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Version 3.0

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Medium Access Control (MAC) Standard for cdma2000 Spread Spectrum Systems

Release 0 — Addendum 2

UPDATE FOREWORD

(This foreword is not part of this standard)

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

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

New text is underlined, as shown below.

This is how new text is identified.

Deleted text is crossed out, as shown below.

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

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

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

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1 INTRODUCTION

This standards specification document defines the cdma2000 Medium Access Control (MAC) sublayer.

1.1 Scope

This standard provides the detailed definitions of all component entities within the cdma2000 MAC layer, the service interfaces and primitives exchanged between entities within the MAC layer, and the service interfaces and primitives exchanged between the MAC layer and other cdma2000 layers.

1.2 Document Release History

This is the initial release of this document.

1.3 Terms

ACH	Access Channel.
Blank data block	A data block that contains no service information bits.
BS	Base station.
Configured Multiplex Option	The multiplex option number stored in the Service Configuration Record for a physical channel (see [5]).
csch	Common Signaling Channel. A point to multipoint logical channel that carries Upper Layer Signaling traffic over a common physical channel.
Data Block	The unit of information exchanged between the multiplex sublayer and a service or Upper Layer Signaling.
DCCH	Dedicated Control Channel.
Dedicated	An attribute of the forward or reverse logical channel, implying that the channel can only be used by a single user.
dsch	Dedicated Signaling Channel. A point-to-point logical channel that carries Upper Layer Signaling traffic over a dedicated physical channel.
dtch	Dedicated Traffic Channel. A point-to-point logical channel that carries data or voice traffic over a dedicated physical channel.
Event	A stimulus generated outside of an entity that triggers some procedure within the entity.
FCH	The Physical Layer Fundamental Channel.
f-csch	Forward Common Signaling Channel. A csch that carries information from the base station to the mobile station.
f-dsch	Forward Dedicated Signaling Channel. A dsch that carries information from the base station to the mobile station.
f-dtch	Forward Dedicated Traffic Channel. A dtch that carries information from the base station to the mobile station.
Fill MuxPDU	A MuxPDU Type 3 that is not associated with any service, used as filler when assembling a Physical Layer SCH SDU.
F-PCH	Forward Paging Channel. The physical channel that carries Common Channel information on the forward link and that is backward compatible with the TIA/EIA-95-B Paging Channel.
Frame duration	The duration of a physical channel transmission interval; may be 5, 10, or 20 ms.

IMSI	International Mobile Station Identifier. A universal address that uniquely identifies any mobile station.
LAC	Link Access Control. Entity that provides reliable or unreliable delivery of information across the air interface between the mobile station and the base station.
Logical Channel	Logical connection between peer entities.
LPM	Logical-to-Physical Mapping. Information that is used by the multiplex sublayer for performing the logical-to-physical channel mapping. See [5].
LTU	Logical Transmission Unit. One or more Type 3 MuxPDUs with a 16 bit CRC.
MAC	Medium Access Control. Entity that controls the access to and from Upper Layer Signaling, Data Services, and Voice Services to Physical Layer resources.
Mode A	Multiplex sublayer operational mode in which the Radio Configuration is less than or equal to 2..
Mode B	Multiplex sublayer operational mode in which the Radio Configuration is greater than 2..
MS	Mobile station.
Multiplex Option	Used to specify the multiplex sublayer operation for a physical channel. Each Multiplex Option specifies the available data rates for the physical channel (FCH, DCCH or max SCH rate).
MuxPDU	Multiplex sublayer Protocol Data Unit. One or more data blocks combined according to multiplex option rules.
Null MuxPDU	A MuxPDU that contains no bits.
Null Traffic MuxPDU	A MuxPDU containing only the lowest negotiated transmit rate primary traffic data block with all bits set to ‘1’.
PDU	Protocol Data Unit. An atomic set of data, header information, and control information that is provided by a service user to a service provider.
Physical Channel	Point-to-point radio transmission link.
Physical Layer SDU	An SDU that is generated by the Mux and QoS Entity that is provided to the Physical Layer for transmission.

Primitive	An abstract, atomic, implementation-independent representation of an interaction between a service user and its service provider. See [7].
QOF	Quasi-Orthogonal Function. Sets of numerical sequences that are used in place of Walsh codes, and which have pair-wise low cross correlations, but which are less than perfectly orthogonal.
QoS	Quality of Service. Metrics that affect the quality of a data service that is delivered to an end user (e.g., throughput, guaranteed bit rate, delay, etc.).
Rate Set 1	The set of data rates 9.6, 4.8, 2.7/2.4, 1.5/1.2, and all integral multiples of 9.6 Kbps.
Rate Set 2	The set of data rates 14.4, 7.2, 3.6, 1.8, and all integral multiples of 14.4 Kbps.
r-csch	Reverse Common Signaling Channel. A csch that carries information from the mobile station to the base station.
r-dsch	Reverse Dedicated Signaling Channel. A dsch that carries information from the mobile station to the base station.
r-dtch	Reverse Dedicated Traffic Channel. A dtch that carries information from the mobile station to the base station.
RLP	Radio Link Protocol. Connection-oriented, negative acknowledgment-based data delivery protocol.
SCCH	Supplemental Code Channel. The Physical Layer Supplemental Code Channel.
SCH	Supplemental Channel. The Physical Layer Supplemental Channel.
SDB	Short Data Burst. Bearer data from a data service transmitted by the SDBTS teleservice.
SDBTS	Short Data Burst Tele-Service. Entity that provides a mapping of the generic Signaling teleservices capabilities (transported by Common Channel *Data Burst Messages*) to the service interface expected by the data services.
SDU	Service Data Unit. A set of data, header information, and control information that is accepted by a service provider from a service user.

Signaling data block	The unit of data exchanged between the multiplex sublayer and signaling.
Signaling Traffic	Another name for the signaling information bits.
sr_id	Service Reference identifier. A unique number assigned to each connected service option instance.
SRBP	Signaling Radio Burst Protocol. An entity that provides connectionless protocol for Signaling messages.

1

1.4 Numeric Information

Numeric information is defined in [5]. The following are additional internal values that are defined in this standard. The values are stored by the mobile station in temporary memory and are not sent over the air. The scope of these internal values is limited to this standard.

ACH_FRAME_SIZE – Size, in bits, of the R-ACH physical layer frame. The value of ACH_FRAME_SIZE is 88.
PCH_FRAME_SIZE – Size, in bits, of the F-PCH physical layer frame.
SYNC_FRAME_SIZE – Size, in bits, of the F-SYNC physical layer frame. The value of SYNC_FRAME_SIZE is 32.

1.5 Normative References

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

[1] Reserved.

[2] C.S0002-0-2, Physical Layer Standard for cdma2000 Spread Spectrum Systems.

[3] C.S0003-0-2, Medium Access Control (MAC) Standard for cdma2000 Spread Spectrum Systems.

[4] C.S0004-0-2, Link Access Control (LAC) Standard for cdma2000 Spread Spectrum Systems.

[5] C.S0005-0-2, Upper Layer (Layer 3) Signaling Standard for cdma2000 Spread Spectrum Systems.

[6] Reserved.

[7] Recommendation X.210 (11/93) – Information technology – Open Systems Interconnection – Basic reference model: Conventions for the definition of OSI services, International Telecommunication Union.

[8] TSB58, Administration of Parameter Value Assignments for TIA/EIA Wideband Spread Spectrum Standards.

1.6 Informative References

This section is intentionally left blank.

1.7 Overview

Section 1 contains an overview of this standard. Section 2 defines the normative behavior of the IS-2000 MAC sublayer by describing the precise processing rules for each of the MAC sublayer entities. Section 2 also describes the overall structure of the IS-2000 MAC sublayer, defines the entity and service model that is used within this standard, and specifies the entities that comprise the MAC sublayer.As shown in Figure 1, IS-95[1] has a layered structure providing voice, packet data, simple circuit data (e.g., async Fax), and simultaneous voice and packet data services. At the most basic level, cdma2000 provides protocols and services that correspond to the bottom two layers of the ISO/OSI Reference Model (i.e., Layer 1 - the Physical Layer, and Layer 2 - the Link Layer) according to the general structure specified by the ITU for IMT-2000 systems. Layer 2 is further subdivided into the Link Access Control (LAC) sublayer and the Medium Access Control (MAC) sublayer. Applications and upper layer protocols, corresponding to OSI Layers 3 through 7, utilize the services provided by the cdma2000 LAC services. Examples include Signaling Services, Voice Services, Packet Data Applications, and Circuit Data Applications.

Motivated by higher bandwidths and the need to handle a wider variety of services, several enhancements have been incorporated into cdma2000. In cdma2000, a generalized multi-media service model is supported. This allows a combination of voice, packet data, and circuit data services to be operating concurrently (within the limitations of the air interface system capacity). cdma2000 also includes a Quality of Service (QoS) control mechanism to balance the varying QoS requirements of multiple concurrent services.

[1] In this section, the term “IS-95” denotes any of the standards that are predecessors to cdma2000, i.e., IS-95, IS-95-A, and TIA/EIA-95-B.

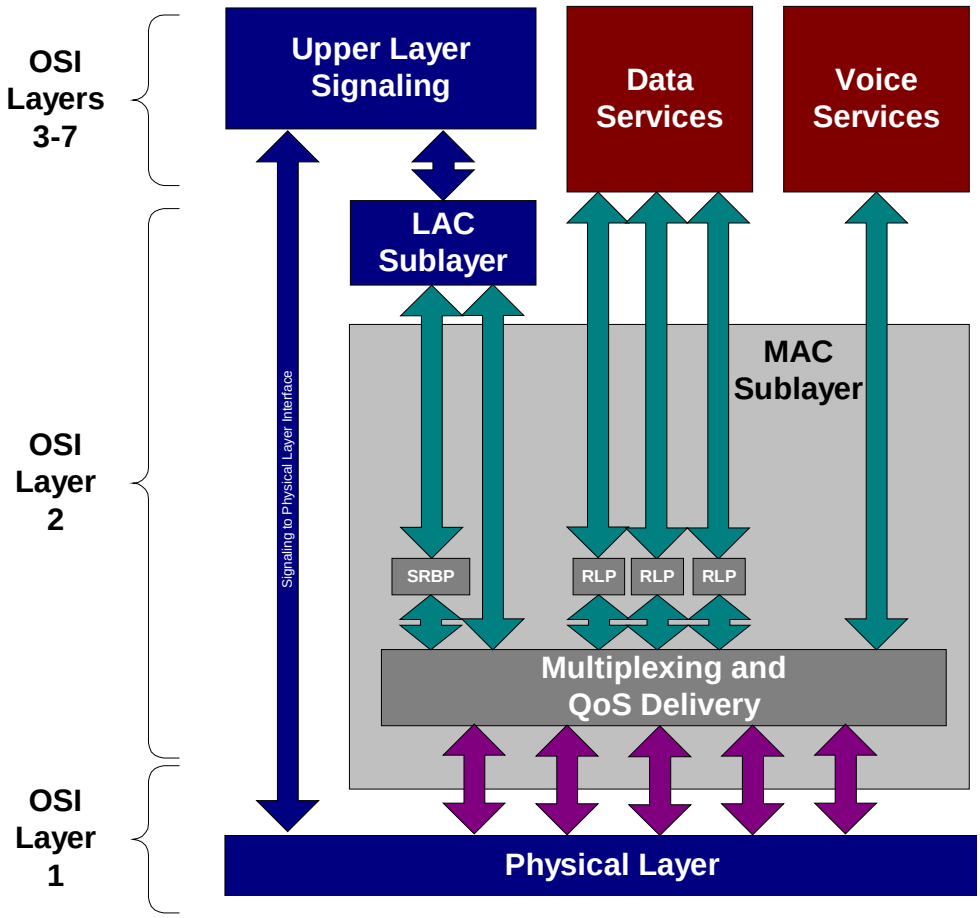

Figure 1. cdma2000 Layer Structure

The cdma2000 MAC sublayer provides two important functions:

-
- Best Effort Delivery - reasonably reliable transmission over the radio link with a Radio Link Protocol (RLP) that provides a “best effort” level of reliability; and
- Multiplexing and QoS Control - enforcement of negotiated QoS levels by mediating conflicting requests from competing services and the appropriate prioritization of access requests.

1.7.1 Layering Model

Figure 2 depicts the cdma2000 entities and services interfaces.

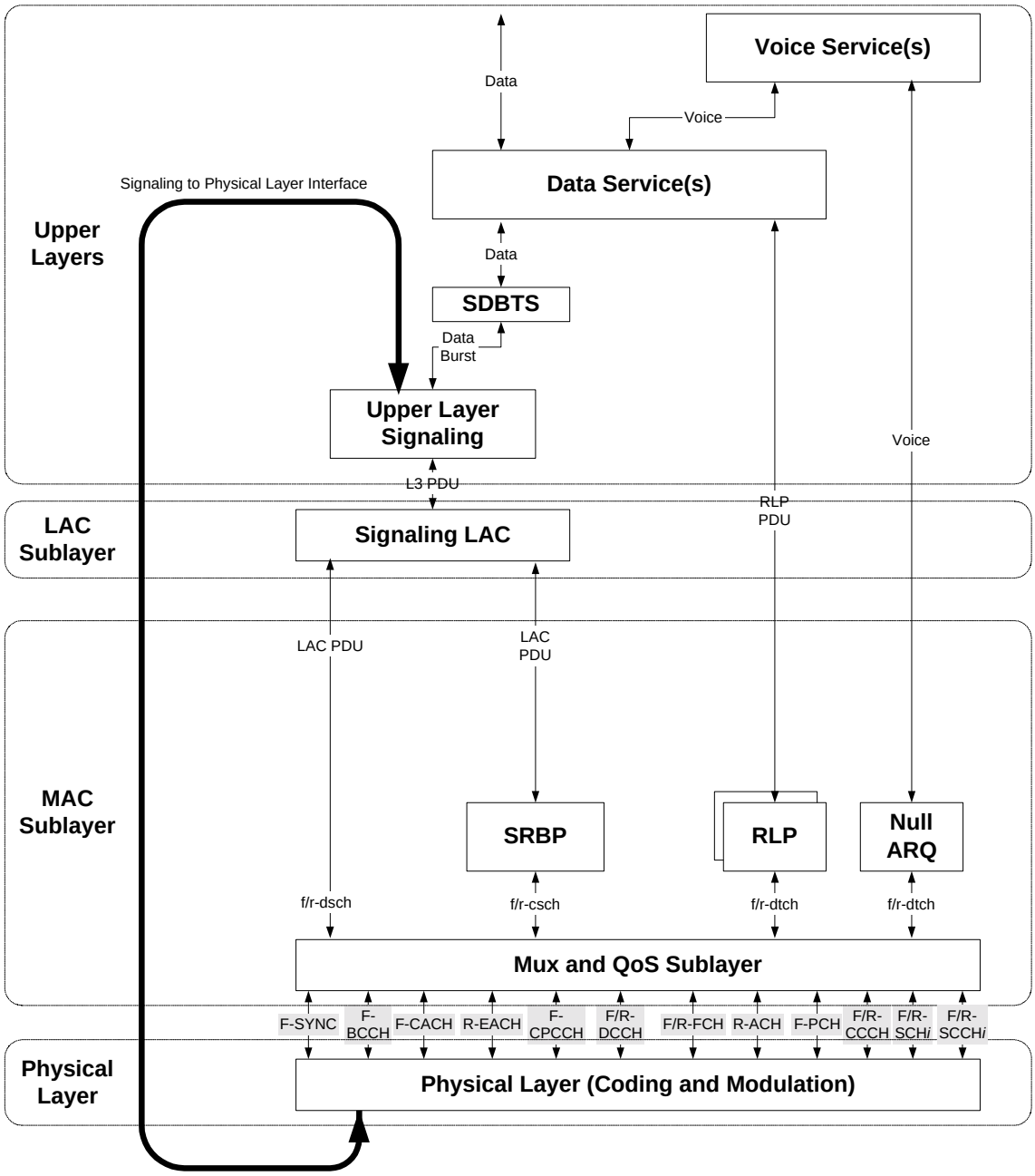

Figure 2. cdma2000 Entities and Service Interfaces

1.8 Conventions Used in this Document

1.8.1 Service Interfaces

1.8.1.1 Service Primitives

Service primitives are abstract, atomic, implementation-independent representations of interactions between a service user and its service provider. No requirement is placed on the mobile station or the base station to implement specific service primitives. See [7].

1.8.2 Pseudo-code Rules

Pseudo-code to describe procedures in this standard will follow the flow control and syntax of the C++ programming language.

No text.

2 DEFINITION OF MAC COMPONENTS

2.1 Service Interfaces (*Informative*)

This section describes the functional service interfaces between entities of the MAC sublayer and other entities outside the MAC sublayer. To support the multi-media capabilities required by cdma2000, it is necessary that the abstract functional description of the air interface (primarily the precise definition of the mobile station's operation) be decomposed into narrowly defined *functional entities*. Furthermore, each of these functional entities is described by:

- a set of *service interface primitives* for every event that acts as a stimulus for a functional entity (informative);
- a set of *procedures* that the functional entity is to follow when a valid primitive is encountered in each state (e.g., set a timer, modify a variable, etc.) (normative).

The normative portions of the entity definitions are found in Section2.

The following subsections contain a summary of the service interface definitions. The conventions that are used for service interface primitives are shown in Table 1, and conform to [7].

Table 1. Service Interface Primitive Types

Primitive Type	Source	Destination	Purpose
Request	service user	service provider	Request a service, resource, etc.
Confirm	service provider	service user	Response (positive or negative) to a Request primitive.
Indication	service provider	service user	Indicates that data has arrived or an event for the service user has occurred.
Response	service user	service provider	Acknowledgment of an Indication.

The invocation of service primitives is notated as follows:

RX-Primitive.Primitive_Type (parameters)

where:

RX - An abbreviation for the service provider entity (e.g., MAC for the MAC sublayer); see Table 2

Primitive - The name of the specific primitive to or from the service provider (e.g., "Data")

Primitive_Type - The specific Primitive Type as defined in Table 1 (e.g., Request)

parameters - An (optional) list of parameters for the primitive (e.g., *channel_type, data, size*)

For example, a request to the MAC sublayer to transmit data specified by the variable *data*, of channel type *channel_type*, and size *size*, is notated as follows:

MAC-Data.Request (*channel_type, data, size*)

Table 2 summarizes the abbreviations (*RX*) that are used in Service Primitive names for various entities that are providers of services.

Table 2. Abbreviations for Entity Names in Service Primitives

Entity (Service Provider)	Abbreviation (*RX*)	Primitives Defined In
Medium Access Control Layer	**MAC**	**[3]**
Physical Layer	**PHY**	**[2]**
Short Data Burst TeleService	**SDBTS**	**[3]**

2.1.1 Service Interface Primitives Received by the MAC Layer

The primitives sent from the Signaling LAC to the MAC are summarized in Table 3.

Table 3. Service Interface Primitives Received by the MAC Layer

Primitive Type	Primitive	Parameters	Notes
Request	MAC-SDUReady	*channel_type, size, P, seqno, scheduling_hint*	Initiates sending of a MAC SDU. *channel_type* is the type of data (e.g., 5 ms or 20 ms);

			size is the size of the SDU in bits; *P* is the value used in the persistence test;[2] and *seqno* is the access probe count within the current access sub-attempt.[3] *scheduling_hint* is an indicator to the multiplex sublayer on how to prioritize fragments of the Layer 2 encapsulated PDU relative to other types of multiplexed traffic (e.g., to determine whether to use blank-and-burst or dim-and-burst)[4].
Request	MAC-Data	*channel_type, data, size*	In response to the MAC-Availability.Indication primitive, this primitive carries the data to be transmitted. *channel_type* is the type of *data* (e.g., 5 ms or 20 ms); *data* is an SDU or a fragment of an SDU; and *size* is the size of *data* in bits.

