDSO is about to transmit frame number 0xab89efad on the
 3 Forward Supplemental Channel (F-SCH0) to a mobile station with the least-significant 32 bits of
 4 PLCM equal to 0x9F000307. Since the least-significant nine bits of (0xab89efad xor 0x2aaaaaaa)
 5 equal 0x107, and the least significant nine bits of the PLCM are 0x0107, it is time to resynchronize
 6 the F-SCH0 TDSO process. The pseudo-random number generator associated with F-SCH0 is
 7 initialized with S-FRNG0 (FRNG for the Forward Supplemental Channel 0) set equal to the 31
 8 least-significant bits of (0xab89efad xor 0x2aaaaaaa) = 0x01234507 as follows (see 3.7.2.1):

9
 10 01234507 (S-FRNG0: starting value for the Synchronization Frame)
 11 3288cf26 (S-FRNG0: 1st iteration)
 12 33d7e1b5 (S-FRNG0: 2nd iteration)
 13 22234caa (S-FRNG0: 3rd iteration)
 14 3b7e3e68 (S-FRNG0: 4th iteration)

15
 16 After reinitialization, the Forward Supplemental Channel TDSO service option would compute $y_n(1)$
 17 = $FRNG/128 = 0x3b7e3e68/128 = 0x76fc7c$. The least-significant 6 bits of $y_n(1)$, O_n , is equal to
 18 0x3c, or 60. $O_n \bmod B(n)$ (see Table 29) for the values of $B(n)$, for RC3 $B(n) = 762$ determines the
 19 byte offset in the circular buffer from where to begin copying data bits into blocks for the multiplex
 20 sublayer.

21 For the synchronization frame, the offset is taken with respect to the first-generated byte in the
 22 circular buffer; whereas for subsequent System Time frames, the byte address next to that of the
 23 last-packed byte from the previous frame serves as the reference. The TDSO always advances this
 24 pointer in the circular buffer according to the value of $O_n \bmod B(n)$, irrespective of whether any
 25 data bits were actually passed to the multiplex sublayer during that frame period as determined by
 26 the value of 24_BIT_PN_NUM.

27 For the F-SCH0, the TDSO generates 762 bytes (two full-rate RC3 frames) through random
 28 number iterations. These bytes are put together, starting with the same 24-bit number that was
 29 used to determine the offset.

30
 31 S-FRNG0 = 0x3b7e3e68, $y_n(1) = 0x76fc7c$
 32 S-FRNG0 = 0x5d333c5b, $y_n(2) = 0xba6678$
 33 S-FRNG0 = 0x4ebfaa2a, $y_n(3) = 0x9d7f54$
 34 S-FRNG0 = 0x93cd3ca, $y_n(4) = 0x1279a7$
 35 S-FRNG0 = 0x78747782, $y_n(5) = 0xf0e8ef$
 36 S-FRNG0 = 0x26523596, $y_n(6) = 0x4ca46b$
 37 S-FRNG0 = 0x5f3c1e81, $y_n(7) = 0xbe783d$

1 S-FRNG0 = 0x63f6d7ff, $y_n(8) = 0xc7edaf$
 2 S-FRNG0 = 0x62ded99e, $y_n(9) = 0xc5bdb3$
 3 S-FRNG0 = 0x14a146c8, $y_n(10) = 0x29428d$
 4 S-FRNG0 = 0x682dff0c, $y_n(11) = 0xd05bfe$
 5 S-FRNG0 = 0x23c3a243, $y_n(12) = 0x478744$
 6 S-FRNG0 = 0xd1ef0d, $y_n(13) = 0x1a3de$
 7 S-FRNG0 = 0x56a53ee6, $y_n(14) = 0xad4a7d$
 8 S-FRNG0 = 0x7ac49a7a, $y_n(15) = 0xf58934$
 9 S-FRNG0 = 0x179fe8e, $y_n(16) = 0x2f3fd$
 10 S-FRNG0 = 0x70371d63, $y_n(17) = 0xe06e3a$
 11 S-FRNG0 = 0x326a8823, $y_n(18) = 0x64d510$
 12 S-FRNG0 = 0x700fcb0, $y_n(19) = 0xe01f97$
 13 S-FRNG0 = 0x1d05c94a, $y_n(20) = 0x3a0b92$
 14 S-FRNG0 = 0x66e22828, $y_n(21) = 0xcdc450$
 15 S-FRNG0 = 0x9ba8edd, $y_n(22) = 0x13751d$
 16 S-FRNG0 = 0x36f95428, $y_n(23) = 0x6df2a8$
 17 S-FRNG0 = 0x2b042a4a, $y_n(24) = 0x560854$
 18 S-FRNG0 = 0x1e747656, $y_n(25) = 0x3ce8ec$
 19 S-FRNG0 = 0x700517b8, $y_n(26) = 0xe00a2f$
 20 S-FRNG0 = 0x5e586a7c, $y_n(27) = 0xbcb0d4$
 21 S-FRNG0 = 0x7eb72347, $y_n(28) = 0xfd6e46$
 22 S-FRNG0 = 0x296d4b4f, $y_n(29) = 0x52da96$
 23 S-FRNG0 = 0x466b44c8, $y_n(30) = 0x8cd689$
 24 S-FRNG0 = 0x2c70ca96, $y_n(31) = 0x58e195$
 25 S-FRNG0 = 0x210454a5, $y_n(32) = 0x4208a9$
 26 S-FRNG0 = 0x23512d92, $y_n(33) = 0x46a25b$
 27 S-FRNG0 = 0x2686de5b, $y_n(34) = 0x4d0dbc$
 28 S-FRNG0 = 0x60703c1f, $y_n(35) = 0xc0e078$
 29 S-FRNG0 = 0x687b48af, $y_n(36) = 0xd0f691$
 30 S-FRNG0 = 0x75e10ebf, $y_n(37) = 0xebc21d$
 31 S-FRNG0 = 0xa8f5a0f, $y_n(38) = 0x151eb4$

1	S-FRNG0 = 0x49619433,	$y_n(39) = 0x92c328$
2	S-FRNG0 = 0x2548c5e8,	$y_n(40) = 0x4a918b$
3	S-FRNG0 = 0x4cb91577,	$y_n(41) = 0x99722a$
4	S-FRNG0 = 0xb305efb,	$y_n(42) = 0x1660bd$
5	S-FRNG0 = 0x14abb67a,	$y_n(43) = 0x29576c$
6	S-FRNG0 = 0x15590e30,	$y_n(44) = 0x2ab21c$
7	S-FRNG0 = 0x9b27c43,	$y_n(45) = 0x1364f8$
8	S-FRNG0 = 0x24fc17ae,	$y_n(46) = 0x49f82f$
9	S-FRNG0 = 0x2276b37a,	$y_n(47) = 0x44ed66$
10	S-FRNG0 = 0x1f012043,	$y_n(48) = 0x3e0240$
11	S-FRNG0 = 0x2ed1e9c,	$y_n(49) = 0x5da3d$
12	S-FRNG0 = 0x1d749544,	$y_n(50) = 0x3ae92a$
13	S-FRNG0 = 0x50f3b277,	$y_n(51) = 0xa1e764$
14	S-FRNG0 = 0x2f49cc26,	$y_n(52) = 0x5e9398$
15	S-FRNG0 = 0x15f9eb0b,	$y_n(53) = 0x2bf3d6$
16	S-FRNG0 = 0x4ab62a72,	$y_n(54) = 0x956c54$
17	S-FRNG0 = 0x7d9cc8af,	$y_n(55) = 0xfb3991$
18	S-FRNG0 = 0x403b9996,	$y_n(56) = 0x807733$
19	S-FRNG0 = 0x8e067cc,	$y_n(57) = 0x11c0cf$
20	S-FRNG0 = 0x44be86a1,	$y_n(58) = 0x897d0d$
21	S-FRNG0 = 0x3878d749,	$y_n(59) = 0x70f1ae$
22	S-FRNG0 = 0x57e1696,	$y_n(60) = 0xafc2d$
23	S-FRNG0 = 0x18fcd4ab,	$y_n(61) = 0x31f9a9$
24	S-FRNG0 = 0x7eee335d,	$y_n(62) = 0xfddc66$
25	S-FRNG0 = 0x486e5fc5,	$y_n(63) = 0x90dcfb$
26	S-FRNG0 = 0x4651a3a9,	$y_n(64) = 0x8ca347$
27	S-FRNG0 = 0x19cfd050,	$y_n(65) = 0x339fa0$
28	S-FRNG0 = 0x1a75416d,	$y_n(66) = 0x34ea82$
29	S-FRNG0 = 0x81a68ad,	$y_n(67) = 0x1034d1$
30	S-FRNG0 = 0x7dce3a02,	$y_n(68) = 0xfb9c74$
31	S-FRNG0 = 0x6e4299d4,	$y_n(69) = 0xdc8533$

1 S-FRNG0 = 0x568165d9, $y_n(70) = 0xad02cb$
2 S-FRNG0 = 0x4945b5ed, $y_n(71) = 0x928b6b$
3 S-FRNG0 = 0x7fab002f, $y_n(72) = 0xff5600$
4 S-FRNG0 = 0x33994f24, $y_n(73) = 0x67329e$
5 S-FRNG0 = 0x161adef3, $y_n(74) = 0x2c35bd$
6 S-FRNG0 = 0x3e232edb, $y_n(75) = 0x7c465d$
7 S-FRNG0 = 0x77d94bbb, $y_n(76) = 0xefb297$
8 S-FRNG0 = 0x5afb1f75, $y_n(77) = 0xb5f63e$
9 S-FRNG0 = 0x1cce68fd, $y_n(78) = 0x399cd1$
10 S-FRNG0 = 0x334ec8d1, $y_n(79) = 0x669d91$
11 S-FRNG0 = 0x79622ba7, $y_n(80) = 0xf2c457$
12 S-FRNG0 = 0x1c201f33, $y_n(81) = 0x38403e$
13 S-FRNG0 = 0xe05bb2, $y_n(82) = 0x1c0b7$
14 S-FRNG0 = 0x9a40391, $y_n(83) = 0x134807$
15 S-FRNG0 = 0x6ee62988, $y_n(84) = 0xddcc53$
16 S-FRNG0 = 0x48b0d899, $y_n(85) = 0x9161b1$
17 S-FRNG0 = 0x525c4a17, $y_n(86) = 0xa4b894$
18 S-FRNG0 = 0x2904563f, $y_n(87) = 0x5208ac$
19 S-FRNG0 = 0x5bba5722, $y_n(88) = 0xb774ae$
20 S-FRNG0 = 0x26aea83a, $y_n(89) = 0x4d5d50$
21 S-FRNG0 = 0x14a68bad, $y_n(90) = 0x294d17$
22 S-FRNG0 = 0x421c1572, $y_n(91) = 0x84382a$
23 S-FRNG0 = 0x41c41146, $y_n(92) = 0x838822$
24 S-FRNG0 = 0x2f4a2c65, $y_n(93) = 0x5e9458$
25 S-FRNG0 = 0x2ea8b324, $y_n(94) = 0x5d5166$
26 S-FRNG0 = 0x4589186a, $y_n(95) = 0x8b1230$
27 S-FRNG0 = 0x2ba1fad0, $y_n(96) = 0x5743f5$
28 S-FRNG0 = 0x17598411, $y_n(97) = 0x2eb308$
29 S-FRNG0 = 0x75ed8410, $y_n(98) = 0xebdb08$
30 S-FRNG0 = 0x3c7972ec, $y_n(99) = 0x78f2e5$
31 S-FRNG0 = 0x496802f8, $y_n(100) = 0x92d005$