2.1.2 Service Interface Primitives Sent from the MAC Layer

The primitives sent from the MAC entity to the LAC entity are shown in Table 4.

Table 4. Service interface Primitives Sent from the MAC Layer

Primitive Type	Primitive	Parameters	Notes
Indication	MAC-Data	*channel_id, type, data, size, system_time*	The MAC Layer delivers *data*. *channel_id* is a channel identifier for the physical channel on which the data was received (see 2.2.2.2.2.4); *type* is the type of *data* (e.g., 5 ms or 20 ms); *data* is an SDU or a fragment of an SDU; *size* is the size of *data* in bits; and *system_time* is the time at which the Physical Layer received the first bit of the Physical Layer frame containing *data*.
Indication	MAC-Availability	*channel_type, max_size, system_time*	Indication of the maximum number of bits that can be transmitted by the next frame. *channel_type* is the type of data to be transmitted (e.g., 5 ms, 20 ms, or either);

[2] Only used for the r-csch.

[3] Only used for the r-csch.

[4] Only used for the dsch.

			max_size is the maximum number of bits that can be placed in the Physical Layer SDU; and *system_time* is the time at which the Physical Layer will transmit the first bit of the Physical Layer frame containing all the information bits supplied.
Indication	MAC-AccessFailure	*reason*	*reason* is the reason for the access failure. *reason* may have one of the following values: "EACAM Not Received" or "Insufficient Transmission Rate".

2.1.3 Short Data Burst TeleService Service Primitives

Table 5 summarizes the service primitives for the Short Data Burst TeleService entity.

Table 5. Short Data Burst TeleService Service Interface Primitives

Primitive Type	Primitive	Parameters	Notes
Request	*SDBTS*-Data	*sr_id, so, length, DataBlock, addr_type, addr_len, address*	The data service sends an SDB to SDBTS. SDBTS sends a *Data Burst Message* with CHARi fields containing *sr_id*, *so* and *DataBlock*, and NUM_FIELDS set to *length+3*. Base station SDBTS also has ADDR_TYPE field set to *addr_type*, ADDR_LEN field set to *addr_len*, and ADDRESS field set to *address*.
Confirm	*SDBTS*-Data		
Indication	*SDBTS*-Data	*so, length, DataBlock*	SDBTS delivers to the data service the received *Data Burst Message* with *so* and *DataBlock* set to the corresponding CHARi fields, and *length* set to the value in NUM_FIELDS field less 3.
Response	*SDBTS*-Data		

2.2 Entities of the MAC Layer

This section defines each of the entities in the MAC Layer and defines the procedures that these entities follow when processing events and service primitives from other entities. The subsections in this section may contain informative text that is designated *Informative* in the section heading. Otherwise, the subsections contain normative text.

2.2.1 Reserved

2.2.2 MAC Sublayer Entities

2.2.2.1 Short Data Bursts

2.2.2.1.1 Overview (*Informative*)

Transmission procedures do not permit more than one Short Data Burst transmission to be outstanding for a given sr_id at the same time. Reception and transmission of a Short Data Burst may occur simultaneously.

Figure 3 shows an overview of the data flow when transporting SDBs via *Data Burst Messages*. A new entity, the *Short Data Burst TeleService* (SDBTS), provides a mapping of the Signaling teleservices capabilities to the service interface expected by the data service instance.

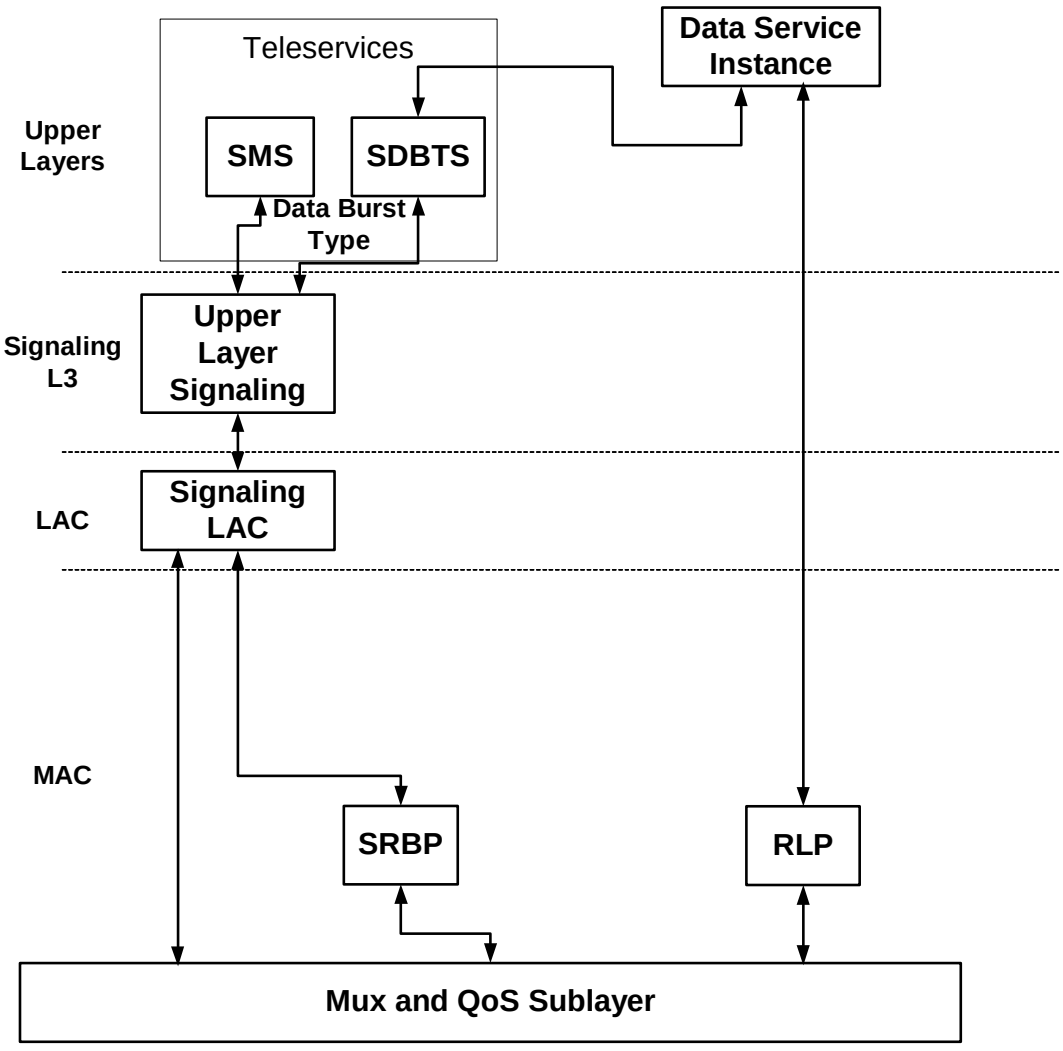

Figure 3. Architecture of SDBs Transported via Data Burst Messages

Attributes of an SDB include the data block, the data length, the service option number to which the data service was connected, the Service Reference Identifier, and, for a mobile termination SDB, address information of the mobile station. The specific Service Reference, *sr_id*, is used by the receiver SDBTS entity to direct other attributes of the SDB to the corresponding data service instance. The service option number is used by the receiver to deliver the data block and its length to the appropriate data service instance Link Layer entity.

Upon the reception of an SDBTS-Data.Request (*sr_id, so, length, DataBlock*) primitive, the SDBTS entity encapsulates the SDB by forming an SDBTS-SDU as shown in Figure 4 and sends it to the expected service interface of the Upper Layer Signaling *Data Burst* service (i.e., the Teleservices service interface). The Upper Layer Signaling entity delivers the provided *Data Burst* SDU using Upper Layer Signaling procedures and *Data Burst Message* over the air. The BURST_TYPE field of the *Data Burst Message* is set to Short Data Burst and the CHARi fields are set to the SDU to be transmitted. When the delivery of SDB completes (either a layer 2 acknowledgment for the *Data Burst Message* is received or the acknowledgment fails), the SDBTS responds with an SDBTS-Data.Confirm (*sr_id, so*) primitive to indicate the end of SDB transmission.

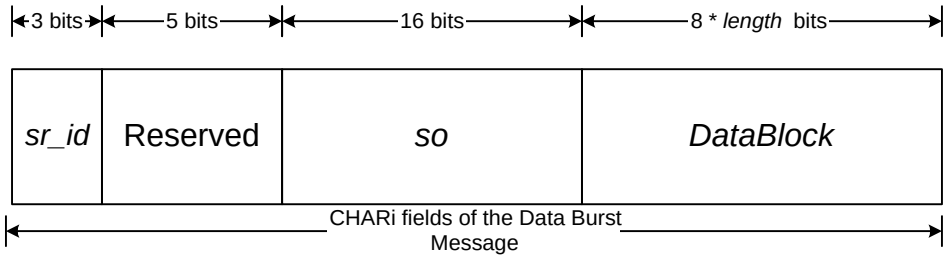

Figure 4. Format of the SDBTS-SDU

On the receiver, the data flow occurs along the same interfaces, but in the opposite direction. Incoming *Data Burst Messages* are delivered to the appropriate teleservice by the BURST_TYPE field. Upon receiving a *Data Burst Message* with BURST_TYPE equal to Short Data Burst, the SDBTS entity passes the received SDU to the data service instance corresponding to the received *sr_id*.

2.2.2.1.2 SDBTS[5]

2.2.2.1.2.1 Mobile Station Procedures

2.2.2.1.2.1.1 Transmitting Procedures

Upon receiving an SDBTS-Data.Request (*sr_id, so, length, DataBlock*) primitive from the data service instance associated with *sr_id*, the mobile station SDBTS entity shall perform the following procedures:

[5] While the SDBTS is not part of MAC or L2, it is being specified here since it is closely tied to the approach used for short data bursts (SDBs) as supported in [3].

- The SDBTS shall compose an SDBTS-SDU as defined in 2.2.2.1.2.3 with the sr_id field set to *sr_id*, the so field set to *so*; and the SDU_DATA field set to the data in *DataBlock*.
- If $AUTH_s$ is set to '01', the SDBTS shall generate an SDB_AUTH variable consisting of up to six 4-bit digits for authentication and an SDB_AUTH_LEN variable indicating the number of digits included in SDB_AUTH. The SDBTS shall use the first 24 bits of SDU_DATA, or entire SDU_DATA if less than 24 bits, to form SDB_AUTH according to the procedures defined in [5].
- The SDBTS entity shall form a *Data Burst Message* (see [5]) with BURST_TYPE set to the value corresponding to Short Data Burst (See [8]), NUM_MSGS and MSG_NUMBER set to 1, NUM_FIELDS set to *length+3*, and CHARi fields containing the SDBTS-SDU. Variable SDB_AUTH and SDB_AUTH_LEN shall be used to compute the authentication fields of the *Data Burst Message* in accordance with the procedures defined in [5].

The mobile station shall send the *Data Burst Message* and transmit it following the procedures defined in [5]. The *Data Burst Messages* always require a layer 2 acknowledgment. The SDBTS entity shall set the ACK_REQ layer 2 field to '1'.

Whether the access attempt is acknowledged or fails (see [5]), the SDBTS shall respond to the data service instance with an SDBTS-Data.Confirm (*sr_id, so*) primitive indicating the end of current SDB transmission session. The SDBTS shall ignore a new SDBTS-Data.Request primitive before the current SDB transmission ends.

2.2.2.1.2.1.2 Receiving Procedures

A mobile station that supports SDB capability shall process all *Data Burst Messages* received in which the BURST_TYPE field is set to the value corresponding to Short Data Burst (See [8]). Layer 2 acknowledgment shall always be returned whether or not message errors are detected by the SDBTS entity. The mobile station SDBTS shall discard the message without further processing if any of the following is true:

- MSG_NUMBER field is set to a value other than 1.
- NUM_MSGS field is set to a value other than 1.
- NUM_FIELDS field is set to zero.

Otherwise, the mobile station SDBTS shall interpret the CHARi fields of the received *Data Burst Message* as an SDBTS-SDU as defined in 2.2.2.1.2.3 and extract the SR_ID, SO, and SDU_DATA fields accordingly. The mobile station SDBTS shall send an SDBTS-Data.Indication (*so, length, DataBlock*) primitive to the data service instance associated with Service Reference *sr_id* and has the so field set to *so*, with *length* set to the value in the NUM_FIELDS field of the received *Data Burst Message* less 3, and *DataBlock* set to SDU_DATA.

Upon receiving an SDBTS-Data.Response (), the SDBTS entity shall take no action.

2.2.2.1.2.2 Base Station Procedures

2.2.2.1.2.2.1 Transmitting Procedures

Upon receiving an SDBTS-Data.Request (*sr_id, so, length, DataBlock, addr_type, addr_len, address*) primitive from the data service instance associated with *sr_id*, the base station SDBTS entity shall perform the following procedures:

- The SDBTS shall compose an SDBTS-SDU as defined in 2.2.2.1.2.3 with the sr_id field set to *sr_id*, the so field set to *so*; and the SDU_DATA field set to the data in *DataBlock*.
- The SDBTS entity shall form a *Data Burst Message* (see [5]) with BURST_TYPE set to the value corresponding to Short Data Burst (See [8]), NUM_MSGS and MSG_NUMBER set to 1, NUM_FIELDS set to *length+3*, CHARi fields containing the SDBTS-SDU, and ADDR_TYPE, ADDR_LEN, ADDRESS field set to *addr_type, addr_len, address*, respectively.

The base station shall send the *Data Burst Message* and transmit it, following the procedures specified in [5]. The *Data Burst Messages* always require a layer 2 acknowledgment. The SDBTS entity shall set the ACK_REQ layer 2 field to '1'.

Whether or not the *Data Burst Message* is acknowledged (see [5]), the SDBTS shall respond to the data service instance with an SDBTS-Data.Confirm (*sr_id, so*) primitive indicating the end of current SDB transmission session. The SDBTS shall ignore a new SDBTS-Data.Request primitive before the current SDB transmission ends.

2.2.2.1.2.2.2 Receiving Procedures

A base station that supports SDB capability shall process all *Data Burst Messages* received on a common traffic channel in which the BURST_TYPE field is set to the value corresponding to Short Data Burst (see [8]). The Layer 2 acknowledgment shall always be returned whether or not message errors are detected by the SDBTS entity. The base station SDBTS shall discard the message without further processing if any of the following is true:

- MSG_NUMBER field is set to a value other than 1.
- NUM_MSGS field is set to a value other than 1.
- NUM_FIELDS field is set to zero.

Otherwise, the base station SDBTS shall interpret the CHARi fields of the received *Data Burst Message* as an SDBTS-SDU, as defined in 2.2.2.1.2.3, and extract the sr_id, so and SDU_DATA field accordingly. If authentication is enabled in the serving system, the SDBTS should perform the following authentication procedures in accordance with [5]:

- The base station SDBTS should form the authentication digits as described in 2.2.2.1.2.1.1 from SDU_DATA.
- The base station SDBTS should use the sequence of digits to compute the authentication signature and should compare the computed signature with the value in the AUTHR field of the received *Data Burst Message*.
- The base station SDBTS should compare the value in the RANDC field of the received *Data Burst Message* with the most significant eight bits of its internally stored value of RAND.
- The base station SDBTS should compare the value in the COUNT field of the received *Data Burst Message* with its internally stored value associated with the received IMSI/ESN.

If the authentication is successful, the base station SDBTS shall send an SDBTS-Data.Indication (*so, length, DataBlock*) primitive to the data service instance associated with Service Reference *sr_id* and with the so field set to *so, length* set to the value in the NUM_FIELDS field of the received *Data Burst Message* minus 3, and *DataBlock* set to SDU_DATA.

Upon receiving an SDBTS-Data.Response (), the SDBTS entity shall take no action.

2.2.2.1.2.3 SDBTS-SDU Format

The mobile station or base station shall use the following variable length format for the SDBTS-SDU:

Field	Length (bits)
SR_ID	3
RESERVED	5
SO	16
SDU_DATA	Variable

SR_ID - Service Reference Identifier.

The mobile station or base station shall set this field to the Service Reference of the data service.

RESERVED – Reserved bits.

The mobile station or base station shall set this field to '00000'.

SO - Service option number.

The mobile station or base station shall set this field to the service option number of the data service.

SDU_ DATA – Data octets.

The mobile station or base station shall set this field to the data included in this message.

2.2.2.2 Mux and QoS Sublayer

2.2.2.2.1 The Multiplex Sublayer

The multiplex sublayer has both a transmitting and a receiving function. The multiplex sublayer transmitting function combines information from various sources (e.g., Upper Layer Signaling, Data Service instances, and Voice Service) and forms Physical Layer SDUs for transmission (see Figure 5). The multiplex sublayer receiving function separates the information contained in Physical Layer SDUs, and directs the information to the correct entity (e.g., Upper Layer Signaling, Data Service instances, or Voice Service).

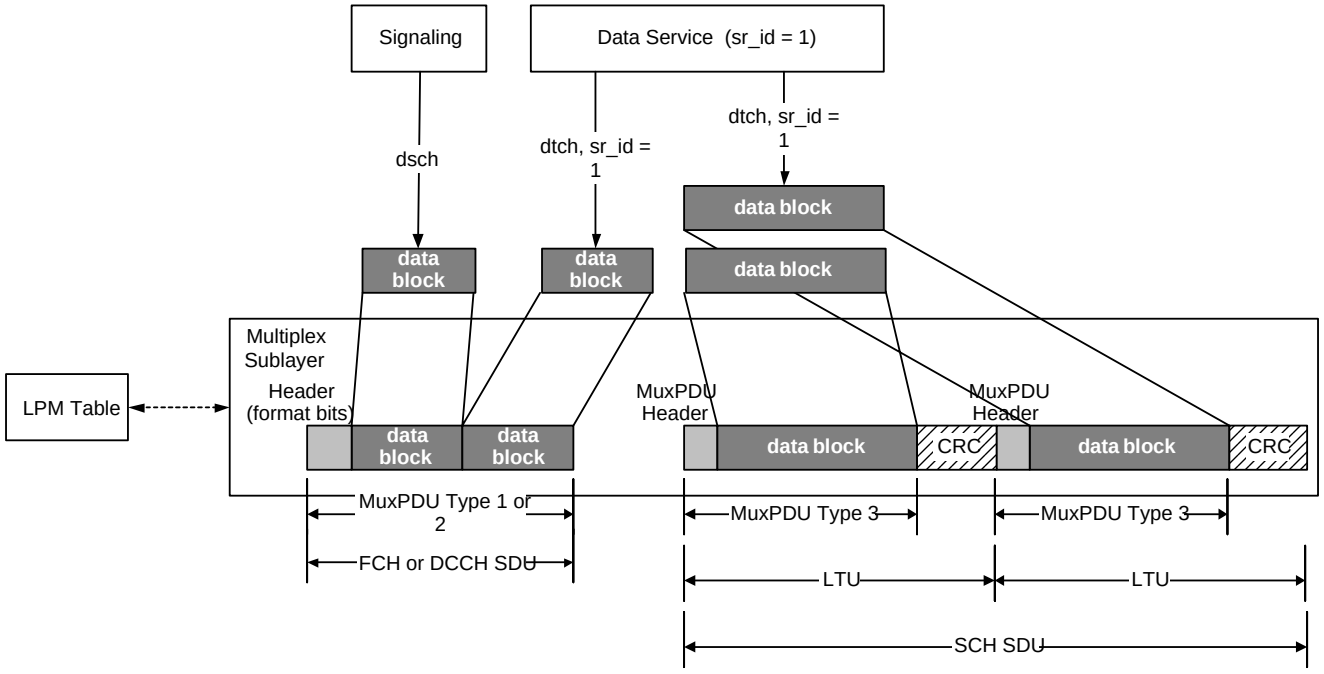

Figure 5. Overview of the Multiplex Sublayer Transmitting Function.