1	S-FRNG0 = 0x4b9b0d6e,	$y_n(101) = 0x97361a$
2	S-FRNG0 = 0x308ed789,	$y_n(102) = 0x611daf$
3	S-FRNG0 = 0x71e87c46,	$y_n(103) = 0xe3d0f8$
4	S-FRNG0 = 0x56371216,	$y_n(104) = 0xac6e24$
5	S-FRNG0 = 0x39848e92,	$y_n(105) = 0x73091d$
6	S-FRNG0 = 0x2dac30be,	$y_n(106) = 0x5b5861$
7	S-FRNG0 = 0x3b4215f,	$y_n(107) = 0x76842$
8	S-FRNG0 = 0x26fae5df,	$y_n(108) = 0x4df5cb$
9	S-FRNG0 = 0x2209a777,	$y_n(109) = 0x44134e$
10	S-FRNG0 = 0x27d18716,	$y_n(110) = 0x4fa30e$
11	S-FRNG0 = 0x2cfbc9c6,	$y_n(111) = 0x59f793$
12	S-FRNG0 = 0x467bfd3c,	$y_n(112) = 0x8cf7fa$
13	S-FRNG0 = 0x762e924a,	$y_n(113) = 0xec5d24$
14	S-FRNG0 = 0x6b8674e3,	$y_n(114) = 0xd70ce9$
15	S-FRNG0 = 0x48641a3b,	$y_n(115) = 0x90c834$
16	S-FRNG0 = 0x23f63c9e,	$y_n(116) = 0x47ec79$
17	S-FRNG0 = 0x7b05bb83,	$y_n(117) = 0xf60b77$
18	S-FRNG0 = 0x3559d48e,	$y_n(118) = 0x6ab3a9$
19	S-FRNG0 = 0x1c91d1ff,	$y_n(119) = 0x3923a3$
20	S-FRNG0 = 0x2971cb00,	$y_n(120) = 0x52e396$
21	S-FRNG0 = 0x6dc68241,	$y_n(121) = 0xdb8d04$
22	S-FRNG0 = 0x391b1b5,	$y_n(122) = 0x72363$
23	S-FRNG0 = 0x5229e3e7,	$y_n(123) = 0xa453c7$
24	S-FRNG0 = 0x3c317cd5,	$y_n(124) = 0x7862f9$
25	S-FRNG0 = 0x54faa2d2,	$y_n(125) = 0xa9f545$
26	S-FRNG0 = 0x12d7b494,	$y_n(126) = 0x25af69$
27	S-FRNG0 = 0xf906a36,	$y_n(127) = 0x1f20d4$
28	S-FRNG0 = 0x522d0735,	$y_n(128) = 0xa45a0e$
29	S-FRNG0 = 0xa3452b9,	$y_n(129) = 0x1468a5$
30	S-FRNG0 = 0x7122f4ea,	$y_n(130) = 0xe245e9$
31	S-FRNG0 = 0x2dfd68ad,	$y_n(131) = 0x5bfad1$

1 S-FRNG0 = 0x57e34d71, $y_n(132) = 0xafc69a$
 2 S-FRNG0 = 0xbf162cb, $y_n(133) = 0x17e2c5$
 3 S-FRNG0 = 0x148d038d, $y_n(134) = 0x291a07$
 4 S-FRNG0 = 0x35e42885, $y_n(135) = 0x6bc851$
 5 S-FRNG0 = 0x16204f67, $y_n(136) = 0x2c409e$
 6 S-FRNG0 = 0x233cfe8a, $y_n(137) = 0x4679fd$
 7 S-FRNG0 = 0x796b2818, $y_n(138) = 0xf2d650$
 8 S-FRNG0 = 0x6a157dee, $y_n(139) = 0xd42afb$
 9 S-FRNG0 = 0x28fecaab, $y_n(140) = 0x51fd95$
 10 S-FRNG0 = 0x6fabb593, $y_n(141) = 0xdf576b$
 11 S-FRNG0 = 0x721dff2b, $y_n(142) = 0xe43bfe$
 12 S-FRNG0 = 0xf5b9a95, $y_n(143) = 0x1eb735$
 13 S-FRNG0 = 0x4701b413, $y_n(144) = 0x8e0368$
 14 S-FRNG0 = 0x40d56fd0, $y_n(145) = 0x81aadf$
 15 S-FRNG0 = 0x7c9fe1f0, $y_n(146) = 0xf93fc3$
 16 S-FRNG0 = 0x64aa937b, $y_n(147) = 0xc95526$
 17 S-FRNG0 = 0x7ab8a3de, $y_n(148) = 0xf57147$
 18 S-FRNG0 = 0x700e82c3, $y_n(149) = 0xe01d05$
 19 S-FRNG0 = 0x48ab09ae, $y_n(150) = 0x915613$
 20 S-FRNG0 = 0x5508a3c7, $y_n(151) = 0xaa1147$
 21 S-FRNG0 = 0x2a38896e, $y_n(152) = 0x547112$
 22 S-FRNG0 = 0x65c6aa69, $y_n(153) = 0xcb8d54$
 23 S-FRNG0 = 0x55de07b2, $y_n(154) = 0xabbc0f$
 24 S-FRNG0 = 0x63cb6328, $y_n(155) = 0xc796c6$
 25 S-FRNG0 = 0x3ddb0a47, $y_n(156) = 0x7bb614$
 26 S-FRNG0 = 0x777fdb0a, $y_n(157) = 0xeeffb6$
 27 S-FRNG0 = 0x6b05aad0, $y_n(158) = 0xd60b55$
 28 S-FRNG0 = 0x41117494, $y_n(159) = 0x8222e9$
 29 S-FRNG0 = 0x60fcc1eb, $y_n(160) = 0xc1f983$
 30 S-FRNG0 = 0x721f5d0b, $y_n(161) = 0xe43eba$
 31 S-FRNG0 = 0x6915b7b5, $y_n(162) = 0xd22b6f$