The multiplex sublayer operates in one of the following two modes:

- Mode A is used when operating radio configuration less than or equal to 2; and
- Mode B is used when operating with a radio configuration greater than 2.

The multiplex sublayer has both a transmitting and a receiving function.

The transmitting function, under QoS control,[6] solicits information bits from signaling and connected services or from logical channels. Information bits are exchanged between signaling and the multiplex sublayer using the primitives described in 2.2.2.2.1.6; the multiplex sublayer converts the information bits received from signaling into a data block. Information bits are exchanged between a connected service or a logical channel and the multiplex sublayer in a unit called a data block. The multiplex sublayer multiplexes one or more data blocks into a MuxPDU and combines one or more MuxPDUs into a Physical Layer SDU for transmission by the Physical Layer. Physical layer SDUs are exchanged between the multiplex sublayer and the Physical Layer using the service interface operations in 2.2.2.2.1.7.

There is a single MuxPDU in each Physical Layer FCH or DCCH SDU. Table 17 and Table 18 detail the data block combinations allowed in the MuxPDU that forms a 20 ms Physical Layer FCH or DCCH SDU. As shown in Table 20, only a single data block is in the MuxPDU that is used to form a 5 ms Physical Layer FCH or DCCH SDU. Table 6 lists the various multiplex options used with the FCH or DCCH.

Table 6. Multiplex Options Applicable to a FCH or DCCH

	Multiplex Option	
	Rate Set 1	Rate Set 2
FCH	0x1	0x2
DCCH	0x1	0x2

When operating in Mode A, one MuxPDU is used to form each Physical Layer SCCH SDU. Each MuxPDU used contains a single data block. Table 7 lists the various multiplex options used with SCCHs.

Table 7. Multiplex Options Applicable to SCCHs

Maximum Number of SCCHs	Maximum Number of MuxPDUs	Multiplex Option	
		Rate Set 1	Rate Set 2
1	1	0x3	0x4
2	2	0x5	0x6
3	3	0x7	0x8
4	4	0x9	0xa
5	5	0xb	0xc
6	6	0xd	0xe
7	7	0xf	0x10

When operating in Mode B, one or more MuxPDUs are used to form a Physical Layer SCH SDU. Each MuxPDU used contains a single data block. The multiplex option associated with the SCH defines both the number of MuxPDUs in the SDU and defines the size of the data block in each MuxPDU. Table 8 lists the various multiplex options used with the SCH, and Table 19 lists the allowed data block sizes. For Table 8, each odd-numbered multiplex option also implies that multiplex option 0x1 is used on the FCH or DCCH. Each even-numbered multiplex option also implies that multiplex option 0x2 is used on the FCH or DCCH.

Table 8. Multiplex Options Applicable to an SCH

[6] When operating in Mode A, the multiplex sublayer assigns relative service priority (see 2.2.2.2.1.2)

SCH Rate	Maximum Number of MuxPDUs in the Physical Layer SDU			Multiplex Option					
				Rate Set 1			Rate Set 2		
	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

Note: SCH Rate is expressed in multiples of a base rate. For Rate Set 1, the base rate is 9600 bps, and for Rate Set 2, the base rate is 14400 bps. Thus a 2x SCH rate means twice 9600 for Rate Set 1 (19200), or twice 14400 for Rate Set 2 (28800).

The multiplex sublayer derives the multiplex option in use for the SCH based upon the configured multiplex option and the current SCH rate. If the configured multiplex option is 0x809, 0x811, 0x821, 0x905, 0x909, 0x911, 0x921, 0x80a, 0x812, 0x822, 0x906, 0x90a, 0x912, or 0x922 and the SCH Rate is 1x, the multiplex option in use is 0x3 when the configured multiplex option is odd-numbered, and is 0x4 when the configured multiplex option is even-numbered. For SCH Rate 2x and higher, the multiplex option in use is specified by the column in Table 8 containing the configured multiplex option and the row in Table 8 corresponding to the current SCH rate.

For multiplex options greater than 0x10, Table 9 describes the fields used to compute the multiplex option number.

Table 9. Fields Used to Compute Multiplex Option Numbers Greater than 0x10

Field Name	Number of Bits	Value	
Rate_Set	2	'01' – Rate Set 1 '10' – Rate Set 2	Least Significant Bit
Max_Data_Blocks	6	'000001' – '001000'	
Data_Block_Size	2	'00' – Single size '01' – Double size	
MuxPDU_Type	2	'00' – MuxPDU Types 1, 2, or 4 '10' – MuxPDU Type 3	
Format_Descriptor	4	'0000' – Format 1	Most Significant Bit

The receiving function accepts a Physical Layer SDU, divides it into one or more MuxPDUs, demultiplexes the data blocks in each MuxPDU and delivers the information bits to the appropriate service.

The information bits in a signaling data block are also called signaling traffic.

2.2.2.2.1.1 Mobile Station Support

If the mobile station supports Radio Configuration 1, it shall support the FCH, and the mobile station shall support Mode A on the FCH.

If the mobile station supports a Radio Configuration with a number greater than 2, and if the mobile station supports a voice service option, the mobile station shall support the FCH, and the mobile station shall support Mode B on the FCH.

The mobile station may support Mode B on the FCH, DCCH, or SCH. If the mobile station supports a Radio Configuration with a number greater than 2, and if the mobile station supports the FCH, the mobile station shall support Mode B on the FCH.

The mobile station shall support multiplex option 0x1 and Rate Set 1.

The mobile station shall support signaling traffic and shall support Primary Traffic.

The mobile station shall support those MuxPDU Type 1 structures that contain signaling traffic only, primary traffic only, or both signaling and primary traffic.

The mobile station may support multiplex option 0x2 and Rate Set 2. If the mobile station supports multiplex option 0x2 and Rate Set 2, it shall support those MuxPDU Type 2 structures that contain signaling traffic only, primary traffic only, or both signaling and primary traffic.

The mobile station may support secondary traffic. If it supports secondary traffic, it shall support those MuxPDU Type 1 structures that contain secondary traffic. If the mobile station supports secondary traffic, multiplex option 0x2, and Rate Set 2, the mobile station shall also support those MuxPDU Type 2 structures that contain secondary traffic.

The mobile station may support one or more of multiplex options 0x3, 0x5, 0x7, 0x9, 0xb, 0xd, and 0xf, in the forward direction, or in the reverse direction, or in both directions.

The mobile station may support one or more of multiplex options 0x4, 0x6, 0x8, 0xa, 0xc, 0xe, and 0x10, in the forward direction, or in the reverse direction, or in both directions.

The mobile station may support one or more of multiplex options 0x809, 0x811, 0x821, 0x905, 0x909, 0x911, and 0x921, in the forward direction, or in the reverse direction, or in both directions. If the mobile station supports any of these multiplex options, it shall also support Mode B.

The mobile station may support one or more of multiplex options 0x80a, 0x812, 0x822, 0x906, 0x90a, 0x912, and 0x922, in the forward direction, or in the reverse direction, or in both directions. If the mobile station supports any of these multiplex options, it shall also support Mode B.

The mobile station may support MuxPDU Type 4.

2.2.2.2.1.2 Default Service Priority

The multiplex sublayer may determine the relative priority between traffic supplied by Signaling and other services using the information provided by the parameters in the MAC-SDUReady.Request () primitive. The exact manner for using this information to deliver over-the-air Quality of Service is not specified by this standard.

2.2.2.2.1.3 Multiplex Sublayer Transmitting Function

2.2.2.2.1.3.1 Assembling the Physical Layer FCH SDU for Transmission

2.2.2.2.1.3.1.1 Mode A

If an FCH physical channel has been assigned, the multiplex sublayer shall assemble a Physical Layer FCH SDU every 20 ms. The multiplex sublayer shall combine available data blocks from signaling and all connected services, according to the relative priority of each, to form a MuxPDU.

If the FCH physical channel is used with Rate Set 1, the multiplex sublayer shall use the supplied data blocks to form a MuxPDU Type 1, as specified in 2.2.2.2.1.5.

If the FCH physical channel is used with Rate Set 2, the multiplex sublayer shall use the supplied data blocks to form a MuxPDU Type 2, as specified in 2.2.2.2.1.5.

If signaling and all services supply Blank data blocks, the multiplex sublayer shall create a null traffic MuxPDU. A null traffic MuxPDU contains only the lowest negotiated transmit rate primary traffic data block with all bits set to '1'.

The multiplex sublayer shall deliver the assembled Physical Layer SDU to the Physical Layer using the *Transmit FCH Request* service interface operation in accordance with 2.2.2.2.1.7.1.

2.2.2.2.1.3.1.2 Mode B

If an FCH physical channel has been assigned, the multiplex sublayer shall assemble a Physical Layer FCH SDU at the beginning of every 20 ms interval. The multiplex sublayer shall not assemble a 20 ms FCH SDU at any time other than the beginning of a 20 ms interval. The multiplex sublayer may assemble a 5 ms FCH SDU at the beginning of any 5 ms interval. See the procedures for Reverse Fundamental Channel Transmission Processing and Forward Fundamental Channel Transmission Processing in [2] for an explanation of the puncturing of 5 ms physical layer frames into 20 ms physical layer frames.

To assemble a 20 ms Physical Layer FCH SDU, the multiplex sublayer shall combine available 20 ms data blocks from signaling and all FCH-mapped logical channels[7], according to the relative priority of each, to form a MuxPDU. The multiplex sublayer shall not combine a 5 ms data block with any 20 ms data block in the same MuxPDU.To assemble a 5 ms Physical Layer FCH SDU, the multiplex sublayer shall use a 5 ms data block from signaling to form a MuxPDU Type 4, as specified in 2.2.2.2.1.5.

If signaling supplies a 5 ms data block at the beginning of a 20 ms interval, the multiplex sublayer shall assemble a 5 ms FCH SDU using the supplied 5 ms data block. If the multiplex sublayer does not also assemble a 20 ms FCH SDU at the beginning of the same 20 ms interval, then every 5 ms interval thereafter, until the beginning of the next 20 ms interval, the multiplex sublayer shall perform the following::

- If signaling supplies a 5 ms data block at the beginning of the interval, the multiplex sublayer shall assemble a 5 ms FCH SDU..
- If signaling does not supply a 5 ms data block at the beginning of the interval, the multiplex sublayer shall assembles a Null MuxPDU.

If signaling supplies a 5 ms data block at any time other than the beginning of a 20 ms interval, the multiplex sublayer shall assemble a 5 ms FCH SDU.

If the FCH physical channel is used with Rate Set 1, the multiplex sublayer shall use the supplied 20 ms data blocks to form a MuxPDU Type 1, as specified in 2.2.2.2.1.5.

If the FCH physical channel is used with Rate Set 2, the multiplex sublayer shall use the supplied 20 ms data blocks to form a MuxPDU Type 2, as specified in 2.2.2.2.1.5.

[7] The Logical-to-Physical Mapping Table specifies the mapping of logical channels to physical channels.

If, at the beginning of a 20 ms interval, signaling and all FCH-mapped logical channels supply Blank data blocks, the multiplex sublayer shall assemble a 20 ms FCH SDU by creating a null traffic MuxPDU, as specified in 2.2.2.2.1.5. A null traffic MuxPDU contains only the lowest negotiated transmit rate primary traffic data block with all bits set to '1'.

The multiplex sublayer shall deliver the assembled Physical Layer FCH SDU or SDUs to the Physical Layer using the *Transmit FCH Request* service interface operation in accordance with 2.2.2.2.1.7.1.

2.2.2.2.1.3.2 Assembling the Physical Layer DCCH SDU for Transmission

2.2.2.2.1.3.2.1 Mode B

If a DCCH physical channel has been assigned, the multiplex sublayer shall assemble a Physical Layer DCCH SDU at the beginning of every 20 ms interval. The multiplex sublayer shall not assemble a 20 ms DCCH SDU at any time other than the beginning of a 20 ms interval. The multiplex sublayer may assemble a 5 ms DCCH SDU at the beginning of any 5 ms interval. See the procedures for Reverse Dedicated Control Channel Transmission Processing and Forward Dedicated Control Channel Transmission Processing in [2] for an explanation of the puncturing of 5 ms physical layer frames into 20 ms physical layer frames. If, at the beginning of a 20 ms interval, PILOT_GATING_USE_RATE is not equal to '0', then the multiplex sublayer shall require all DCCH-mapped logical channels, other than signaling, to supply a 20 ms Blank data block.

To assemble a 20 ms physical layer DCCH SDU, the multiplex sublayer shall combine available 20 ms data blocks from signaling and all DCCH-mapped logical channels, according to the relative priority of each, to form a MuxPDU. The multiplex sublayer shall not combine a 5 ms data block with any 20 ms data block in the same MuxPDU. To assemble a 5 ms Physical Layer DCCH SDU, the multiplex sublayer shall use a 5 ms data block from signaling to form a MuxPDU Type 4, as specified in 2.2.2.2.1.5. If the DCCH physical channel is used with Rate Set 1, the multiplex sublayer shall use the supplied 20 ms data blocks to form a MuxPDU Type 1, as specified in 2.2.2.2.1.5.

If the DCCH physical channel is used with Rate Set 2, the multiplex sublayer shall use the supplied 20 ms data blocks to form a MuxPDU Type 2, as specified in 2.2.2.2.1.5.

If, at the beginning of a 20 ms interval, signaling supplies a 20 ms Blank data block, and all other DCCH-mapped logical channels supply either a 20 ms Blank data block or an idle category 20 ms data block,[8] the multiplex sublayer shall assemble a 20 ms DCCH SDU by creating a Null MuxPDU.

The multiplex sublayer shall deliver the assembled Physical Layer DCCH SDU or SDUs to the Physical Layer using the *Transmit DCCH Request* service interface operation in accordance with 2.2.2.2.1.7.2.

[8] A data service option may indicate a data block's category when it supplies the data block to the multiplex sublayer.

2.2.2.2.1.3.3 Assembling the Physical Layer SCCH SDU for Transmission

2.2.2.2.1.3.3.1 Mode A

For each SCCH (Supplemental Code Channel) that has been assigned, the multiplex sublayer shall assemble a Physical Layer SCCH SDU every 20 ms. The multiplex sublayer shall form a MuxPDU using a single data block from a connected service, requesting the data block from each connected service in order of the relative priority of each connected service.

If all connected services supply Blank data blocks, the multiplex sublayer shall create a Null MuxPDU.

If a connected service supplies a non-Blank data block and if the SCCH is used with Rate Set 1, the multiplex sublayer shall use the supplied data block to form a MuxPDU Type 1, as specified in 2.2.2.2.1.5.

If a connected service supplies a non-Blank data block and if the SCCH is used with Rate Set 2, the multiplex sublayer shall use the supplied data block to form a MuxPDU Type 2, as specified in 2.2.2.2.1.5.

The multiplex sublayer shall deliver the assembled Physical Layer SCCH SDU to the Physical Layer using the *Transmit SCCH Request* service interface operation in accordance with 2.2.2.2.1.7.3.

2.2.2.2.1.3.3.2 Procedures for Adding and Dropping R-SCCHs

Whenever the multiplex sublayer is delivering MuxPDUs of Type 1 or 2 for *i* R-SCCHs, the multiplex sublayer shall deliver a MuxPDU of Type 1 or 2 for each R-SCCH with code channel indices 1 to *i*. If the multiplex sublayer reduces the number of R-SCCHs on which it is delivering MuxPDUs of Type 1 or 2 (e.g., due to transmitter power limitations, lack of data to transmit, or when fewer R-SCCHs are allocated), the multiplex sublayer shall discontinue delivering MuxPDUs of Type 1 or 2 to the Physical Layer for R-SCCHs with the highest code channel indices first.

If $\text{REV\_DTX\_DURATION}_S$ is not equal to '1111' and the multiplex sublayer stops delivering MuxPDUs of Type 1 or 2 to the Physical Layer for an R-SCCH for a period of time longer than $\text{REV\_DTX\_DURATION}_S \times 20$ ms, then the multiplex sublayer shall not resume delivering MuxPDUs of Type 1 or 2 to the Physical Layer for that R-SCCH until that R-SCCH is re-allocated. Similarly, if the multiplex sublayer increases the number of MuxPDUs of Type 1 or 2 that are sent to the Physical Layer for R-SCCHs that are in use from *j* to *j* + 1 (e.g., due to resumption of transmission when discontinuous transmission is permitted, or when additional R-SCCHs are allocated), the multiplex sublayer shall begin to deliver MuxPDUs of Type 1 or 2 for an R-SCCH with code channel index *j* + 1 before delivering MuxPDUs of Type 1 or 2 for code channels with any larger index.

2.2.2.2.1.3.3.3 Procedures for the R-SCCH Transmission Preamble

- Whenever the multiplex sublayer begins to deliver MuxPDUs of Type 1 or 2 to the Physical Layer for an R-SCCH following one or more Null MuxPDUs for the first time after the allocation of the R-SCCH, the multiplex sublayer shall send a *Transmit R-SCCH Preamble Request* with NUM_PREAMBLE_FRAMES set to BEGIN_PREAMBLE_S.

2.2.2.2.1.3.3.4 Procedures for the R-SCCH Discontinuous Transmission (DTX) Preamble

If the currently connected service option permits discontinuous R-SCCH transmission, then the multiplex sublayer may resume delivering MuxPDUs of Type 1 or 2 to the Physical Layer for an R-SCCH following one or more Null MuxPDUs for that R-SCCH. When the multiplex sublayer resumes delivering MuxPDUs of Type 1 or 2 for an R-SCCH, the multiplex sublayer shall indicate to the Physical Layer that the Discontinuous Transmission preamble is to be transmitted on the R-SCCH by sending a *Transmit R-SCCH Preamble Request* to the Physical Layer with NUM_PREAMBLE_FRAMES set to RESUME_PREAMBLE_S.

The multiplex sublayer shall not indicate that the Supplemental Code Channel Discontinuous Transmission preamble is to be transmitted by the Physical Layer when the multiplex sublayer begins to deliver MuxPDUs of Type 1 or 2 for an R-SCCH following the allocation of that R-SCCH.

2.2.2.2.1.3.4 Assembling the Physical Layer SCH SDU for Transmission

2.2.2.2.1.3.4.1 Mode B

For each SCH that has been assigned, the multiplex sublayer shall assemble a Physical Layer SCH SDU every 20 ms. The multiplex sublayer shall form each MuxPDU using a single data block from a SCH-mapped logical channel. The multiplex sublayer shall request data blocks from the SCH-mapped logical channels, according to the relative priority of each logical channel, until enough data blocks have been supplied to form the number of MuxPDUs needed to fill the SCH SDU, or all SCH-mapped logical channels have supplied all available data blocks. The multiplex sublayer shall indicate the multiplex option in use when it requests data blocks from the SCH-mapped logical channels.

If all SCH-mapped logical channels supply a Blank data block, the multiplex sublayer shall create a single Null MuxPDU and shall consider assembly of this Physical Layer SCH SDU completed.

If the SCH multiplex option in use is 0x3, the multiplex sublayer shall use the supplied non-Blank data block to form a MuxPDU Type 1, as specified in 2.2.2.2.1.5.

If the SCH multiplex option in use is 0x4, the multiplex sublayer shall use the supplied non-Blank data block to form a MuxPDU Type 2, as specified in 2.2.2.2.1.5.

If the SCH multiplex option in use is greater than 0x10, the multiplex sublayer shall use each supplied non-Blank data block to form a MuxPDU Type 3, as specified in 2.2.2.2.1.5. If the Physical Layer uses convolutional coding for the SCH during transmission of the Physical Layer frame containing the SDU, and if Table 10 indicates a non-zero number of LTUs in the SDU, the multiplex sublayer shall assemble the Physical Layer SCH SDU using LTUs, according to 2.2.2.2.1.3.4.1.1. Otherwise, the multiplex sublayer shall insert the MuxPDUs serially into the Physical Layer SCH SDU. If the number of inserted MuxPDUs is less than the number of MuxPDUs required by the multiplex option for the SCH (see Table 8), then the multiplex sublayer shall insert one Fill MuxPDU containing a data block of the size indicated by the multiplex option associated with the SCH, filled with ‘0’ bits. The multiplex sublayer shall fill any remaining space in the SCH SDU with ‘0’ bits.

The multiplex sublayer shall deliver the assembled Physical Layer SCH SDU to the Physical Layer using the *Transmit SCH Request* service interface operation in accordance with 2.2.2.2.1.7.4.

2.2.2.2.1.3.4.1.1 LTU Assembly

The multiplex sublayer shall combine Type 3 MuxPDUs into LTUs according to Table 10. Each LTU shall contain a 16-bit CRC and either 2 MuxPDUs that contain a single size non-Blank data block or 1 MuxPDU that contains a double size non-Blank data block. If there are not enough supplied MuxPDUs to fill every LTU in the Physical Layer SCH SDU, the multiplex sublayer shall insert enough Fill MuxPDUs into each LTU that is not full, so as to fill the LTU. Each Fill MuxPDU shall contain a data block filled with '0' bits, of the size indicated by the multiplex option associated with the SCH. The multiplex sublayer shall calculate a 16-bit CRC on all bits in the LTU, except the CRC, and shall insert the CRC following the MuxPDUs in the LTU. The CRC shall be calculated using the procedure used to calculate the 16-bit SCH frame quality indicator. The multiplex sublayer shall insert the LTUs serially into the Physical Layer SCH SDU and shall fill any remaining space in the Physical Layer SCH SDU with '0' bits.

Table 10. Number of LTUs in an SCH Physical Layer SDU

SDU Transmit Rate (bits/sec)	Number of LTUs in the SDU
9600	0
19200	0
38400	2
76800	4
153600	8
14400	0
28800	0
57600	2
115200	4
230400	8

2.2.2.2.1.3.4.2 Procedures for Discontinuous Transmission (DTX) on the R-SCH

If $REV\_DTX\_DURATION_S$ is not equal to '1111' and the multiplex sublayer delivers consecutive Null MuxPDUs to the Physical Layer for a period of time longer than $REV\_DTX\_DURATION_S \times 20$ ms, then the multiplex sublayer shall not resume delivering MuxPDUs of Type 1, 2, or 3 to the Physical Layer for that R-SCH until the R-SCH is re-allocated by the base station.

If $REV\_DTX\_DURATION_S$ is equal to '1111', the multiplex sublayer may resume delivering MuxPDUs of Type 1, 2, or 3 to the Physical Layer for the R-SCH at any time that the R-SCH is allocated.

2.2.2.2.1.4 Multiplex Sublayer Receiving Function

The Physical Layer delivers a Physical Layer SDU to the multiplex sublayer using a physical channel specific *Receive Indication* service interface operation.

The mobile station's multiplex sublayer shall categorize each MuxPDU in each received Physical Layer SDU and shall supply the category when it delivers a data block from the SDU to the logical channel. Table 11 lists the categories associated with each MuxPDU Type 1 that may be received on the FCH or DCCH. Table 12 lists the categories associated with each MuxPDU Type 2 that may be received on the FCH or DCCH. Table 13 lists the categories associated with each MuxPDU Type 4 that may be received on the FCH or DCCH. Table 14 lists the categories associated with each MuxPDU Type 1 that may be received on a SCCH or a SCH operating at 9600 bps. Table 15 lists the categories associated with each MuxPDU Type 2 that may be received on a SCCH or SCH operating at 14400 bps. Table 16 lists the categories associated with each MuxPDU Type 3 that may be received on a SCH operating at rate 2x or higher.

Table 11. Received MuxPDU Type 1 Categories and Formats for the FCH and DCCH

	MuxPDU Header or Frame Description						Applies to	
Category	**Mixed Mode (MM)**	**Traffic Type (TT)**	**Traffic Mode (TM)**	**Primary Traffic (bits/ block)**	**Signaling Traffic (bits/ block)**	**Secondary Traffic (bits/block)**	**FCH**	**DCCH**
1	'0'	–	–	171	0	0	Y	Y
2	'1'	'0'	'00'	80	88	0	Y	Y
3	'1'	'0'	'01'	40	128	0	Y	Y
4	'1'	'0'	'10'	16	152	0	Y	Y
5	'1'	'0'	'11'	0	168	0	Y	Y
6	–	–	–	80	0	0	Y	N
7	–	–	–	40	0	0	Y	N
8	–	–	–	16	0	0	Y	N
9	9600 bps Physical Layer frame with insufficient Physical Layer frame quality [9]			0	0	0	Y	Y
10	Insufficient Physical Layer frame quality[10]			0	0	0	Y	Y
11	'1'	'1'	'00'	80	0	88	Y	Y
12	'1'	'1'	'01'	40	0	128	Y	Y
13	'1'	'1'	'10'	16	0	152	Y	Y
14	'1'	'1'	'11'	0	0	168	Y	Y
15	Null Physical Layer frame			0	0	0	N	Y

[9] This category is used when the Physical Layer frame quality is insufficient, but other parameters indicate a 9600 bps frame has been received.

[10] This category is used when the Physical Layer frame's bit rate cannot be determined or when the error does not belong to category 9.

Table 12. Received MuxPDU Type 2 Categories and Formats for the FCH and DCCH

	MuxPDU Header or Frame Description					Applies to	
Category	**Mixed Mode (MM)**	**Frame Mode (FM)**	**Primary Traffic (bits/ block)**	**Signaling Traffic (bits/ block)**	**Secondary Traffic (bits/block)**	**FCH**	**DCCH**
1	'0'	–	266	0	0	Y	Y
2	'1'	'0000'	124	138	0	Y	Y
3	'1'	'0001'	54	208	0	Y	Y
4	'1'	'0010'	20	242	0	Y	Y
5	'1'	'0011'	0	262	0	Y	Y
6	'1'	'0100'	124	0	138	Y	Y
7	'1'	'0101'	54	0	208	Y	Y
8	'1'	'0110'	20	0	242	Y	Y
9	'1'	'0111'	0	0	262	Y	Y
10	'1'	'1000'	20	222	20	Y	Y
11	'0'	–	124	0	0	Y	N
12	'1'	'000'	54	67	0	Y	N
13	'1'	'001'	20	101	0	Y	N
14	'1'	'010'	0	121	0	Y	N
15	'1'	'011'	54	0	67	Y	N
16	'1'	'100'	20	0	101	Y	N
17	'1'	'101'	0	0	121	Y	N
18	'1'	'110'	20	81	20	Y	N
19	'0'	–	54	0	0	Y	N
20	'1'	'00'	20	32	0	Y	N
21	'1'	'01'	0	52	0	Y	N
22	'1'	'10'	20	0	32	Y	N
23	'1'	'11'	0	0	52	Y	N
24	'0'	–	20	0	0	Y	N
25	'1'	–	0	0	20	Y	N
26	Insufficient Physical Layer frame quality[11]		0	0	0	Y	Y
27	Null Physical Layer frame		0	0	0	N	Y

[11] This category is used when the Physical Layer frame's bit rate cannot be determined or when errors are detected.

Table 13. Received MuxPDU Type 4 Categories and Formats for the FCH and DCCH

Category	MuxPDU Header or Description	Signaling Traffic (bits/ block)	Applies to	
			FCH	DCCH
1	-	24	Y	Y
2	Insufficient Physical Layer frame quality	0	Y	Y

Table 14. Received MuxPDU Type 1 Categories and Formats for the SCCH and SCH

	MuxPDU Header or Frame Description					
Category	Mixed Mode (MM)	Traffic Type (TT)	Traffic Mode (TM)	Primary Traffic (bits/ block)	Signaling Traffic (bits/ block)	Secondary Traffic (bits/block)
1	'0'	–	–	171	0	0
2	'1'	'1'	'11'	0	0	168
3	Insufficient Physical Layer frame quality			0	0	0

Table 15. Received MuxPDU Type 2 Categories and Formats for the SCCH and SCH

	MuxPDU Header or Frame Description				
Category	**Mixed Mode (MM)**	**Frame Mode (FM)**	**Primary Traffic (bits/ block)**	**Signaling Traffic (bits/ block)**	**Secondary Traffic (bits/block)**
1	'0'	–	266	0	0
2	'1'	'0111'	0	0	262
3	Insufficient Physical Layer frame quality		0	0	0

Table 16. Received MuxPDU Type 3 Categories and Formats for the SCH

Category	**Frame Description or MuxPDU Header**		**Traffic (bits/ block)**	**RS 1**	**RS 2**
	sr_id	**Reserved**			
4	'001'-'110'	'000'	170	X	
			266		X
5	'001'-'110'	'000'	346	X	
			538		X
3	Insufficient Physical Layer frame quality		0	X	X

2.2.2.2.1.4.1 Processing the Received Physical Layer FCH SDU

2.2.2.2.1.4.1.1 Mode A

If a FCH physical channel has been assigned, the Physical Layer delivers a Physical Layer FCH SDU every 20 ms. Each Physical Layer FCH SDU contains at most one MuxPDU.

If the Physical Layer indicates the Physical Layer frame's size is 20 ms and the Physical Layer frame's quality is sufficient, the multiplex sublayer shall identify the MuxPDU in the Physical Layer SDU according to the following:

- If the FCH physical channel is used with Rate Set 1, the multiplex sublayer shall use Table 17 to identify a MuxPDU Type 1 from the set of those allowed for the FCH.
- If the FCH physical channel is used with Rate Set 2, the multiplex sublayer shall use Table 18 to identify a MuxPDU Type 2 from the set of those allowed for the FCH.

If the multiplex sublayer identifies a valid, non-null traffic MuxPDU, it shall deliver the signaling data block to signaling, and deliver each data block for a connected service to that service.

The multiplex sublayer shall deliver a Blank data block to signaling and each connected service when any of the following are true:

- The Physical Layer indicates the Physical Layer frame's size is not 20 ms.
- The Physical Layer indicates the Physical Layer frame's quality is insufficient.
- The multiplex sublayer cannot identify the MuxPDU in the Physical Layer SDU, or determines the MuxPDU is invalid.
- The multiplex sublayer determines it has received a null traffic MuxPDU.

When the multiplex sublayer delivers a data block to signaling, it shall use the procedures in 2.2.2.2.1.6.

2.2.2.2.1.4.1.2 Mode B

If an FCH physical channel has been assigned, the Physical Layer delivers a Physical Layer FCH SDU at least every 20 ms. Each Physical Layer FCH SDU contains at most one MuxPDU.

If the Physical Layer indicates the Physical Layer frame's size is 5 ms and the Physical Layer frame's quality is sufficient, the multiplex sublayer shall identify the MuxPDU in the Physical Layer SDU according to Table 20. If the multiplex sublayer identifies a valid MuxPDU Type 4, it shall deliver the signaling data block to signaling.

If the Physical Layer indicates the Physical Layer frame's size is 20 ms and the Physical Layer frame's quality is sufficient, the multiplex sublayer shall identify the MuxPDU in the Physical Layer SDU according to the following:

- If the FCH physical channel is used with Rate Set 1, the multiplex sublayer shall use Table 17 to identify a MuxPDU Type 1 from the set of those allowed for the FCH.
- If the FCH physical channel is used with Rate Set 2, the multiplex sublayer shall use Table 18 to identify a MuxPDU Type 2 from the set of those allowed for the FCH.

If the multiplex sublayer identifies a valid, non-null traffic 20 ms MuxPDU, it shall deliver the signaling data block to signaling and shall deliver each data block for a FCH-mapped logical channel to that logical channel. If the Physical Layer indicates that the Physical Layer frame's bit rate is less than the negotiated maximum bit rate, the mobile station's multiplex sublayer shall set the multiplex format indicator to the MuxPDU category (e.g., from Table 11 or Table 12), and shall set the category for the MuxPDU to the MuxPDU category associated with a null Physical Layer frame category[12] and shall supply the multiplex format indicator in addition to the category when it delivers a Blank data block to a FCH-mapped logical channel.

The multiplex sublayer shall deliver a Blank data block to signaling and to each FCH-mapped logical channel when any one or more of the following is true:

- The Physical Layer indicates the Physical Layer frame's size is not 5 ms or 20 ms.
- The Physical Layer indicates the Physical Layer frame's quality is insufficient.
- The multiplex sublayer cannot identify the MuxPDU in the Physical Layer SDU, or determines the MuxPDU is invalid.

[12] This category indicates that a service had an opportunity to send information but did not, and may be used by the service to advance retransmission timers.

- The multiplex sublayer determines it has received a null traffic MuxPDU.

When the multiplex sublayer delivers a data block to signaling, it shall use the procedures in 2.2.2.2.1.6.

2.2.2.2.1.4.2 Processing the Received Physical Layer DCCH SDU

2.2.2.2.1.4.2.1 Mode B

If a DCCH physical channel has been assigned, the Physical Layer delivers a Physical Layer DCCH SDU at least every 20 ms. Each Physical Layer DCCH SDU contains at most one MuxPDU.

If the Physical Layer indicates no-frame-received, the multiplex sublayer shall perform the following:

- If PILOT_GATING_USE_RATE is equal to '0', then the multiplex sublayer shall deliver a Blank data block to signalingand to each DCCH-mapped logical channel; the mobile station's multiplex sublayer shall use the null Physical Layer frame category[13] when it delivers a Blank data block to a DCCH-mapped logical channel.
- Otherwise, if PILOT_GATING_USE_RATE is not equal to '0', then the multiplex sublayer shall deliver a Blank data block to signaling.

If the Physical Layer indicates the Physical Layer frame's size is 5 ms and the Physical Layer frame's quality is sufficient, the multiplex sublayer shall identify the MuxPDU in the Physical Layer SDU according to Table 20. If the multiplex sublayer identifies a valid MuxPDU Type 4, it shall deliver the signaling data block to signaling.

If the Physical Layer indicates the Physical Layer frame's size is 20 ms and the Physical Layer frame's quality is sufficient, the multiplex sublayer shall identify the MuxPDU in the Physical Layer SDU according to the following:

- If the DCCH physical channel is used with Rate Set 1, the multiplex sublayer shall use Table 17 to identify a MuxPDU Type 1 from the set of those allowed for the DCCH.
- If the DCCH physical channel is used with Rate Set 2, the multiplex sublayer shall use Table 18 to identify a MuxPDU Type 2 from the set of those allowed for the DCCH.

If the multiplex sublayer identifies a valid, non-null traffic 20 ms MuxPDU, it shall deliver the signaling data block to signaling, and shall deliver each data block for a DCCH-mapped logical channel to that logical channel.

The multiplex sublayer shall deliver a Blank data block to signaling when any one or more of the following is true:

- The Physical Layer indicates that the Physical Layer frame's size is unknown.
- The Physical Layer indicates that the Physical Layer frame's quality is insufficient.
- The multiplex sublayer cannot identify the MuxPDU in the Physical Layer SDU, or determines if the MuxPDU is invalid.

[13] This category indicates that a service had an opportunity to send information but did not, and may be used by the service to advance retransmission timers.

The multiplex sublayer shall deliver a Blank data block to each DCCH-mapped logical channel when PILOT_GATING_USE_RATE is equal to '0' and any one or more of the following is true:

- The Physical Layer indicates that the Physical Layer frame's size is unknown.
- The Physical Layer indicates that the Physical Layer frame's quality is insufficient.
- The multiplex sublayer cannot identify the MuxPDU in the Physical Layer SDU, or determines if the MuxPDU is invalid.

When the multiplex sublayer delivers a data block to signaling, it shall use the procedures in 2.2.2.2.1.6.

2.2.2.2.1.4.3 Processing the Received Physical Layer SCCH SDU

2.2.2.2.1.4.3.1 Mode A

For each assigned SCCH physical channel, the Physical Layer delivers a Physical Layer SCCH SDU every 20 ms. Each Physical Layer SCCH SDU contains at most one MuxPDU.

If the Physical Layer indicates the Physical Layer frame's size is 20 ms and the Physical Layer frame's quality is sufficient, the multiplex sublayer shall identify the MuxPDU in the Physical Layer SDU according to the following:

- If the SCCH physical channel is used with Rate Set 1, the multiplex sublayer shall use Table 17 to identify a MuxPDU Type 1 from the set of those allowed for the SCCH.
- If the SCCH physical channel is used with Rate Set 2, the multiplex sublayer shall use Table 18 to identify a MuxPDU Type 2 from the set of those allowed for the SCCH.

If the multiplex sublayer identifies a valid MuxPDU, it shall deliver each data block for a connected service to that service.

The multiplex sublayer shall deliver a Blank data block to each connected service when one or more of the following is true:

- The Physical Layer indicates the Physical Layer frame's size is not 20 ms.
- The Physical Layer indicates the Physical Layer frame's quality is insufficient.
- The multiplex sublayer cannot identify the MuxPDU in the Physical Layer SDU, or it determines that the MuxPDU is invalid.

2.2.2.2.1.4.4 Processing the Received Physical Layer SCH SDU

2.2.2.2.1.4.4.1 Mode B

For each assigned SCH physical channel, the Physical Layer delivers a Physical Layer SCH SDU every 20 ms. Each Physical Layer SCH SDU contains one or more MuxPDUs.

The multiplex sublayer shall process the Physical Layer SDU according to 2.2.2.2.1.4.4.1.2 when all of the following are true:

- the SCH multiplex option in use is greater than 0x10,
- the Physical Layer indicates the Physical Layer frame's size is 20 ms,

- the Physical Layer used convolutional coding for the SCH during transmission of the Physical Layer frame, and
- Table 10 indicates a non-zero number of LTUs in the SDU.

Otherwise, the multiplex sublayer shall process the Physical Layer SDU according to 2.2.2.2.1.4.4.1.1.

2.2.2.2.1.4.4.1.1 Non-LTU Processing

If the Physical Layer indicates the Physical Layer frame's size is 20 ms and the Physical Layer frame's quality is sufficient, the multiplex sublayer shall identify the MuxPDUs in the Physical Layer SDU according to the following:

- If the SCH multiplex option in use is 0x3, the mux sublayer shall use Table 17 to identify each MuxPDU Type 1 from the set of those allowed for the SCH.
- If the SCH multiplex option in use is 0x4, the mux sublayer shall use Table 18 to identify each MuxPDU Type 2 from the set of those allowed for the SCH.
- If the SCH multiplex option in use is greater than 0x10, the multiplex sublayer shall use Table 19 to identify each MuxPDU Type 3.

For each valid MuxPDU Type 1 or MuxPDU Type 2, the multiplex sublayer shall deliver each data block for an SCH-mapped logical channel to that logical channel. For each valid, non-Fill MuxPDU Type 3, the multiplex sublayer shall deliver the data block to the SCH-mapped logical channel with a Service Reference matching sr_id in the MuxPDU.

The multiplex sublayer shall deliver a Blank data block to each SCH-mapped logical channel when one or more of the following is true:

- The Physical Layer indicates that the Physical Layer frame's size is not 20 ms.
- The Physical Layer indicates that the Physical Layer frame's quality is insufficient.
- The multiplex sublayer cannot identify the MuxPDU in the Physical Layer SDU, or it determines that the MuxPDU is invalid.

2.2.2.2.1.4.4.1.2 LTU Processing

The multiplex sublayer shall use Table 10 to identify the number of LTUs in the Physical Layer SDU. For each LTU, the multiplex sublayer shall identify the MuxPDUs in the LTU according to the following:

- If the Physical Layer indicates that the Physical Layer frame's quality is insufficient, the multiplex sublayer shall check the CRC in the LTU. If the CRC in the LTU is incorrect, the multiplex sublayer shall not identify the MuxPDUs in the LTU. If the CRC is correct, the multiplex sublayer shall use Table 19 to identify each MuxPDU Type 3 in the LTU.
- If the Physical Layer indicates that the Physical Layer frame's quality is sufficient, the multiplex sublayer shall use Table 19 to identify each MuxPDU Type 3 in the LTU.