1	S-FRNG0 = 0x10d001f9,	$y_n(163) = 0x21a003$
2	S-FRNG0 = 0x48318b0e,	$y_n(164) = 0x906316$
3	S-FRNG0 = 0x2ca06929,	$y_n(165) = 0x5940d2$
4	S-FRNG0 = 0x575819a2,	$y_n(166) = 0xaeb033$
5	S-FRNG0 = 0x58fb077a,	$y_n(167) = 0xb1f60e$
6	S-FRNG0 = 0x48a80839,	$y_n(168) = 0x915010$
7	S-FRNG0 = 0xfb3fb73,	$y_n(169) = 0x1f67f6$
8	S-FRNG0 = 0x71414312,	$y_n(170) = 0xe28286$
9	S-FRNG0 = 0x739a8cd4,	$y_n(171) = 0xe73519$
10	S-FRNG0 = 0x2793ed97,	$y_n(172) = 0x4f27db$
11	S-FRNG0 = 0x60d368cd,	$y_n(173) = 0xc1a6d1$
12	S-FRNG0 = 0x57859c64,	$y_n(174) = 0xaf0b38$
13	S-FRNG0 = 0x4de9620,	$y_n(175) = 0x9bd2c$
14	S-FRNG0 = 0x3152115f,	$y_n(176) = 0x62a422$
15	S-FRNG0 = 0x2f28d45,	$y_n(177) = 0x5e51a$
16	S-FRNG0 = 0x218ae86,	$y_n(178) = 0x4315d$
17	S-FRNG0 = 0x2269e07d,	$y_n(179) = 0x44d3c0$
18	S-FRNG0 = 0x55114031,	$y_n(180) = 0xaa2280$
19	S-FRNG0 = 0x5f8d7c98,	$y_n(181) = 0xbf1af9$
20	S-FRNG0 = 0x41ef102a,	$y_n(182) = 0x83de20$
21	S-FRNG0 = 0x360e5737,	$y_n(183) = 0x6c1cae$
22	S-FRNG0 = 0x677ff79a,	$y_n(184) = 0xcefff$
23	S-FRNG0 = 0x258d48c,	$y_n(185) = 0x4b1a9$
24	S-FRNG0 = 0x15ea3488,	$y_n(186) = 0x2bd469$
25	S-FRNG0 = 0x431ed7f5,	$y_n(187) = 0x863daf$
26	S-FRNG0 = 0x1df43840,	$y_n(188) = 0x3be870$
27	S-FRNG0 = 0xc99011d,	$y_n(189) = 0x193202$
28	S-FRNG0 = 0x11181d61,	$y_n(190) = 0x22303a$
29	S-FRNG0 = 0x4630d40b,	$y_n(191) = 0x8c61a8$
30	S-FRNG0 = 0x2fb1422d,	$y_n(192) = 0x5f6284$
31	S-FRNG0 = 0x1e6fb0d1,	$y_n(193) = 0x3cdf61$

1 S-FRNG0 = 0x36c178f3, $y_n(194) = 0x6d82f1$
 2 S-FRNG0 = 0x57ebb59a, $y_n(195) = 0xafd76b$
 3 S-FRNG0 = 0x33dfbe8e, $y_n(196) = 0x67bf7d$
 4 S-FRNG0 = 0x2657773d, $y_n(197) = 0x4caeee$
 5 S-FRNG0 = 0x38555975, $y_n(198) = 0x70aab2$
 6 S-FRNG0 = 0x6b642d37, $y_n(199) = 0xd6c85a$
 7 S-FRNG0 = 0x7dd4acf5, $y_n(200) = 0xfba959$
 8 S-FRNG0 = 0x15a7495d, $y_n(201) = 0x2b4e92$
 9 S-FRNG0 = 0x19c183c6, $y_n(202) = 0x338307$
 10 S-FRNG0 = 0x6fb2495f, $y_n(203) = 0xdf6492$
 11 S-FRNG0 = 0x21ef3543, $y_n(204) = 0x43de6a$
 12 S-FRNG0 = 0x5f91d31c, $y_n(205) = 0xbf23a6$
 13 S-FRNG0 = 0x5ebb0448, $y_n(206) = 0xbd7608$
 14 S-FRNG0 = 0x4816438e, $y_n(207) = 0x902c87$
 15 S-FRNG0 = 0x2dad449b, $y_n(208) = 0x5b5a89$
 16 S-FRNG0 = 0x4a73338a, $y_n(209) = 0x94e667$
 17 S-FRNG0 = 0x513ccf35, $y_n(210) = 0xa2799e$
 18 S-FRNG0 = 0x6f47ca3d, $y_n(211) = 0xde8f94$
 19 S-FRNG0 = 0x522ea3de, $y_n(212) = 0xa45d47$
 20 S-FRNG0 = 0x74086df8, $y_n(213) = 0xe810db$
 21 S-FRNG0 = 0x556bf04b, $y_n(214) = 0xaad7e0$
 22 S-FRNG0 = 0x216cf7bd, $y_n(215) = 0x42d9ef$
 23 S-FRNG0 = 0x78fcaa6f, $y_n(216) = 0xf1f954$
 24 S-FRNG0 = 0x14199b77, $y_n(217) = 0x283336$
 25 S-FRNG0 = 0x1d2dabf0, $y_n(218) = 0x3a5b57$
 26 S-FRNG0 = 0x21732887, $y_n(219) = 0x42e651$
 27 S-FRNG0 = 0xf69c839, $y_n(220) = 0x1ed390$
 28 S-FRNG0 = 0x69d81e16, $y_n(221) = 0xd3b03c$
 29 S-FRNG0 = 0x6b9f6ca3, $y_n(222) = 0xd73ed9$
 30 S-FRNG0 = 0x2f957888, $y_n(223) = 0x5f2af1$
 31 S-FRNG0 = 0x7e1c411f, $y_n(224) = 0xfc3882$