For each valid, non-Fill MuxPDU Type 3, the multiplex sublayer shall deliver the data block to the SCH-mapped logical channel with a Service Reference matching sr_id in the MuxPDU.

The multiplex sublayer shall deliver a Blank data block to each SCH-mapped logical channel when one or more of the following is true:

- The Physical Layer indicates the Physical Layer frame's quality is insufficient and there are no LTUs with a correct CRC in the Physical Layer SDU.
- The multiplex sublayer cannot identify any MuxPDU in the Physical Layer SDU, or it determines that all the MuxPDUs are invalid.

2.2.2.2.1.5 MuxPDU Types Processed by the Multiplex Sublayer

Figure 6 shows the MuxPDU types processed by the multiplex sublayer.

When the multiplex sublayer is operating in Mode B, and when it is forming a MuxPDU Type 1, a MuxPDU Type 2 or a MuxPDU Type 3, it shall use the supplied data blocks to form the MuxPDU according to the following procedures:

- The multiplex sublayer shall determine the traffic type of the data block from the Traffic Channel traffic type in the service option connection record (i.e., FOR_TRAFFIC for forward traffic type or REV_TRAFFIC for reverse traffic) for the service option connection associated with the logical channel that supplied the data block.
- The multiplex sublayer shall determine the Service Reference identifier (sr_id) to be included in MuxPDUs that include an sr_id field according to the following rules:
  - If the logical channel that supplied the data block is the dsch, the sr_id field is set to '000'.
  - If the logical channel that supplied the data block is a dtch and the MuxPDU is not a Fill MuxPDU, the sr_id field is set to the sr_id value specified for the service instance associated with the dtch.
  - If the MuxPDU is a Fill MuxPDU, the sr_id field is set to '111'.
- The multiplex sublayer shall form the MuxPDU as follows:
  - To form a MuxPDU Type 1, the multiplex sublayer shall form the MuxPDU according to the set of allowed data block combinations specified in Table 17.
  - To form a MuxPDU Type 2, the multiplex sublayer shall form the MuxPDU according to the set of allowed data block combinations specified in Table 18.
  - To form a MuxPDU Type 3, the multiplex sublayer shall form the MuxPDU according to the set of allowed data block combinations specified in Table 19.

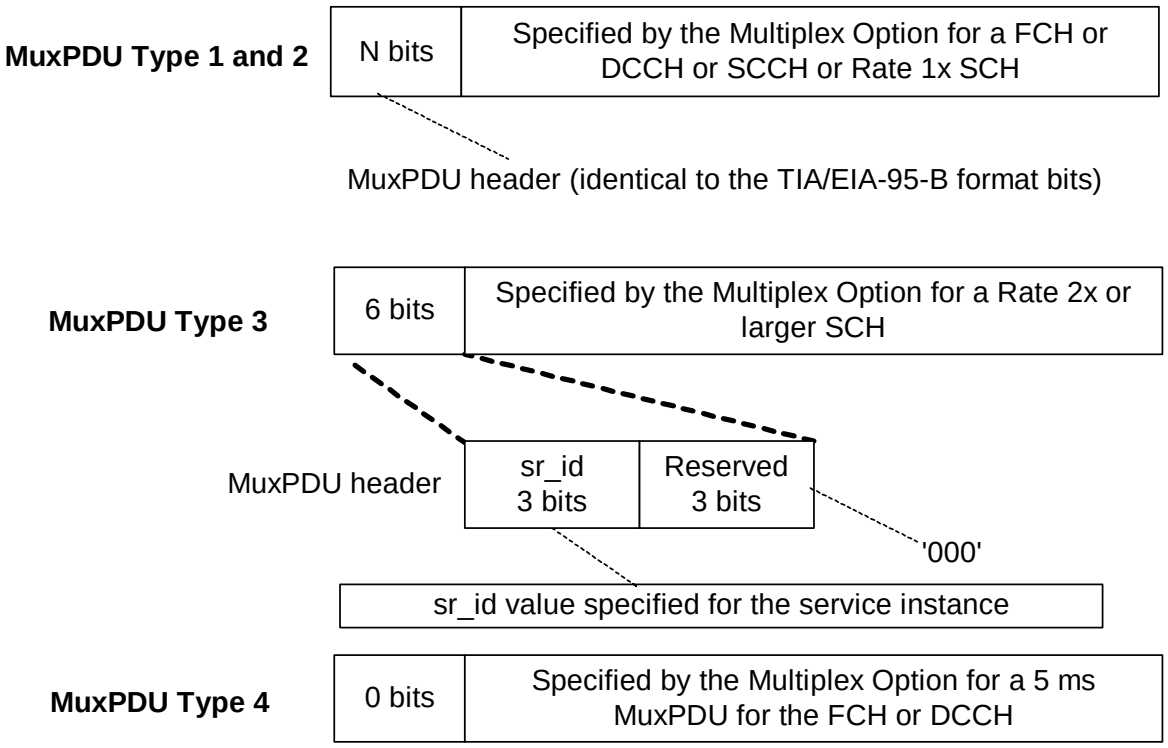

Figure 6. MuxPDU Types Processed by the Multiplex Sublayer

2.2.2.2.1.5.1 MuxPDU Type 1

Table 17 lists the allowed data block combinations for the FCH, DCCH, SCCH, and SCH. The SCCH referenced in Table 17 is a TIA/EIA-95-B Supplemental Code Channel operating at 9600 bps; the SCH is a Supplemental Channel operating at 9600 bps.

Table 17. MuxPDU Type 1 Formats

	MuxPDU Header						Permitted on			
Transmit Rate (bits/sec)	Mixed Mode (MM)	Traffic Type (TT)	Traffic Mode (TM)	Primary Traffic (bits/ block)	Signaling Traffic (bits/ block)	Secondary Traffic (bits/block)	FCH	DCCH	SCCH	SCH
9600	'0'	–	–	171	0	0	Y	Y	Y	Y
	'1'	'0'	'00'	80	88	0	Y	Y	N	N
	'1'	'0'	'01'	40	128	0	Y	Y	N	N
	'1'	'0'	'10'	16	152	0	Y	Y	N	N
	'1'	'0'	'11'	0	168	0	Y	Y	N	N
	'1'	'1'	'00'	80	0	88	Y	Y	N	N
	'1'	'1'	'01'	40	0	128	Y	Y	N	N
	'1'	'1'	'10'	16	0	152	Y	Y	N	N
	'1'	'1'	'11'	0	0	168	Y	Y	Y	Y
4800	–	–	–	80	0	0	Y	N	N	N
2400/ 2700	–	–	–	40	0	0	Y	N	N	N
1200/ 1500	–	–	–	16	0	0	Y	N	N	N

2.2.2.2.1.5.2 MuxPDU Type 2

Table 18 lists the allowed data block combinations for the FCH, DCCH, SCCH, and SCH. The SCCH referenced in Table 18 is a TIA/EIA-95-B Supplemental Code Channel operating at 14400 bps; the SCH is an IS-2000 Supplemental Channel operating at 14400 bps.

Table 18. MuxPDU Type 2 Formats

	MuxPDU Header					Permitted on			
Transmit Rate (bits/sec)	Mixed Mode (MM)	Frame Mode (FM)	Primary Traffic (bits/ block)	Signaling Traffic (bits/ block)	Secondary Traffic (bits/block)	FCH	DCCH	SCCH	SCH
14400	'0'	–	266	0	0	Y	Y	Y	Y
	'1'	'0000'	124	138	0	Y	Y	N	N
	'1'	'0001'	54	208	0	Y	Y	N	N
	'1'	'0010'	20	242	0	Y	Y	N	N
	'1'	'0011'	0	262	0	Y	Y	N	N
	'1'	'0100'	124	0	138	Y	Y	N	N
	'1'	'0101'	54	0	208	Y	Y	N	N
	'1'	'0110'	20	0	242	Y	Y	N	N
	'1'	'0111'	0	0	262	Y	Y	Y	Y
	'1'	'1000'	20	222	20	Y	Y	N	N
7200	'0'	–	124	0	0	Y	N	N	N
	'1'	'000'	54	67	0	Y	N	N	N
	'1'	'001'	20	101	0	Y	N	N	N
	'1'	'010'	0	121	0	Y	N	N	N
	'1'	'011'	54	0	67	Y	N	N	N
	'1'	'100'	20	0	101	Y	N	N	N
	'1'	'101'	0	0	121	Y	N	N	N
	'1'	'110'	20	81	20	Y	N	N	N
3600	'0'	–	54	0	0	Y	N	N	N
	'1'	'00'	20	32	0	Y	N	N	N
	'1'	'01'	0	52	0	Y	N	N	N
	'1'	'10'	20	0	32	Y	N	N	N
	'1'	'11'	0	0	52	Y	N	N	N
1800	'0'	–	20	0	0	Y	N	N	N
	'1'	–	0	0	20	Y	N	N	N

2.2.2.2.1.5.3 MuxPDU Type 3

Table 19 lists the allowed data block combinations for a MuxPDU Type 3. For Rate Set 1, a data block containing 170 bits is called a single size data block, and a data block containing 346 bits is called a double size data block. For Rate Set 2, a data block containing 266 bits is called a single size data block, and a data block containing 538 bits is called a double size data block.

The sr_id field of the MuxPDU shall be set to:

- the sr_id determined by the data service instance associated with the logical channel that supplied the MuxPDU, if the MuxPDU is not a Fill MuxPDU; or
- '111', if the MuxPDU is a Fill MuxPDU.

Table 19. MuxPDU Type 3 Formats

	MuxPDU Header		Traffic bits/ block
	sr_id	Reserved	
Rate Set 1	'001'-'110'	'000'	170/346
	'111'	'000'	0
Rate Set 2	'001'-'110'	'000'	266/538
	'111'	'000'	0

2.2.2.2.1.5.4 MuxPDU Type 4

Table 20 lists the allowed data block combinations for a MuxPDU Type 4. A MuxPDU Type 4 is used to carry a 5 ms data block.

Table 20. MuxPDU Type 4 Formats

Transmit Rate (bits/sec)	Signaling Traffic (bits/ block)
9600	24

2.2.2.2.1.6 Interface to Signaling LAC

The multiplex sublayer sends a MAC-Availability.Indication (*channel_type, max_size, system_time*) primitive to the Signaling LAC entity to request information bits from signaling. The multiplex sublayer processes information that is received in a MAC-Data.Request (*channel_type, data, size*) primitive from the Signaling LAC entity. The multiplex sublayer sends a MAC-Data.Indication (*channel_id, type, data, size, system_time*) primitive to the Signaling LAC entity to indicate that data for the Signaling LAC entity has been received.

2.2.2.2.1.6.1 The MAC-SDUReady.Request Primitive

The multiplex sublayer may process the MAC-SDUReady.Request (*channel_type, size, scheduling_hint*) primitive. The parameters of this primitive may be used to determine the relative priority between traffic supplied by Signaling and other services. The exact manner for using this information to deliver over-the-air Quality of Service is not specified by this standard. The parameters to this primitive are as follows:

- *type* is set to "5ms FCH/DCCH frame", "20ms FCH/DCCH frame"
- *size* is set to the number of bits in the Layer 2 encapsulated PDU
- *scheduling_hint* is used to indicate to the multiplex sublayer of the MAC how to prioritize fragments of the Layer 2 encapsulated SDU relative to other types of multiplexed traffic.

2.2.2.2.1.6.2 The MAC-Availability.Indication Primitive

The multiplex sublayer shall send a MAC-Availability.Indication (*channel_type*, *max_size*, *system_time*) primitive to request information bits from the Signaling LAC entity whenever the multiplex sublayer is able to carry bits from Layer 2 encapsulated PDUs. The multiplex sublayer may use information received in a MAC-SDUReady.Request () primitive (e.g., *scheduling_hint*) to determine when to send MAC-Availability.Indication () primitive(s) to the Signaling LAC entity., : The parameters of the MAC-Availability.Indication () primitive shall be set as follows:

- *type* is the type of signaling message allowed (i.e., 5 ms or 20 ms or either),
- *max_size* is the maximum number of bits from the Signaling LAC that the multiplex sublayer can fit into the Physical Layer SDU subject to the current Quality of Service constraints, which are not specified by this standard, (e.g., the multiplex sublayer may set this parameter to a value that is less than the total available space in the MuxPDU to permit bits provided by other services to be transported in the same frame),[14] and
- *system_time* is the time at which the Physical Layer will transmit the first bit of the Physical Layer frame containing all of the information bits supplied by signaling.

2.2.2.2.1.6.3 The MAC-Data.Request Primitive

The multiplex sublayer shall process a MAC-Data.Request (*channel_type*, *data*, *size*) primitive from the Signaling LAC entity, where *data* is the Signaling LAC data to be transmitted. The MAC-Data.Request (*channel_type*, *data*, *size*) primitive shall be processed by creating a signaling data block, in accordance with the following procedure during Physical Layer SDU assembly:

- If signaling did not supply any information bits (i.e., *data* is NULL), the multiplex sublayer shall create a Blank data block.
- If signaling supplied more information bits than the *max_size* parameter indicated in the corresponding MAC-Availability.Indication (*channel_type*, *max_size*, *system_time*) primitive, the multiplex sublayer shall discard the information bits and create a Blank data block.
- The multiplex sublayer shall fit the received information bits into the closest size data block allowed by the Rate Set in use by the physical channel[15] which will hold all of the received bits. If there are not enough information bits to completely fill the data block, the multiplex sublayer shall fill the unfilled space with '0' bits.

2.2.2.2.1.6.4 The MAC-Data.Indication Primitive

The multiplex sublayer shall send one MAC-Data.Indication (*channel_id*, *type*, *data*, *size*, *system_time*) primitive to the Signaling LAC entity for each Physical Layer SDU containing signaling data. The multiplex sublayer shall not combine information bits from multiple Physical Layer SDUs.

The multiplex sublayer shall include the following parameters in a MAC-Data.Indication (*channel_id*, *type*, *data*, *size*, *system_time*) primitive:

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[14] The maximum number will vary depending upon the type of signaling message, i.e., 5 ms or 20 ms.

[15] The size of the data block will vary depending upon the type of signaling message, i.e., 5 ms or 20 ms.

- *channel_id* set to a channel identifier for the physical channel on which the data was received (see 2.2.2.2.2.4);
- *type* is the Physical Layer frame type (i.e., 5 ms or 20 ms),
- *data* is the data for the Signaling LAC entity,
- *size* is the size (in bits) of *data*, and
- *system_time* is the time at which the Physical Layer received the first bit of the Physical Layer frame containing the information bits.

2.2.2.2.1.7 Interface to the Physical Layer

The multiplex sublayer operates in time synchronization with the Physical Layer. If the Physical Layer is transmitting with a non-zero frame offset (see [2]), the multiplex sublayer delivers Physical Layer SDUs for transmission by the Physical Layer at the appropriate frame offset from system time. The multiplex sublayer delivers a Physical Layer SDU to the Physical Layer using a physical-channel specific *Transmit Request* service interface operation. The Physical Layer delivers a Physical Layer SDU to the multiplex sublayer using a physical channel specific *Receive Indication* service interface operation.

2.2.2.2.1.7.1 The *Transmit FCH Request* Service Interface Operation

To deliver a Physical Layer FCH SDU to the Physical Layer, the multiplex sublayer shall send a *Transmit FCH Request* to the Physical Layer with the following arguments:

- SDU, which the multiplex sublayer shall set to:
  - NULL if the Physical Layer FCH SDU contains a Null MuxPDU, or
  - the Physical Layer FCH SDU if the Physical Layer FCH SDU contains a MuxPDU Type 1 or MuxPDU Type 2 or MuxPDU Type 4.
- FRAME_SIZE, which the multiplex sublayer shall set to
  - 5 ms if the Physical Layer FCH SDU contains a MuxPDU Type 4, or
  - 20 ms if the Physical Layer FCH SDU contains a MuxPDU Type 1 or MuxPDU Type 2.
- FRAME_RATE, which the multiplex sublayer shall set to the MuxPDU's transmit rate if the Physical Layer FCH SDU contains a MuxPDU Type 1 or MuxPDU Type 2 or MuxPDU Type 4.

2.2.2.2.1.7.2 The *Transmit DCCH Request* Service Interface Operation

To deliver a Physical Layer DCCH SDU to the Physical Layer, the multiplex sublayer shall send a *Transmit DCCH Request* to the Physical Layer with the following arguments:

- SDU, which the multiplex sublayer shall set to:
  - NULL if the Physical Layer DCCH SDU contains a Null MuxPDU, or
  - the Physical Layer DCCH SDU if the Physical Layer DCCH SDU contains a MuxPDU Type 1 or MuxPDU Type 2 or MuxPDU Type 4.
- FRAME_DURATION, which the multiplex sublayer shall set to

- 5 ms if the Physical Layer DCCH SDU contains a MuxPDU Type 4, or
- 20 ms if the Physical Layer DCCH SDU contains a MuxPDU Type 1 or MuxPDU Type 2.

- FRAME_RATE, which the multiplex sublayer shall set to the MuxPDU's transmit rate if the Physical Layer DCCH SDU contains a MuxPDU Type 1 or MuxPDU Type 2 or MuxPDU Type 4.

2.2.2.2.1.7.3 The *Transmit SCCH Request* Service Interface Operation

To deliver a Physical Layer SCCH SDU to the Physical Layer, the multiplex sublayer shall send a *Transmit SCCH Request* to the Physical Layer with the following arguments:

- SDU, which the multiplex sublayer shall set to:
  - NULL if the Physical Layer SCCH SDU contains a Null MuxPDU, or
  - the Physical Layer SCCH SDU if the Physical Layer SCCH SDU contains a MuxPDU Type 1 or MuxPDU Type 2.
- FRAME_DURATION, which the multiplex sublayer shall set to
  - 20 ms if the Physical Layer SCCH SDU contains a MuxPDU Type 1 or MuxPDU Type 2.
- FRAME_RATE, which the multiplex sublayer shall set to the MuxPDU's transmit rate if the Physical Layer SCCH SDU contains a MuxPDU Type 1 or MuxPDU Type 2.

2.2.2.2.1.7.4 The *Transmit SCH Request* Service Interface Operation

To deliver a Physical Layer SCH SDU to the Physical Layer, the multiplex sublayer shall send a *Transmit SCH Request* to the Physical Layer with the following arguments:

- SDU, which the multiplex sublayer shall set to:
  - NULL if the Physical Layer SCH SDU contains a Null MuxPDU, or
  - the Physical Layer SCH SDU if the Physical Layer SCH SDU contains a MuxPDU Type 1 or MuxPDU Type 2 or MuxPDU Type 3.
- FRAME_DURATION, which the multiplex sublayer shall set to
  - 20 ms if the Physical Layer SCH SDU contains a MuxPDU Type 1 or MuxPDU Type 2 or MuxPDU Type 3.
- FRAME_RATE, which the multiplex sublayer shall set to the SCH's transmit rate.

2.2.2.2.1.7.5 The *Receive FCH Indication* Service Interface Operation

The Physical Layer delivers an FCH SDU to the multiplex sublayer using a *Receive FCH Indication* with the following arguments:

- SDU, which the Physical Layer sets to the Physical Layer FCH SDU if the Physical Layer received a Physical Layer FCH frame.
- FRAME_DURATION, which the Physical Layer sets to the duration of the received Physical Layer frame (i.e., 5 ms or 20 ms).
- FRAME_RATE, which the Physical Layer sets to the data rate of the received Physical Layer frame.

- FRAME_QUALITY, which the Physical Layer sets to the frame quality of the received Physical Layer frame (i.e., sufficient or insufficient).