1 S-FRNG0 = 0x70f79ae7, $y_n(225) = 0xe1ef35$
 2 S-FRNG0 = 0xfdaeda2, $y_n(226) = 0x1fb5db$
 3 S-FRNG0 = 0x6e272ecf, $y_n(227) = 0xdc4e5d$
 4 S-FRNG0 = 0x4e725088, $y_n(228) = 0x9ce4a1$
 5 S-FRNG0 = 0x330538f4, $y_n(229) = 0x660a71$
 6 S-FRNG0 = 0x1bde3557, $y_n(230) = 0x37bc6a$
 7 S-FRNG0 = 0x197ff10c, $y_n(231) = 0x32ffe2$
 8 S-FRNG0 = 0x1eaa57e8, $y_n(232) = 0x3d54af$
 9 S-FRNG0 = 0x41715012, $y_n(233) = 0x82e2a0$
 10 S-FRNG0 = 0x763fef4e, $y_n(234) = 0xec7fde$
 11 S-FRNG0 = 0x5f782688, $y_n(235) = 0xbef04d$
 12 S-FRNG0 = 0x4929dbaf, $y_n(236) = 0x9253b7$
 13 S-FRNG0 = 0x5b15e3af, $y_n(237) = 0xb62bc7$
 14 S-FRNG0 = 0x7a1724e0, $y_n(238) = 0xf42e49$
 15 S-FRNG0 = 0x5762cbf, $y_n(239) = 0xaec59$
 16 S-FRNG0 = 0x1173b266, $y_n(240) = 0x22e764$
 17 S-FRNG0 = 0x42c54f7d, $y_n(241) = 0x858a9e$
 18 S-FRNG0 = 0x27e5b9ca, $y_n(242) = 0x4fcb73$
 19 S-FRNG0 = 0x5b08913c, $y_n(243) = 0xb61122$
 20 S-FRNG0 = 0xf7728d5, $y_n(244) = 0x1eee51$
 21 S-FRNG0 = 0x5819bfe1, $y_n(245) = 0xb0337f$
 22 S-FRNG0 = 0x28479f7, $y_n(246) = 0x508f3$
 23 S-FRNG0 = 0x4763486b, $y_n(247) = 0x8ec690$
 24 S-FRNG0 = 0x47278d6a, $y_n(248) = 0x8e4f1a$
 25 S-FRNG0 = 0x75b54ea4, $y_n(249) = 0xeb6a9d$
 26 S-FRNG0 = 0x523e2d5b, $y_n(250) = 0xa47c5a$
 27 S-FRNG0 = 0x7013db8b, $y_n(251) = 0xe027b7$
 28 S-FRNG0 = 0x27b2bc29, $y_n(252) = 0x4f6578$
 29 S-FRNG0 = 0x475f3c1b, $y_n(253) = 0x8ebe78$
 30 S-FRNG0 = 0x3d633538, $y_n(254) = 0x7ac66a$

31

1 Each 24-bit number $y_n(k)$ is written to the frame buffer in little-endian fashion. So 0x76fc7c turns
 2 into the byte stream 0x7c 0xfc 0x76. The little-endian version of the next 24-bit number,
 3 0xba6678, is written immediately after the first number.

4 The circular buffer to be used to generate data block(s) for the F-SCH for the next 512 frames is
 5 thus organized as follows:

6
 7 →7c fc 76 78 66 ba 54 7f 9d a7 79 12 ef e8 f0 6b a4 4c 3d 78 be af ed c7
 8 b3 bd c5 8d 42 29 fe 5b d0 44 87 47 de a3 01 7d 4a ad 34 89 f5 fd f3 02
 9 3a 6e e0 10 d5 64 97 1f e0 92 0b 3a 50 c4 cd 1d 75 13 a8 f2 6d 54 08 56
 10 ec e8 3c 2f 0a e0 d4 b0 bc 46 6e fd 96 da 52 89 d6 8c 95 e1 58 a9 08 42
 11 5b a2 46 bc 0d 4d 78 e0 c0 91 f6 d0 1d c2 eb b4 1e 15 28 c3 92 8b 91 4a
 12 2a 72 99 bd 60 16 6c 57 29 1c b2 2a f8 64 13 2f f8 49 66 ed 44 40 02 3e
 13 3d da 05 2a e9 3a 64 e7 a1 98 93 5e d6 f3 2b 54 6c 95 91 39 fb 33 77 80
 14 cf c0 11 0d 7d 89 ae f1 70 2d fc 0a a9 f9 31 66 dc fd bf dc 90 47 a3 8c
 15 a0 9f 33 82 ea 34 d1 34 10 74 9c fb 33 85 dc cb 02 ad 6b 8b 92 00 56 ff
 16 9e 32 67 bd 35 2c 5d 46 7c 97 b2 ef 3e f6 b5 d1 9c 39 91 9d 66 57 c4 f2
 17 3e 40 38 b7 c0 01 07 48 13 53 cc dd b1 61 91 94 b8 a4 ac 08 52 ae 74 b7
 18 50 5d 4d 17 4d 29 2a 38 84 22 88 83 58 94 5e 66 51 5d 30 12 8b f5 43 57
 19 08 b3 2e 08 db eb e5 f2 78 05 d0 92 1a 36 97 af 1d 61 f8 d0 e3 24 6e ac
 20 1d 09 73 61 58 5b 42 68 07 cb f5 4d 4e 13 44 0e a3 4f 93 f7 59 fa f7 8c
 21 24 5d ec e9 0c d7 34 c8 90 79 ec 47 77 0b f6 a9 b3 6a a3 23 39 96 e3 52
 22 04 8d db 63 23 07 c7 53 a4 f9 62 78 45 f5 a9 69 af 25 d4 20 1f 0e 5a a4
 23 a5 68 14 e9 45 e2 d1 fa 5b 9a c6 af c5 e2 17 07 1a 29 51 c8 6b 9e 40 2c
 24 fd 79 46 50 d6 f2 fb 2a d4 95 fd 51 6b 57 df fe 3b e4 35 b7 1e 68 03 8e
 25 df aa 81 c3 3f f9 26 55 c9 47 71 f5 05 1d e0 13 56 91 47 11 aa 12 71 54
 26 54 8d cb 0f bc ab c6 96 c7 14 b6 7b b6 ff ee 55 0b d6 e9 22 82 83 f9 c1
 27 ba 3e e4 6f 2b d2 03 a0 21 16 63 90 d2 40 59 33 b0 ae 0e f6 b1 10 50 91
 28 f6 67 1f 86 82 e2 19 35 e7 db 27 4f d1 a6 c1 38 0b af 2c bd 09 22 a4 62
 29 1a e5 05 5d 31 04 c0 d3 44 80 22 aa f9 1a bf 20 de 83 ae 1c 6c ef ff ce
 30 a9 b1 04 69 d4 2b af 3d 86 70 e8 3b 02 32 19 3a 30 22 a8 61 8c 84 62 5f
 31 61 df 3c f1 82 6d 6b d7 af 7d bf 67 ee ae 4c b2 aa 70 5a c8 d6 59 a9 fb
 32 92 4e 2b 07 83 33 92 64 df 6a de 43 a6 23 bf 08 76 bd 87 2c 90 89 5a 5b
 33 67 e6 94 9e 79 a2 94 8f de 47 5d a4 db 10 e8 e0 d7 aa ef d9 42 54 f9 f1

1 36 33 28 57 5b 3a 51 e6 42 90 d3 1e 3c b0 d3 d9 3e d7 f1 2a 5f 82 38 fc
 2 35 ef e1 db b5 1f 5d 4e dc a1 e4 9c 71 0a 66 6a bc 37 e2 ff 32 af 54 3d
 3 a0 e2 82 de 7f ec 4d f0 be b7 53 92 c7 2b b6 49 2e f4 59 ec 0a 64 e7 22
 4 9e 8a 85 73 cb 4f 22 11 b6 51 ee 1e 7f 33 b0 f3 08 05 90 c6 8e 1a 4f 8e
 5 9d 6a eb 5a 7c a4 b7 27 e0 78 65 4f 78 be 8e 6a c6 7a→

6
 7 Following the procedure outlined in Figure 4, the new pseudo-random number generator is as
 8 follows:

9
 10 31_BIT_PN_NUM = (0x682dff0c * a) mod m = 0x23c3a243

11 24_BIT_PN_NUM = 31_BIT_PN_NUM >> 7 = 0x478744 = 4687684

12
 13 As the value of 24_BIT_PN_NUM is less than the ON_THRESHOLD, the TDSO_STATE turns to ON
 14 and, therefore, TDSO shall pass two Rate 1 frame to the multiplex sublayer during the current
 15 frame period.

16 The starting offset for the first frame in the 512 frame segment is given by $O_n \bmod B(n)$, which in
 17 this case is $60 \bmod 762 = 60$. Therefore, the TDSO will generate two Rate 1 (170-bit) data blocks
 18 that are supplied to the multiplex sublayer. Each data block is comprised of 21 octets from the
 19 circular buffer beginning at the 60th byte offset in the circular buffer followed by 2 zero bits as
 20 shown:

21
 22 50 c4 cd 1d 75 13 a8 f2 6d 54 08 56 ec e8 3c 2f 0a e0 d4 b0 bc '00'

23 46 6e fd 96 da 52 89 d6 8c 95 e1 58 a9 08 42 5b a2 46 bc 0d 4d '00'

24
 25 The first 5 bits of each generated PDU, however, will be masked by 2 bits representing the
 26 CHANNEL_ID, that is, 10 for F-SCH0 followed by 3 bits to designate the PDU sequence number
 27 within the physical layer SDU ('000' for first data block and '001' for the second). Therefore, the
 28 two data blocks that are passed to the multiplex sublayer look like the following:

29
 30 PDU1->80 c4 cd 1d 75 13 a8 f2 6d 54 08 56 ec e8 3c 2f 0a e0 d4 b0 bc '00'

31 PDU2->8e 6e fd 96 da 52 89 d6 8c 95 e1 58 a9 08 42 5b a2 46 bc 0d 4d '00'

32
 33 For the next frame, however, the byte offset pointer advances to the byte immediately after 4d, that
 34 is, 78.

1 ANNEX C Using the TDSO

2 C.1 Introduction

3 This annex outlines the procedure for conducting a TDSO test and a method for computing frame
4 error rates.

6 C.2 Conducting a TDSO test

7 A TDSO test may be conducted at a base station using the following procedures:

- 8 1. Start a TDSO call (or clear the counters of an existing call).
- 9 2. To conduct a TDSO call with a random data source, send a *Service Option Control*
10 *Message* control directive with DATA_SOURCE field set to '001' and the
11 CLEAR_COUNTERS field set to '1' for the particular physical channel.
- 12 3. Wait for the test interval to elapse.
- 13 4. Direct the mobile station to make a copy of the TDSO counters.
- 14 5. Wait for the forward synchronization and reverse synchronization frame after the action
15 time to occur.
- 16 6. Retrieve the values of the copied counters from the mobile station and compute the
17 FERs.

18 A call is started by negotiating the TDSO (see 3.1) and initializing and connecting the service
19 option. The service option counters are cleared at initialization, or could be cleared explicitly by the
20 base station by sending a control directive while a TDSO call is in progress.

21 The duration of a test should correspond to an integral number of segments (see 3.2). The mobile
22 station's processing of the control directive (see 3.4.2.2) enforces this test duration.

23 The base station sends a *Service Option Control Message* directing the mobile station to copy the
24 received and transmitted TDSO counters to buffers at the next Forward and Reverse Traffic
25 Channel synchronization frames. This provides a synchronized snapshot of all the TDSO counters
26 for accurate calculations of FERs.