2.2.2.2.1.7.6 The *Receive DCCH Indication* Service Interface Operation

The Physical Layer delivers an DCCH SDU to the multiplex sublayer using a *Receive DCCH Indication* with the following arguments:

- SDU, which the Physical Layer sets to:
  - NULL if the Physical Layer did not receive a Physical Layer DCCH frame, or
  - the Physical Layer DCCH SDU if the Physical Layer received a Physical Layer DCCH frame.
- FRAME_DURATION, which the Physical Layer sets to the duration of the received Physical Layer frame (i.e., 5 ms or 20 ms).
- FRAME_RATE, which the Physical Layer sets to the data rate of the received Physical Layer frame.
- FRAME_QUALITY, which the Physical Layer sets to the frame quality of the received Physical Layer frame (i.e., sufficient or insufficient).

2.2.2.2.1.7.7 The *Receive SCCH Indication* Service Interface Operation

The Physical Layer delivers an SCCH SDU to the multiplex sublayer using a *Receive SCCH Indication* with the following arguments:

- SDU, which the Physical Layer sets to the Physical Layer SCCH SDU if the Physical Layer received a Physical Layer SCCH frame.
- FRAME_DURATION, which the Physical Layer sets to the duration of the received Physical Layer frame (i.e., 20 ms).
- FRAME_RATE, which the Physical Layer sets to the data rate of the received Physical Layer frame.
- FRAME_QUALITY, which the Physical Layer sets to the frame quality of the received Physical Layer frame (i.e., sufficient or insufficient).

2.2.2.2.1.7.8 The *Receive SCH Indication* Service Interface Operation

The Physical Layer delivers an SCH SDU to the multiplex sublayer using a *Receive SCH Indication* with the following arguments:

- SDU, which the Physical Layer sets to the Physical Layer SCH SDU if the Physical Layer received a Physical Layer SCH frame.
- FRAME_DURATION, which the Physical Layer sets to the duration of the received Physical Layer frame (i.e., 20 ms).
- FRAME_RATE, which the Physical Layer sets to the data rate of the received Physical Layer frame.
- FRAME_QUALITY, which the Physical Layer sets to the frame quality of the received Physical Layer frame (i.e., sufficient or insufficient).

2.2.2.2.2 SRBP and Common Channel Multiplex Sublayer

2.2.2.2.2.1 Overview (Informative)

2.2.2.2.2.1.1 Sync Channel Procedures

The Sync Channel is used to provide time and frame synchronization to the mobile station.

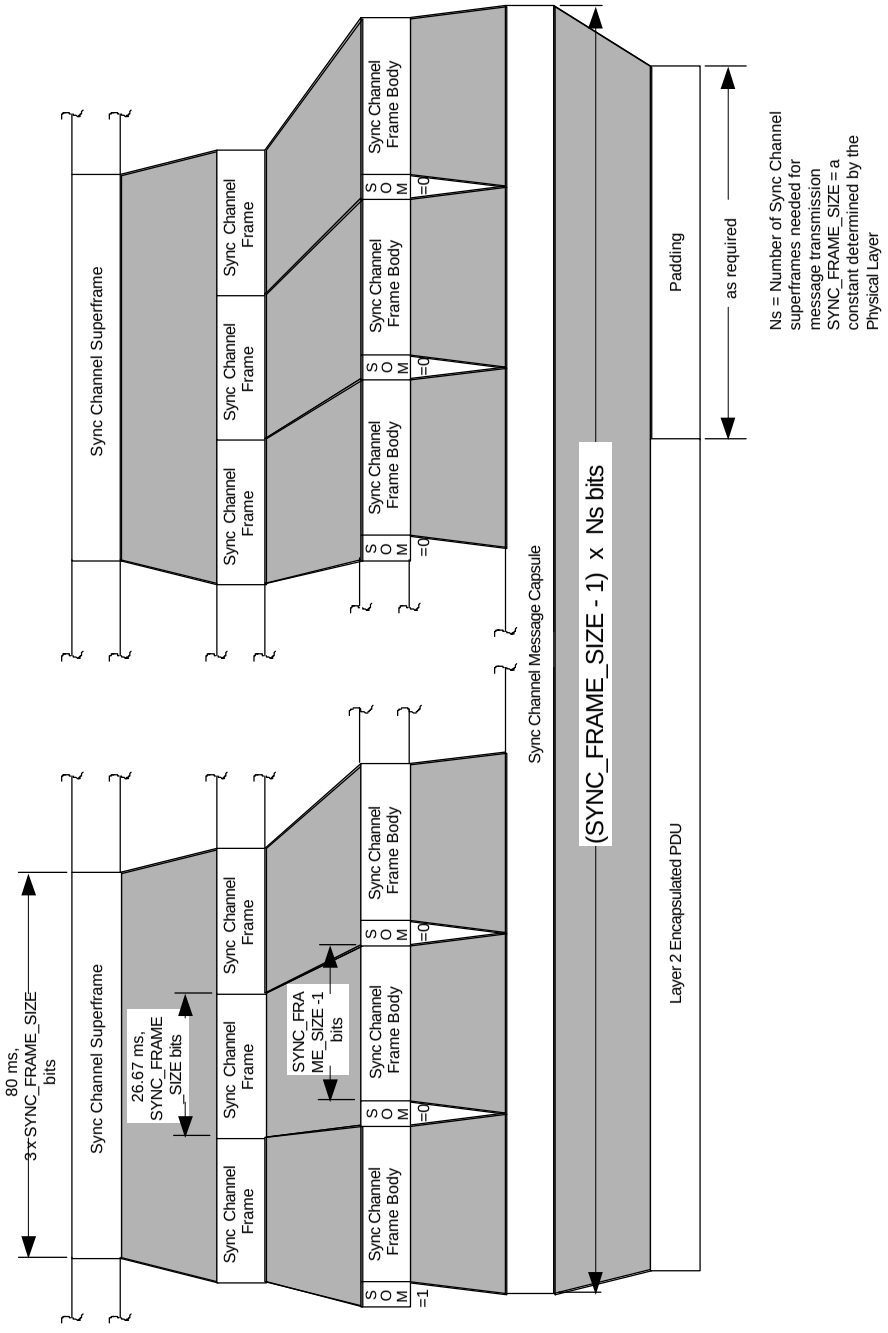

Figure 7. Sync Channel Structure (1200bps) Example

2.2.2.2.2.1.2 Paging Channel Procedures

The Paging Channel is used to send control information to mobile stations that have not been assigned to a Traffic Channel.

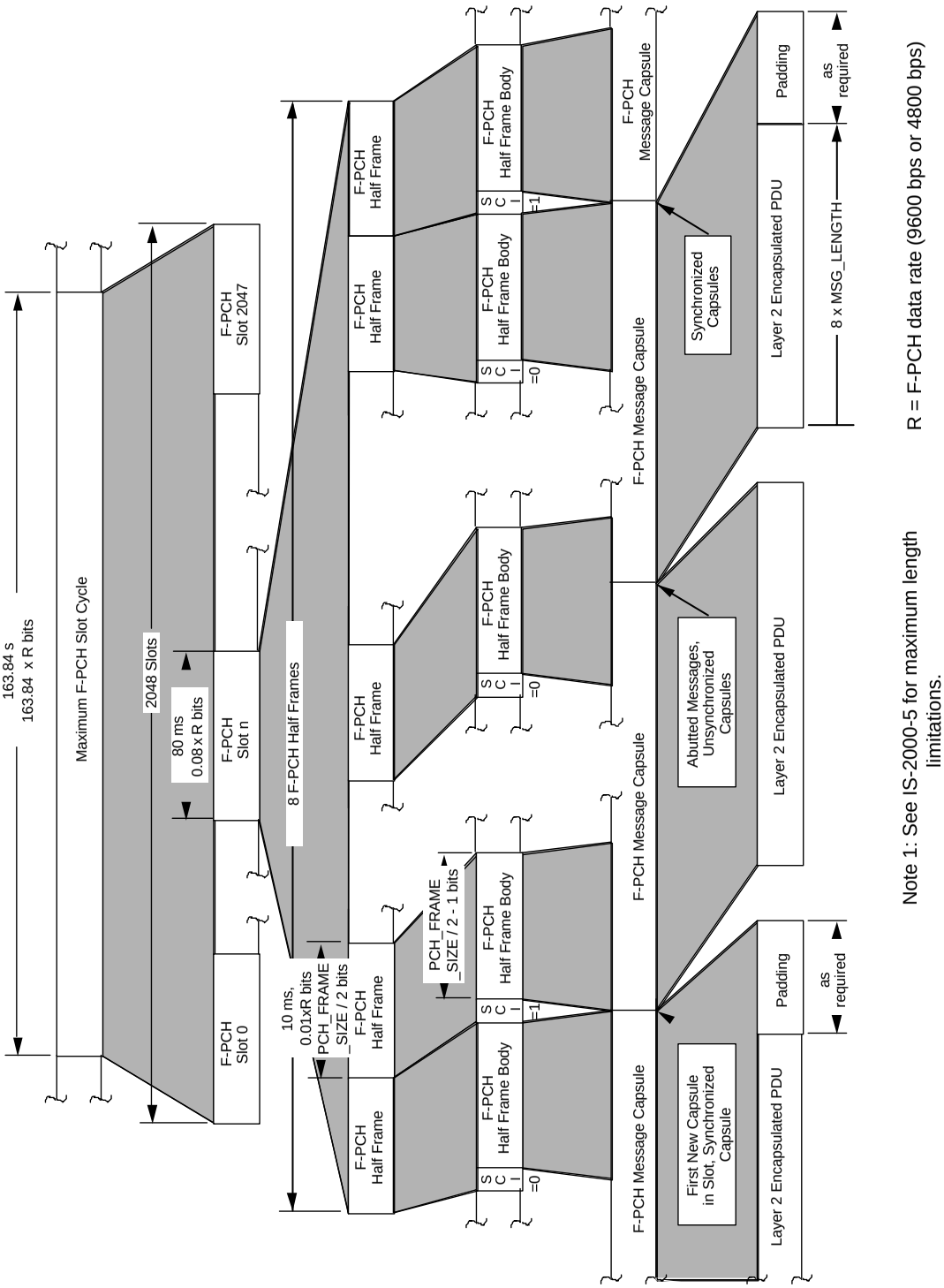

Figure 8. Paging Channel Structure Example

2.2.2.2.2.1.3 Access Procedures

The entire process of sending one Layer 2 encapsulated PDU and receiving (or failing to receive) an acknowledgment for the PDU is called an access attempt (see Figure 9). One access attempt consists of one or more access sub-attempts (see Figure 9 and Figure 10). Each transmission in the access sub-attempt is called an access probe. Each access probe consists of an R-ACH preamble and a R-ACH message capsule (see Figure 10).

Within an access sub-attempt, access probes are grouped into access probe sequences. The R-ACH used for each access probe sequence is chosen pseudorandomly from among all the R-ACHs associated with the current F-PCH. If there is only one R-ACH associated with the current F-PCH, all access probes within an access probe sequence are transmitted on the same R-ACH. If there is more than one R-ACH associated with the current F-PCH, all access probes within an access probe sequence may be transmitted on the different R-ACHs associated with the current F-PCH. Each access probe sequence consists of up to 1 + NUM_STEP_S access probes. The first access probe of each access probe sequence is transmitted at an initial power level determined by the Physical Layer relative to the nominal open loop power level. Each subsequent access probe within an access probe sequence is transmitted at a power level that is a function of PWR_LVL, calculated by the SRBP entity.

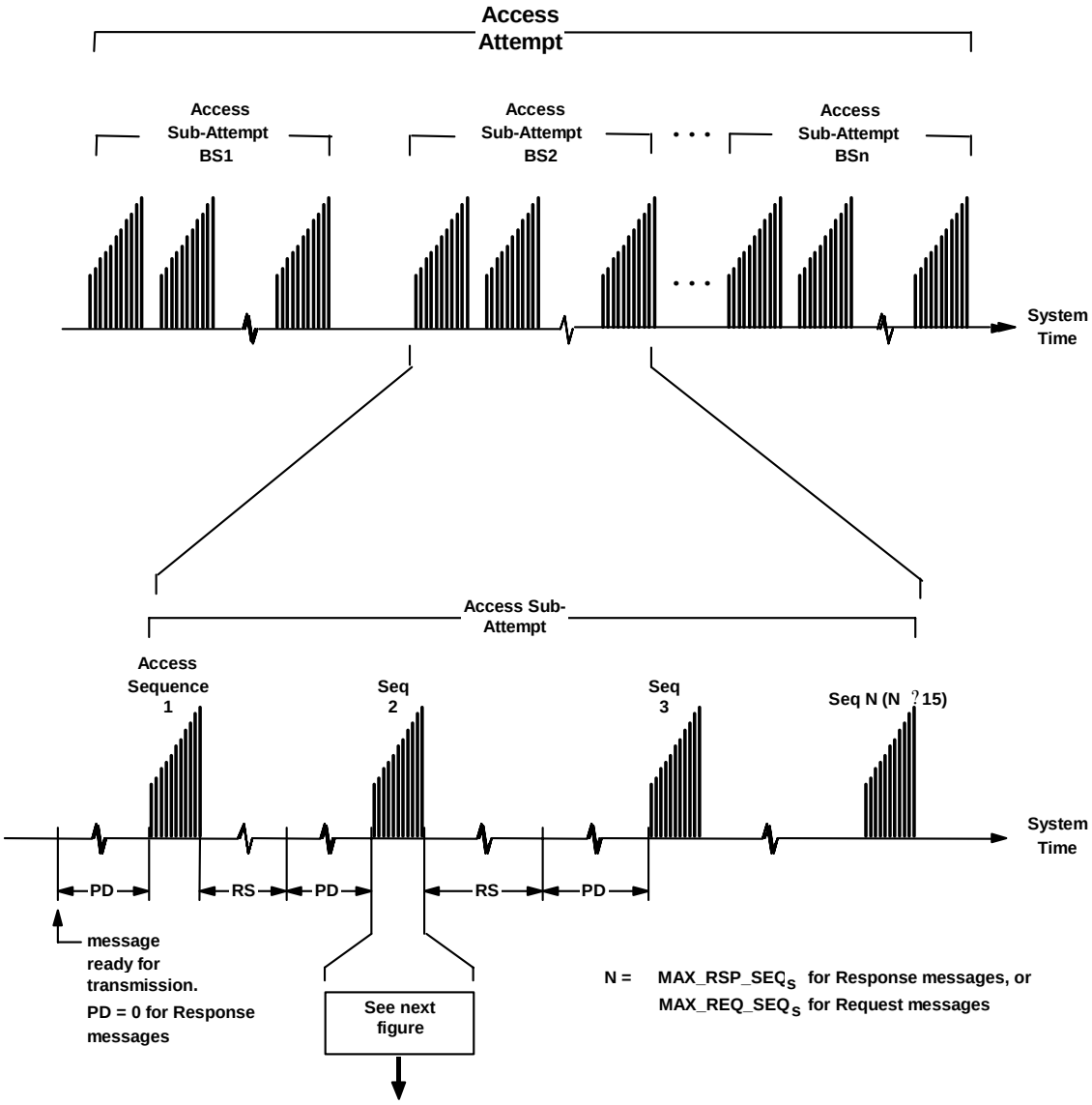

Figure 9. Access Attempt (Part 1) [16]

[16] This figure contains some detailed information of the Access Attempt that is outside the scope of this document

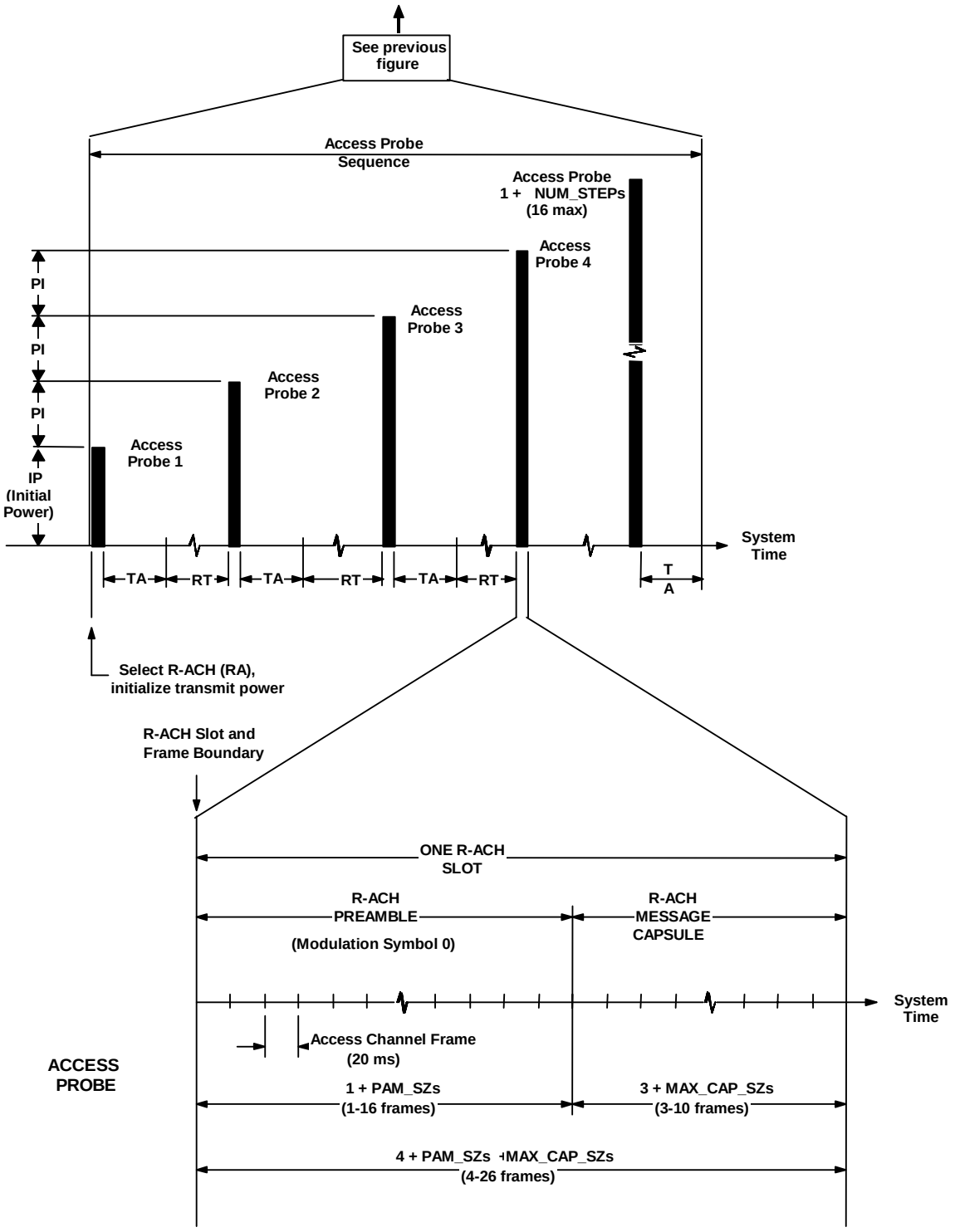

Figure 10. Access Attempt (Part 2)

The timing of access probes and access probe sequences is expressed in terms of R-ACH slots (see Figure 11). The transmission of an access probe begins at the start of an R-ACH slot. The timing of the start of each access probe sequence is determined pseudorandomly. For every access probe sequence, a backoff delay, RS, from 0 to 1 + $BKOFF_S$ slots is generated pseudorandomly. An additional delay is imposed by the use of a random persistence test that determines the value of the Persistence Delay, PD[17], based on the parameter *P* of the MAC-SDUReady.Request primitive.

For each slot after the backoff delay, RS, the SRBP entity performs a pseudorandom test based on the parameter *P* of the MAC-SDUReady.Request primitive. If the test passes, the first access probe of the sequence begins in that slot. If the test fails, the access probe sequence is deferred until at least the next slot.

The delay between access probes of an access probe sequence is generated pseudorandomly. Upon reception of an acknowledgement from the base station, the upper layer terminates the access by no longer sending the MAC-SDUReady.Request primitive. If a MAC-SDUReady.Request primitive with (*seqno* mod (NUM_STEP_S + 1)) not equal to 0 is received:

- If the common channel multiplex sublayer transmits all the access probes within an access probe sequence on the same R-ACH associated with the current F-PCH, the next access probe is transmitted after an additional backoff delay, RT, from 0 to 1 + $PROBE\_BKOFF_S$ slots.

- If the common channel multiplex sublayer pseudorandomly selects an R-ACH from among all R-ACHs associated with the current F-PCH, the next access probe is transmitted after an additional backoff delay, RT, from 0 to $PROBE\_BKOFF_S$ slots.

The precise timing of the Access Channel transmissions in an access attempt is determined by a procedure called PN randomization. For each access sub-attempt, the SRBP entity computes a delay, RN, from 0 to $2^{PROBE\_PN\_RAN_S}$ - 1 PN chips using a hash function, which is a function of $RN\_HASH\_KEY_S$ and $PROBE\_PN\_RAN_S$ (see 2.2.2.2.2.2.3.4). The variables that are related to the random access are shown in Table 21.

[17]A persistence test is not needed for sending SDUs that contain response messages, because the base station controls the arrival rate of response messages directly by controlling the rate at which it transmits messages requiring responses.

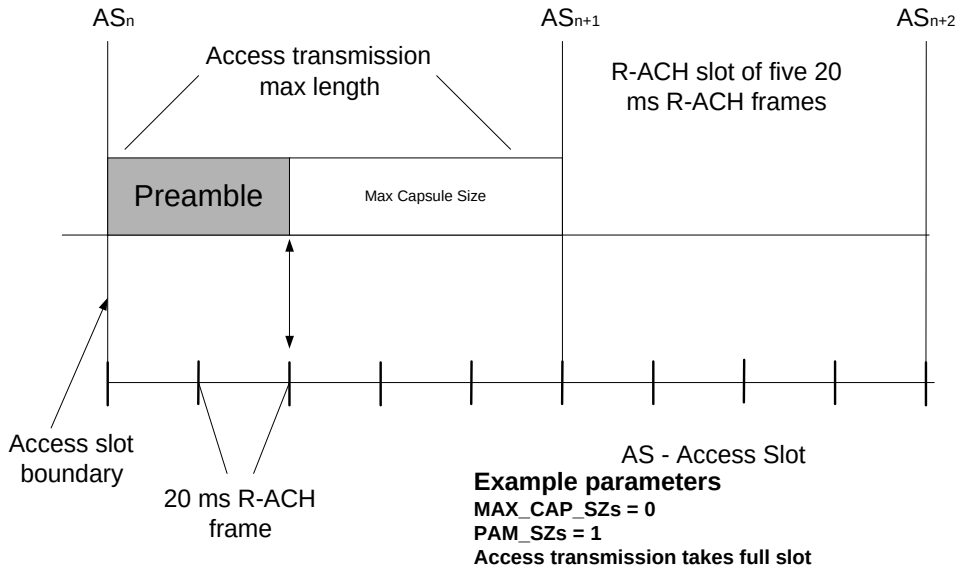

Figure 11. Example of R-ACH Slot Structure

Table 21. Calculated, Random, and Hashed Variables

Var-iable	Name	Generation	Range	Units
PD	Persistence Delay	Delay continues slot-by-slot until persistence test (run every slot) passes.	—	slots
RA	R-ACH Number	Random between 0 and ACC_CHAN_S; generated before every access probe sequence or every access probe.	0 to 31	—
RN	PN Randomization Delay	Hash using $RN\_HASH\_KEY_S$ between 0 and $2^{PROBE\_PN\_RAN_S} - 1$; generated once at the beginning of each access sub-attempt.	0 to 511	chips
RS	Sequence Backoff	Random between 0 and 1 + $BKOFF_S$; generated before every sequence of an access sub-attempt (except the first sequence).	0 to 16	slots
RT	Probe Backoff	Random between 0 and 1 + $PROBE\_BKOFF_S$; generated before subsequent probes if the mobile station transmits all access probes within an access probe sequence on the same R-ACH. Random between 0 and $PROBE\_BKOFF_S$; generated before subsequent probes if the common channel multiplex sublayer pseudorandomly selects an R-ACH from among all R-ACHs associated with the current Paging Channel.	0 to 16	slots

2.2.2.2.2.1.4 R-ACH Structure

The base station shall set the ACH_FRAME_SIZE to 88.

An R-ACH slot is $(3 + MAX\_CAP\_SZ_S) + (1 + PAM\_SZ_S)$ R-ACH frames in length. An R-ACH slot begins and ends on R-ACH frame boundary. R-ACH slots begin at R-ACH frames, in which

$$t \bmod (4 + MAX\_CAP\_SZ_S + PAM\_SZ_S) = 0,$$

where t is the System Time in frames. Note that all R-ACHs associated with a particular F-PCH have the same slot size, and that all of the slots begin at the same time. Figure 11 shows an example of R-ACH slots and Figure 12 shows the R-ACH structure.

An R-ACH transmission consists of the R-ACH preamble and the Layer 2 encapsulated PDU. An R-ACH transmission is an integer number of R-ACH frames in length, and does not exceed $4 + MAX\_CAP\_SZ_S + PAM\_SZ_S$ R-ACH frames in length.

On each R-ACH transmission, the mobile station transmits a preamble consisting of frames of (ACH_FRAME_SIZE + Length of Tail bits) zeros, starting at the beginning of the slot (plus PN randomization, as specified in the "Pseudorandom Number Generator" section of [5]) and 1 + PAM_SZ_S R-ACH frames in length.. The mobile station transmits the R-ACH Message capsule, immediately following the preamble (see Figure 12).

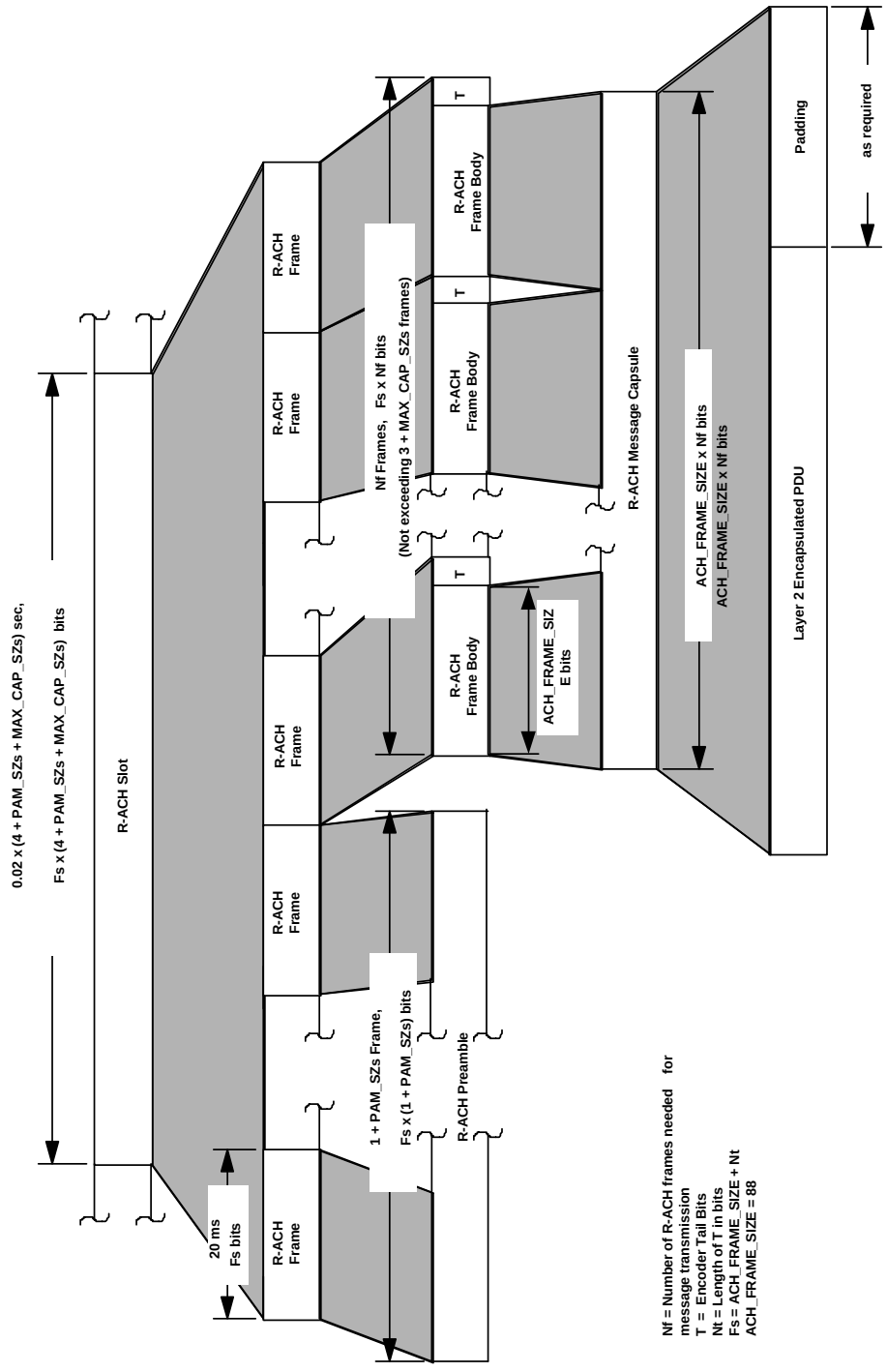

Figure 12. R-ACH Structure[18]

[18] This figure contains some detailed information of the Access Channel structure that is outside the scope of this document

2.2.2.2.2.1.5 R-ACH Message Capsule Structure

An R-ACH message capsule consists of a Layer 2 encapsulated PDU and the padding added by the common channel multiplex sublayer, as shown in Figure 13. The length of the R-ACH message capsule is an integer number of R-ACH frames given by

$$CAP\_SZ = \lceil size / ACH\_FRAME\_SIZE \rceil,$$

where *size* is passed by the MAC-SDUReady.Request primitive.

The mobile station transmits the Layer 2 encapsulated PDU, immediately following the preamble. The mobile station transmits padding, consisting of zero or more '0' bits immediately following the Layer 2 encapsulated PDU. The length of the padding is equal to CAP_SZ × ACH_FRAME_SIZE - *size*.

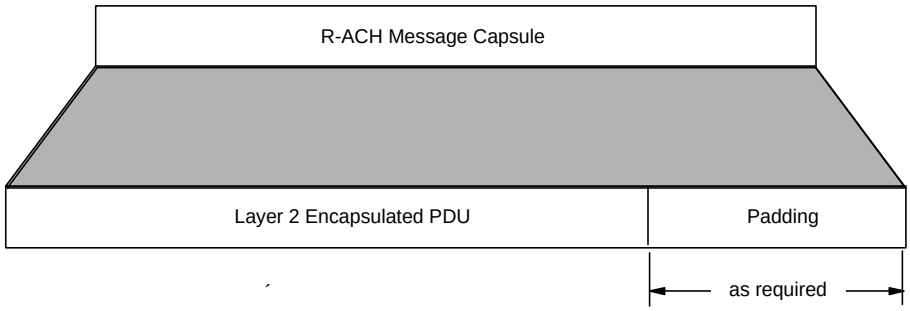

Figure 13. R-ACH Message Capsule Structure

2.2.2.2.2.2 Mobile Station Procedures

2.2.2.2.2.2.1 Sync Channel Procedures

If the common channel multiplex sublayer receives a *Receive F-SYNC Indication* from the Physical Layer with SDU as the argument, the SRBP entity shall send a MAC-Data.Indication (*channel_id*, *type*, *data*, *size*, *system_time*) primitive with:

- *type* set to "F-SYNC frame",
- *data* set to SDU,
- *size* set to the size of *data* in bits; and
- *system_time* set to the time associated with the Physical Layer frame which carried the F-SYNC SDU.

2.2.2.2.2.2.2 Paging Channel Procedures

If the common channel multiplex sublayer receives a *Receive F-PCH Indication* from the Physical Layer with SDU as the argument, the common channel multiplex sublayer entity shall send a MAC-Data.Indication (*channel_id*, *type*, *data*, *size*, *system_time*) primitive with:

- *type* set to "F-PCH frame",
- *data* set to SDU;
- *size* set to the size of *data* in bits; and
- *system_time* set to the time associated with the Physical Layer frame which carried the F-PCH SDU.

2.2.2.2.2.2.3 Access Procedures

This section specifies the random access procedures at the mobile station for sending Layer 2 encapsulated PDUs on the R-ACH (see Figure 14).

2.2.2.2.2.2.3.1 Processing of the MAC-SDUReady.Request Primitive

Upon reception of a MAC-SDUReady.Request (*channel_type*, *size*, *P*, *seqno*) primitive, the SRBP entity shall do the following:

- If *seqno* is equal to 0:
  - The SRBP entity shall compute a number, RN, from 0 to $2^{PROBE\_PN\_RAN_S}$ - 1, using the hashing technique described in 2.2.2.2.2.2.3.4.
  - The SRBP entity shall perform a persistence test for each R-ACH slot until the test passes. To perform the persistence test, the SRBP entity shall generate a random number RP, $0 < RP < 1$, using the technique described in the "Pseudorandom Number Generator" section of [5]. The persistence test is said to pass when RP is less than the value of *P*.
  - The common channel multiplex sublayer shall generate a random number, RA, from 0 to ACC_CHAN_S using the procedure described in the "Pseudorandom Number Generator" section of [5].
- If *seqno* is non-zero and (*seqno* mod (NUM_STEP_S+1)) is equal to 0:
  - The SRBP entity shall generate a random number, RS, from 0 to ($BKOFF_S$ + 1), using the procedure described in the "Pseudorandom Number Generator" section of [5].
  - The SRBP entity shall wait for RS R-ACH slots and then perform a persistence test for each R-ACH slot until the test passes (see above).
  - The common channel multiplex sublayer shall generate a random number, RA, from 0 to ACC_CHAN_S using the procedure described in the "Pseudorandom Number Generator" section of [5].
- If (*seqno* mod (NUM_STEP_S+1)) is non-zero:
  - If the common channel multiplex sublayer transmits all access probes within an access probe sequence on the same R-ACH, the SRBP entity shall generate a random number, RT, from 0 to 1 + $PROBE\_BKOFF_S$, using the procedure described in the "Pseudorandom Number Generator" section of [5].
  - If the common channel multiplex sublayer pseudorandomly selects an R-ACH among all the R-ACHs associated with the current F-PCH, the SRBP entity shall generate a random number, RT, from 0 to $PROBE\_BKOFF_S$, using the procedure described in the "Pseudorandom Number Generator" section of [5]. If there is more than one R-ACH associated with the current Paging Channel, the common channel multiplex sublayer should generate a random number, RA, from 0 to ACC_CHAN_S using the procedure described in the "Pseudorandom Number Generator" section of [5].
  - The SRBP entity shall wait for RT R-ACH slots.
- Perform the procedures described in 2.2.2.2.2.2.3.2.

2.2.2.2.2.2.3.2 Transmitting an Access Probe

When transmitting an access probe, the SRBP entity shall do the following:

- Set PWR_LVL to (*seqno* mod (NUM_STEP_S+1)).
- The common channel multiplex sublayer shall send a *Transmit R-ACH Preamble Request* to the Physical Layer with the following arguments:
  - RA,
  - PWR_LVL,
  - RN, and
  - NUM_PREAMBLE_FRAMES set to (1 + PAM_SZ_S).
- After the transmission of the preamble, the SRBP entity shall send a MAC-Availability.Indication primitive and wait for the reception of the matching MAC-Data.Request primitive, for each R-ACH frame, until all the fragments of the Layer 2 encapsulated PDU are transmitted. When sending the MAC-Availability.Indication primitive, the SRBP entity shall set *max_size* to ACH_FRAME_SIZE, and *system_time* to the time at which the frame will be transmitted (see 2.2.2.2.2.2.3.3 for the processing of the MAC-Data.Request primitive).

2.2.2.2.2.2.3.3 Processing of the MAC-Data.Request Primitive

Upon reception of the MAC-Data.Request (*channel_type*, *data*, *size*) primitive with non-zero *size*, the SRBP entity shall perform the following:

- The SRBP entity shall add (ACH_FRAME_SIZE – *size*) '0' bits to *data* to form a Physical Layer R-ACH SDU.
- The common channel multiplex sublayer shall send a *Transmit R-ACH Frame Request to the Physical Layer* with the following arguments:
  - RA,
  - PWR_LVL,
  - RN, and
  - SDU set to the assembled R-ACH SDU.

2.2.2.2.2.2.3.4 Hash Function

The following function returns the value of RN, using $RN\_HASH\_KEY_S$ and $PROBE\_PN\_RAN_S$ as arguments as described below. Note that DECORR is a modifier that serves to decorrelate the values obtained for the various applications from the same mobile station.

Define:

- Word L to be bits 0-15 of $RN\_HASH\_KEY_S$, where bit 0 is the least significant bit of $RN\_HASH\_KEY_S$,
- Word H to be bits 16-31 of $RN\_HASH\_KEY_S$, where bit 0 is the least significant bit of $RN\_HASH\_KEY_S$,
- N to be $2^{PROBE\_PN\_RAN_S}$, and

- DECORR to be $RN\_HASH\_KEY_S$ [0...11], where $RN\_HASH\_KEY_S$ [0...11] denotes the 12 least significant bits of $RN\_HASH\_KEY_S$.

Then RN is computed as follows:[19]

$$RN = \lfloor N \times ((40503 \times (L \oplus H \oplus DECORR)) \bmod 2^{16}) \; / \; 2^{16} \rfloor,$$

where $\oplus$ denotes bitwise modulo-2 addition.

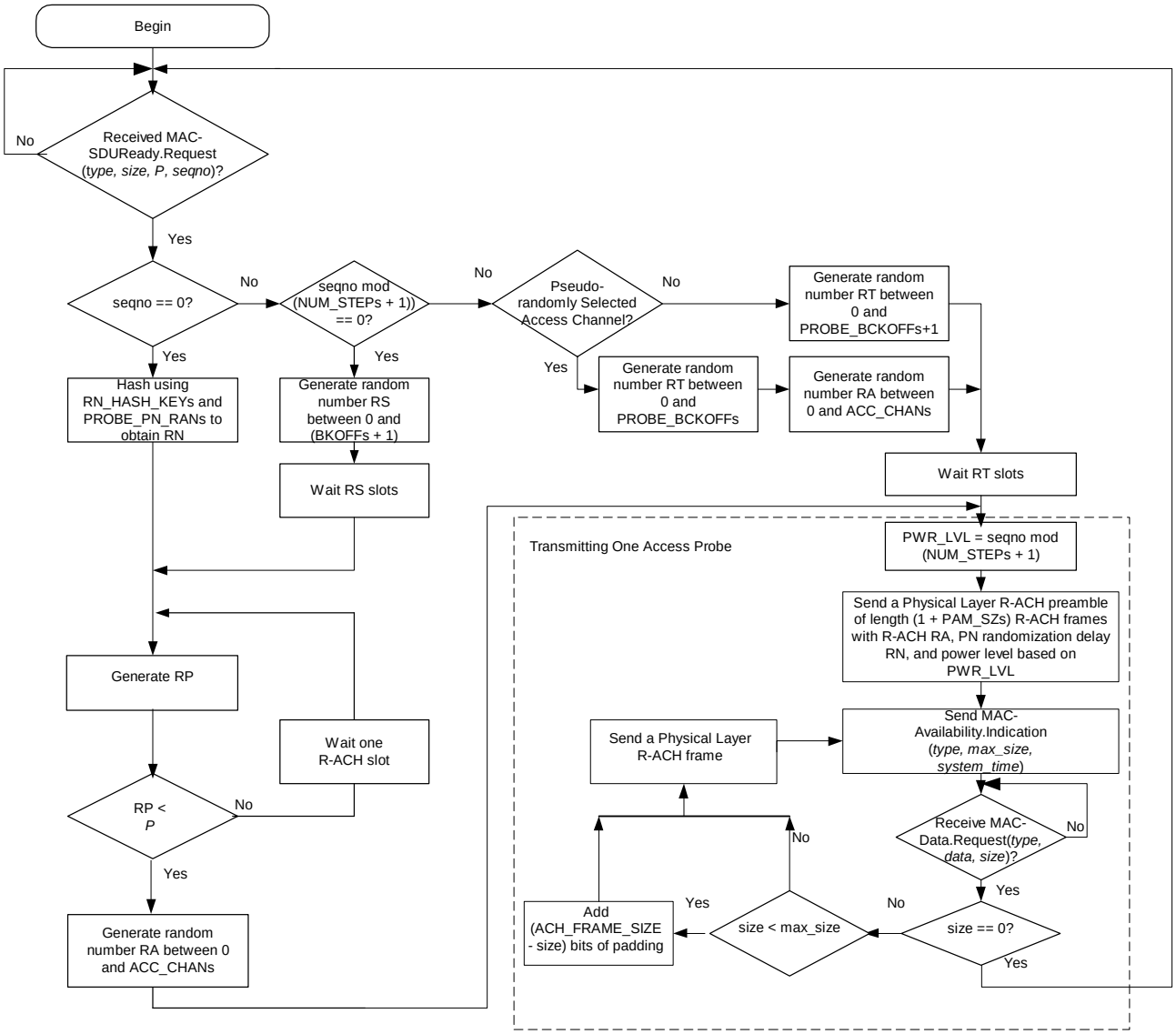

Figure 14. Example of Random Access Procedures at the Mobile Station

[19]This formula is adapted from Knuth, Donald N., *The Art of Computer Programming*, 2 volumes, (Reading, MA, Addison-Wesley, 1998).