27 The base station sends *Service Option Control Messages* to request counter values to be retrieved
28 from the copied buffer. These counter values are used in frame-error rate and bit-error rate
29 calculations.

31 C.3 Computation of FERs

32 C.3.1 FER computation on the FCH and DCCH

33 The FER on the Forward Fundicated Traffic Channel is given by the following calculation:
34

$$35 \text{ FER}_{\text{Rate 1 (Forward)}} = 1 - (\text{TDSO_E1_R1}_m + \text{TDSO_EN_RN}_m) / (\text{TDSO_E1_T1}_b + \text{TDSO_EB_TB}_b)$$

where counters in the mobile station are denoted by a subscript m, and counters in the base station are denoted by a subscript b.

The FER of the Reverse Fundicated Traffic Channel is given by the following calculation:

$$FER_{Rate\ 1\ (Reverse)} = 1 - (TDSO_E1_R1_b + TDSO_EN_RN_b) / (TDSO_E1_T1_m + TDSO_EB_TB_m)$$

where counters in the mobile station are denoted by a subscript m, and counters in the base station are denoted by a subscript b.

The number of dim-and-burst frames and the number of blank-and-burst frames are not used in the FER calculations described above.

The values of the base station transmit counter TDSO_E1_T1_b, TDSO_EB_TB_b can be estimated by summing the values of the corresponding mobile station counters for received frames as follows:

$$TDSO_E1_T1_b \approx TDSO_E1_R1_m + TDSO_E1_RO_m + TDSO_E1_RFL_m + TDSO_E1_RE_m + TDSO_E1_RERR_m$$

$$TDSO_EB_TB_b \approx TDSO_EN_RN_m + TDSO_EN_RO_m$$

The values of the mobile station transmit counter TDSO_E1_T1_m, TDSO_EB_TB_m can be estimated at the base station by summing the values of the corresponding base station counters for received frames as follows:

$$TDSO_E1_T1_m \approx TDSO_E1_R1_b + TDSO_E1_RO_b + TDSO_E1_RFL_b + TDSO_E1_RE_b + TDSO_E1_RERR_b$$

$$TDSO_EB_TB_m \approx TDSO_EN_RN_b + TDSO_EN_RO_b$$

C.3.2 FER computation on the SCH

The FER of Nx9.6 or Nx14.4 frames on the Forward Supplemental Channel is given by the following calculation:

$$FER_{Rate\ Nx9.6\ Or\ Nx14.4\ (Forward)} = 1 - (TDSO_EN_x_RN_x_m + TDSO_EB_RB_m) / (TDSO_EN_x_TN_x_b + TDSO_EB_TB_b)$$

where counters in the mobile station are denoted by a subscript m, and counters in the base station are denoted by a subscript b.

1 The FERs of Nx9.6 or Nx14.4 frames on the Reverse Fundicated Traffic Channel are given by the
2 following calculation:

$$3$$

$$4 \text{ FER}_{\text{Rate Nx9.6 or Nx14.4 (Reverse)}} = 1 - (\text{TDSO_ENx_RNx}_b + \text{TDSO_EB_RB}_b) / (\text{TDSO_ENx_TNx}_m +$$

$$5 \text{ TDSO_EB_TB}_m)$$

6 where counters in the mobile station are denoted by a subscript m, and counters in the base
7 station are denoted by a subscript b.

8 The values of the base station transmit counter TDSO_ENx_TNx_b, TDSO_EB_TB_b can be estimated
9 by summing the values of the corresponding mobile station counters for received frames as follows:

$$10$$

$$11 \text{ TDSO_ENx_TNx}_b \approx \text{TDSO_ENx_RNx}_m + \text{TDSO_ENx_RE}_m + \text{TDSO_ENx_RERR}_m,$$

$$12 \text{ TDSO_EB_TB}_b \approx \text{TDSO_EB_RB}_m + \text{TDSO_EB_RO}_m$$

13

14 The values of the mobile station transmit counter TDSO_ENx_TNx_m, TDSO_EB_TB_m can be
15 estimated at the base station by summing the values of the corresponding base station counters
16 for received frames as follows:

$$17$$

$$18 \text{ TDSO_ENx_TNx}_m \approx \text{TDSO_ENx_RNx}_b + \text{TDSO_ENx_RE}_b + \text{TDSO_ENx_RERR}_b,$$

$$19 \text{ TDSO_EB_TB}_m \approx \text{TDSO_EB_RB}_b + \text{TDSO_EB_RO}_b$$

20

21 C.4 PER computation on SCH

22 The PER of Rate 1a, Rate 1b, Rate 2, and Rate 3 frames on the Forward Supplemental Traffic
23 Channel is given by the following calculation:

$$24$$

$$25 \text{ PER}_{\text{Rate 1a (Forward)}} = 1 - \text{TDSO_E1a_R1a}_m / \text{TDSO_E1a_T1a}_b$$

$$26 \text{ PER}_{\text{Rate 1b (Forward)}} = 1 - \text{TDSO_E1b_R1b}_m / \text{TDSO_E1b_T1b}_b$$

$$27 \text{ PER}_{\text{Rate 2 (Forward)}} = 1 - \text{TDSO_E2_R2}_m / \text{TDSO_E2_T2}_b$$

$$28 \text{ PER}_{\text{Rate 3 (Forward)}} = 1 - \text{TDSO_E3_R3}_m / \text{TDSO_E3_T3}_b$$

29

30 where counters in the mobile station are denoted by a subscript m, and counters in the base
31 station are denoted by a subscript b.

32 The PER of Rate 1a, Rate 1b, Rate 2, and Rate 3 frames on the Reverse Supplemental Traffic
33 Channel is given by the following calculation:

$$34$$

$$35 \text{ PER}_{\text{Rate 1a (Reverse)}} = 1 - \text{TDSO_E1a_R1a}_b / \text{TDSO_E1a_T1a}_m$$

$$1 \quad \text{PER}_{\text{Rate 1b (Reverse)}} = 1 - \text{TDSO_E1b_R1b}_b / \text{TDSO_E1b_T1b}_m$$

$$2 \quad \text{PER}_{\text{Rate 2 (Reverse)}} = 1 - \text{TDSO_E2_R2b}_b / \text{TDSO_E2_T2}_m$$

$$3 \quad \text{PER}_{\text{Rate 3 (Reverse)}} = 1 - \text{TDSO_E3_R3b}_b / \text{TDSO_E2_T2}_m$$

4

5 where counters in the mobile station are denoted by a subscript m, and counters in the base
6 station are denoted by a subscript b.

7 The values of the base station transmit counters TDSO_E1a_T1a_b, TDSO_E1b_T1b_b, TDSO_E2_T2_b,
8 and TDSO_E3_T3_b can be calculated by summing the values of the corresponding mobile station
9 counters for received frames as follows:

10

$$11 \quad \text{TDSO_E1a_T1a}_b = \text{TDSO_E1a_R1a}_m + \text{TDSO_E1a_RERR}_m + \text{TDSO_E1a_RE}_m,$$

$$12 \quad \text{TDSO_E1b_T1b}_b = \text{TDSO_E1b_R1b}_m + \text{TDSO_E1b_RERR}_m + \text{TDSO_E1b_RE}_m,$$

$$13 \quad \text{TDSO_E2_T2}_b = \text{TDSO_E2_R2}_m + \text{TDSO_E2_RERR}_m + \text{TDSO_E2_RE}_m,$$

$$14 \quad \text{TDSO_E3_T3}_b = \text{TDSO_E3_R3}_m + \text{TDSO_E3_RERR}_m + \text{TDSO_E3_RE}_m$$

15

16 The values of the mobile station transmit counters TDSO_E1a_T1a_m, TDSO_E1b_T1b_m,
17 TDSO_E2_T2_m, and TDSO_E3_T3_m can be calculated by summing the values of the corresponding
18 base station counters for received frames as follows:

19

$$20 \quad \text{TDSO_E1a_T1a}_m = \text{TDSO_E1a_R1a}_b + \text{TDSO_E1a_RERR}_b + \text{TDSO_E1a_RE}_b,$$

$$21 \quad \text{TDSO_E1b_T1b}_m = \text{TDSO_E1b_R1b}_b + \text{TDSO_E1b_RERR}_b + \text{TDSO_E1b_RE}_b,$$

$$22 \quad \text{TDSO_E2_T2}_m = \text{TDSO_E2_R2}_b + \text{TDSO_E2_RERR}_b + \text{TDSO_E2_RE}_b,$$

$$23 \quad \text{TDSO_E3_T3}_m = \text{TDSO_E3_R3}_b + \text{TDSO_E3_RERR}_b + \text{TDSO_E3_RE}_b$$

24 C.5 FER computation on the FCH and DCCH with 5 ms frame length

25 The FER on the Forward Fundicated Traffic Channel is given by the following calculation:

26 Let R_m be the number of good 5 ms frames received in the mobile station and T_b be the total
27 number of 5 ms frames transmitted by the base station during the test period, then

$$28 \quad \text{FER}_{\text{Rate 1 (Forward)}} = 1 - (R_m / T_b)$$

29 where counters in the mobile station are denoted by a subscript m, and counters in the base
30 station are denoted by a subscript b.

31 The FER on the Reverse Fundicated Traffic Channel is given by the following calculation:

32 Let R_b be the number of good 5 ms frames received in the base station and T_m be the total number
33 of 5 ms frames transmitted by the mobile station during the test period, then

$$34 \quad \text{FER}_{\text{Rate 1 (Reverse)}} = 1 - (R_b / T_m)$$

1 where counters in the mobile station are denoted by a subscript m, and counters in the base
2 station are denoted by a subscript b.

3 Both R_m and T_m can be derived from the values of the mobile station counters (e.g.,
4 MUX1_FOR_FCH_5_ms) retrieved in the *5 ms Frame Received Counters Response* and *5 ms Frame*
5 *Transmitted Counters Response*, respectively. For example, for a 5 ms DCCH using Multiplex
6 Option 0x01, R_m can be calculated as the difference of the values of TDSO_MUX1_5ms_R1 at the
7 beginning of the first TDSO frame and at the end of the last TDSO frame during the test.

8 Similarly, both R_b and T_b can be derived from the values of the base station counters. For
9 example, R_b can be calculated as the difference of the values of the corresponding counter in the
10 base station at the beginning of the first TDSO frame and at the end of the last TDSO frame during
11 the test.

12

- 1 No text.

1 ANNEX D Calculating p and q Based on D and B

2
3 Given the transition probabilities p and q, the average frame activity (D) and the average burst
4 length (B) can be calculated based on the following equations:

5
6
$$D = q/(p+q) \quad \text{(Equation 1)}$$

7
$$B = 1/p \quad \text{(Equation 2)}$$

8
9 However, to inversely calculate p and q based on the desired D and B, cautions have to be taken
10 since D and B are dependent on each other and some combinations cannot be achieved as
11 explained below:

12 From Equation 1 and Equation 2,

13
14
$$D = Bq/(1+Bq) \quad \text{(Equation 3)}$$

15
$$B = D/((1-D)q) \quad \text{(Equation 4)}$$

16
17 Equation 3 shows that given a fixed B, D varies from 0 to $B/(1+B)$, when q varies from 0 to 1.
18 Similarly, Equation 4 shows that given a fixed value of D, B varies from $D/(1-D)$ to infinity.

19 For example, if B is set to 2, D has to be smaller than $2/3$. As a result, the frame activity (D) can
20 never get higher than $2/3$ when B is set to 2. Similarly, if D is set to $7/10$, B has to be greater than
21 $7/3$.

22 The corresponding valid values of p and q can be calculated from Equation 1 and Equation 2 given
23 a valid pair of D and B.