2.2.2.2.2.3 Base Station Procedures

2.2.2.2.2.3.1 Sync Channel Procedures

The base station shall set the SYNC_FRAME_SIZE to 32.

When the base station is transmitting the F-SYNC, the SRBP entity shall generate a MAC-Availability.Indication (*channel_type*, *max-size*, *system_time*) primitive every (80 ÷ 3) ms, with:

- *type* set to “F-SYNC frame”,
- *max-size* set to SYNC_FRAME_SIZE, and
- *system_time* set to the time associated with the F-SYNC frame which will carry the F-SYNC SDU.

Upon reception of a MAC-Data.Request (*channel_type*, *data*, *size*) primitive, the SRBP entity shall perform the following:

- The SRBP entity shall append (SYNC_FRAME_SIZE - *size*) '0' bits to *data* to form a Physical Layer F-SYNC SDU.
- The common channel multiplex sublayer shall send a *Transmit F-SYNC Request* to the Physical Layer with the argument SDU set to the assembled F-SYNC SDU.

2.2.2.2.2.3.2 Paging Channel Procedures

The base station shall set PCH_FRAME_SIZE to 96 if the F-PCH data rate is 4800 bps, or to 192 if the F-PCH data rate is 9600 bps.

When the base station is transmitting an F-PCH, the SRBP entity shall generate a MAC-Availability.Indication (*channel_type*, *max_size*, *system_time*) primitive every 20 ms, with:

- *type* set to “F-PCH frame”,
- *max-size* set to PCH_FRAME_SIZE, and
- *system_time* set to the time associated with the F-PCH frame which will carry the F-PCH SDU.

Upon reception of a MAC-Data.Request (*channel_type*, *data*, *size*) primitive, the SRBP entity shall perform the following:

- The SRBP entity shall append (PCH_FRAME_SIZE-*size*) '0' bits to *data* to form a Physical Layer F-PCH SDU.
- The common channel multiplex sublayer shall send a *Transmit F-PCH Request* to the Physical Layer with the argument SDU set to the assembled F-PCH SDU.

2.2.2.2.2.3.3 Access Channel Procedures

If the common channel multiplex sublayer receives a *Receive R-ACH Indication* from the Physical Layer with SDU as an argument, the common channel multiplex sublayer entity shall send a MAC-Data.Indication (*channel_id*, *type*, *data*, *size*, *system_time*) primitive with:

- *data* set to SDU;

- *size* set to the size of *data* in bits; and
- *system_time* set to the time associated with the R-ACH frame which carries the SDU.

2.2.2.2.2.4 Procedures for Generating the Channel Identifier

The SRBP entity shall generate a channel identifier, *channel_id*, for the physical channel on which the data was received to be included in MAC-Data.Indication primitives. The *channel_id* values included in any two MAC-Data.Indication primitives shall be the same if all of the following are true:

- the received data were transmitted by the same base station,
- the received data were transmitted on the same code channel, and
- the received data were transmitted on the same CDMA Channel.

Otherwise, the *channel_id* values included in the MAC-Data.Indication primitives shall have distinct values.

2.2.3 Supervisory Procedures

2.2.3.1 Mobile Station Transmission Statistics

The mobile station shall count, by physical channel, the number and type of Physical Layer SDU that the multiplex sublayer delivers to the Physical Layer. Each counter used for this purpose shall be 24 bits long. The mobile station shall initialize each counter that it maintains to zero upon power-on. The mobile station shall not reinitialize any counter except upon command from the base station. Each counter shall be maintained modulo 2^{24}.

Each time the multiplex sublayer delivers a Physical Layer SDU to the Physical Layer, it shall increment the counter corresponding to the physical channel and the type of Physical Layer SDU. If the mobile station also supports LTU processing, it shall also increment the counter corresponding to the physical channel for each LTU in the Physical Layer SDU.

2.2.3.1.1 Mobile Station Transmission Statistics for the FCH

The mobile station shall maintain counters 1 through 8 in Table 22. If the mobile station also supports secondary traffic on the FCH, it shall also maintain counters 11 through 14 in Table 22. If the mobile station supports MuxPDU Type 4 on the FCH, it shall also maintain counter 16 in Table 22.

Table 22. FCH Transmission Counters for Multiplex Option 0x1

Counter Number	Counter Name	Description
1	MUX1_REV_FCH_1	9600 bps, MuxPDU Type 1 Header = '0' or null traffic MuxPDU
2	MUX1_REV_FCH_2	9600 bps, MuxPDU Type 1 Header = '1000'
3	MUX1_REV_FCH_3	9600 bps, MuxPDU Type 1 Header = '1001'
4	MUX1_REV_FCH_4	9600 bps, MuxPDU Type 1 Header = '1010'
5	MUX1_REV_FCH_5	9600 bps, MuxPDU Type 1 Header = '1011'
6	MUX1_REV_FCH_6	4800 bps, MuxPDU Type 1 or null traffic MuxPDU
7	MUX1_REV_FCH_7	2400, bps MuxPDU Type 1 or null traffic MuxPDU
8	MUX1_REV_FCH_8	1200, bps MuxPDU Type 1 or null traffic MuxPDU
9	MUX1_REV_FCH_9	reserved
10	MUX1_REV_FCH_10	reserved
11	MUX1_REV_FCH_11	9600 bps, MuxPDU Type 1 Header = '1100'
12	MUX1_REV_FCH_12	9600 bps, MuxPDU Type 1 Header = '1101'
13	MUX1_REV_FCH_13	9600 bps, MuxPDU Type 1 Header = '1110'
14	MUX1_REV_FCH_14	9600 bps, MuxPDU Type 1 Header = '1111'
15	MUX1_REV_FCH_15	reserved
16	MUX1_REV_FCH_5_ms	MuxPDU Type 4

If the mobile station supports multiplex option 0x2 on the FCH, it shall maintain counters 1 through 5, 11 through 14, 19 through 21, and 24 in Table 23. If the mobile station also supports secondary traffic on the FCH, it shall also maintain counters 6 through 10, 15 through 18, 22 through 23, and 25 in Table 23. If the mobile station supports MuxPDU Type 4 on the FCH, it shall also maintain counter 28 in Table 23.

Table 23. FCH Transmission Counters for Multiplex Option 0x2

Counter Number	Counter Name	Description
1	MUX2_REV_FCH_1	14400 bps, MuxPDU Type 2 Header = '0' or null traffic MuxPDU
2	MUX2_REV_FCH_2	14400 bps, MuxPDU Type 2 Header = '10000'
3	MUX2_REV_FCH_3	14400 bps, MuxPDU Type 2 Header = '10001'
4	MUX2_REV_FCH_4	14400 bps, MuxPDU Type 2 Header = '10010'
5	MUX2_REV_FCH_5	14400 bps, MuxPDU Type 2 Header = '10011'
6	MUX2_REV_FCH_6	14400 bps, MuxPDU Type 2 Header = '10100'
7	MUX2_REV_FCH_7	14400 bps, MuxPDU Type 2 Header = '10101'
8	MUX2_REV_FCH_8	14400 bps, MuxPDU Type 2 Header = '10110'
9	MUX2_REV_FCH_9	14400 bps, MuxPDU Type 2 Header = '10111'
10	MUX2_REV_FCH_10	14400 bps, MuxPDU Type 2 Header = '11000'
11	MUX2_REV_FCH_11	7200 bps, MuxPDU Type 2 Header = '0' or null traffic MuxPDU
12	MUX2_REV_FCH_12	7200 bps, MuxPDU Type 2 Header = '1000'
13	MUX2_REV_FCH_13	7200 bps, MuxPDU Type 2 Header = '1001'
14	MUX2_REV_FCH_14	7200 bps, MuxPDU Type 2 Header = '1010'
15	MUX2_REV_FCH_15	7200 bps, MuxPDU Type 2 Header = '1011'
16	MUX2_REV_FCH_16	7200 bps, MuxPDU Type 2 Header = '1100'
17	MUX2_REV_FCH_17	7200 bps, MuxPDU Type 2 Header = '1101'
18	MUX2_REV_FCH_18	7200 bps, MuxPDU Type 2 Header = '1110'
19	MUX2_REV_FCH_19	3600 bps, MuxPDU Type 2 Header = '0' or null traffic MuxPDU
20	MUX2_REV_FCH_20	3600 bps, MuxPDU Type 2 Header = '100'
21	MUX2_REV_FCH_21	3600 bps, MuxPDU Type 2 Header = '101'
22	MUX2_REV_FCH_22	3600 bps, MuxPDU Type 2 Header = '110'
23	MUX2_REV_FCH_23	3600 bps, MuxPDU Type 2 Header = '111'
24	MUX2_REV_FCH_24	1800 bps, MuxPDU Type 2 Header = '0' or null traffic MuxPDU
25	MUX2_REV_FCH_25	1800 bps, MuxPDU Type 2 Header = '1'
26	MUX2_REV_FCH_26	reserved
27	MUX2_REV_FCH_27	reserved
28	MUX2_REV_FCH_5_ms	MuxPDU Type 4

2.2.3.1.2 Mobile Station Transmission Statistics for the DCCH

If the mobile station supports a DCCH, it shall maintain counters 1 through 5 and 15 in Table 24. If the mobile station supports secondary traffic on the DCCH, it shall also maintain counters 11 through 14 in Table 24. If the mobile station supports MuxPDU Type 4 on the DCCH, it shall also maintain counter 16 in Table 24.

Table 24. DCCH Transmission Counters for Multiplex Option 0x1

Counter Number	Counter Name	Description
1	MUX1_REV_DCCH_1	9600 bps, MuxPDU Type 1 Header = '0'
2	MUX1_REV_DCCH_2	9600 bps, MuxPDU Type 1 Header = '1000'
3	MUX1_REV_DCCH_3	9600 bps, MuxPDU Type 1 Header = '1001'
4	MUX1_REV_DCCH_4	9600 bps, MuxPDU Type 1 Header = '1010'
5	MUX1_REV_DCCH_5	9600 bps, MuxPDU Type 1 Header = '1011'
6	MUX1_REV_DCCH_6	reserved
7	MUX1_REV_DCCH_7	reserved
8	MUX1_REV_DCCH_8	reserved
9	MUX1_REV_DCCH_9	reserved
10	MUX1_REV_DCCH_10	reserved
11	MUX1_REV_DCCH_11	9600 bps, MuxPDU Type 1 Header = '1100'
12	MUX1_REV_DCCH_12	9600 bps, MuxPDU Type 1 Header = '1101'
13	MUX1_REV_DCCH_13	9600 bps, MuxPDU Type 1 Header = '1110'
14	MUX1_REV_DCCH_14	9600 bps, MuxPDU Type 1 Header = '1111'
15	MUX1_REV_DCCH_15	Null MuxPDU
16	MUX1_REV_DCCH_5_ms	MuxPDU Type 4

If the mobile station supports a DCCH and also supports multiplex option 0x2 on the DCCH, it shall maintain counters 1 through 5 and 27 in Table 25. If the mobile station also supports secondary traffic on the DCCH, it shall also maintain counters 6 through 10 in Table 25. If the mobile station supports MuxPDU Type 4 on the DCCH, it shall also maintain counter 28 in Table 25.

Table 25. DCCH Transmission Counters for Multiplex Option 0x2

Counter Number	Counter Name	Description
1	MUX2_REV_DCCH_1	14400 bps, MuxPDU Type 2 Header = '0'
2	MUX2_REV_DCCH_2	14400 bps, MuxPDU Type 2 Header = '10000'
3	MUX2_REV_DCCH_3	14400 bps, MuxPDU Type 2 Header = '10001'
4	MUX2_REV_DCCH_4	14400 bps, MuxPDU Type 2 Header = '10010'
5	MUX2_REV_DCCH_5	14400 bps, MuxPDU Type 2 Header = '10011'
6	MUX2_REV_DCCH_6	14400 bps, MuxPDU Type 2 Header = '10100'
7	MUX2_REV_DCCH_7	14400 bps, MuxPDU Type 2 Header = '10101'
8	MUX2_REV_DCCH_8	14400 bps, MuxPDU Type 2 Header = '10110'
9	MUX2_REV_DCCH_9	14400 bps, MuxPDU Type 2 Header = '10111'
10	MUX2_REV_DCCH_10	14400 bps, MuxPDU Type 2 Header = '11000'
11	MUX2_REV_DCCH_11	reserved
12	MUX2_REV_DCCH_12	reserved
13	MUX2_REV_DCCH_13	reserved
14	MUX2_REV_DCCH_14	reserved
15	MUX2_REV_DCCH_15	reserved
16	MUX2_REV_DCCH_16	reserved
17	MUX2_REV_DCCH_17	reserved
18	MUX2_REV_DCCH_18	reserved
19	MUX2_REV_DCCH_19	reserved
20	MUX2_REV_DCCH_20	reserved
21	MUX2_REV_DCCH_21	reserved
22	MUX2_REV_DCCH_22	reserved
23	MUX2_REV_DCCH_23	reserved
24	MUX2_REV_DCCH_24	reserved
25	MUX2_REV_DCCH_25	reserved
26	MUX2_REV_DCCH_26	reserved
27	MUX2_REV_DCCH_27	Null MuxPDU
28	MUX2_REV_DCCH_5_ms	MuxPDU Type 4

2.2.3.1.3 Mobile Station Transmission Statistics for the SCCH

If the mobile station supports multiplex option 0x3 or 0x4, it shall support counters 1 and 2 in Table 26. If the mobile station supports multiplex option 0x5 or 0x6, it shall support counters 1 through 4 in Table 26. If the mobile station supports multiplex option 0x7 or 0x8, it shall support counters 1 through 6 in Table 26. If the mobile station supports multiplex option 0x9 or 0xa, it shall support counters 1 through 8 in Table 26. If the mobile station supports multiplex option 0xb or 0xc, it shall support counters 1 through 10 in Table 26. If the mobile station supports multiplex option 0xd or 0xe, it shall support counters 1 through 12 in Table 26. If the mobile station supports multiplex option 0xf or 0x10, it shall support counters 1 through 14 in Table 26.

Table 26. SCCH Transmission Counters

Counter Number	Counter Name	Description
1	SCCH1_REV_P	9600 bps, MuxPDU Type 1 Header = '0' or 14400 bps, MuxPDU Type 2 Header = '0'
2	SCCH1_REV_S	9600 bps, MuxPDU Type 1 Header = '1111' or 14400 bps, MuxPDU Type 2 Header = '10111
3	SCCH2_REV_P	9600 bps, MuxPDU Type 1 Header = '0' or 14400 bps, MuxPDU Type 2 Header = '0'
4	SCCH2_REV_S	9600 bps, MuxPDU Type 1 Header = '1111' or 14400 bps, MuxPDU Type 2 Header = '10111
5	SCCH3_REV_P	9600 bps, MuxPDU Type 1 Header = '0' or 14400 bps, MuxPDU Type 2 Header = '0'
6	SCCH3_REV_S	9600 bps, MuxPDU Type 1 Header = '1111' or 14400 bps, MuxPDU Type 2 Header = '10111
7	SCCH4_REV_P	9600 bps, MuxPDU Type 1 Header = '0' or 14400 bps, MuxPDU Type 2 Header = '0'
8	SCCH4_REV_S	9600 bps, MuxPDU Type 1 Header = '1111' or 14400 bps, MuxPDU Type 2 Header = '10111
9	SCCH5_REV_P	9600 bps, MuxPDU Type 1 Header = '0' or 14400 bps, MuxPDU Type 2 Header = '0'
10	SCCH5_REV_S	9600 bps, MuxPDU Type 1 Header = '1111' or 14400 bps, MuxPDU Type 2 Header = '10111
11	SCCH6_REV_P	9600 bps, MuxPDU Type 1 Header = '0' or 14400 bps, MuxPDU Type 2 Header = '0'
12	SCCH6_REV_S	9600 bps, MuxPDU Type 1 Header = '1111' or 14400 bps, MuxPDU Type 2 Header = '10111
13	SCCH7_REV_P	9600 bps, MuxPDU Type 1 Header = '0' or 14400 bps, MuxPDU Type 2 Header = '0'
14	SCCH7_REV_S	9600 bps, MuxPDU Type 1 Header = '1111' or 14400 bps, MuxPDU Type 2 Header = '10111

2.2.3.1.4 Mobile Station Transmission Statistics for the SCH

If the mobile station supports SCH0 and multiplex option 0x3 or 0x4, it shall maintain counter 1 in Table 27. If the mobile station supports SCH0 and multiplex option 0x809, 0x80a, 0x905, or 0x906, it shall maintain counters 1 and 2 in Table 27. If the mobile station supports SCH0 and multiplex option 0x811, 0x812, 0x909, or 0x90a, it shall maintain counters 1 through 3 in Table 27. If the mobile station supports SCH0 and multiplex option 0x821, 0x822, 0x911, or 0x912, it shall maintain counters 1 through 4 in Table 27. If the mobile station supports SCH0 and multiplex option 0x921 or 0x922, it shall maintain counters 1 through 5 in Table 27. If the mobile station supports LTU assembly for transmission on SCH0, it shall maintain counter 6 in Table 27.

If the mobile station supports SCH1 and multiplex option 0x3 or 0x4, it shall maintain counter 8 in Table 27. If the mobile station supports SCH1 and multiplex option 0x809, 0x80a, 0x905, or 0x906, it shall maintain counters 8 and 9 in Table 27. If the mobile station supports SCH1 and multiplex option 0x811, 0x812, 0x909, or 0x90a, it shall maintain counters 8 through 10 in Table 27. If the mobile station supports SCH1 and multiplex option 0x821, 0x822, 0x911, or 0x912, it shall maintain counters 8 through 11 in Table 27. If the mobile station supports SCH1 and multiplex option 0x921 or 0x922, it shall maintain counters 8 through 12 in Table 27. If the mobile station supports LTU assembly for transmission on SCH1, it shall maintain counter 13 in Table 27.

Table 27. SCH Transmission Counters

Counter Number	Counter Name	Description
1	SCH0_REV_1X	9600 bps or 14400 bps (1x SCH rate)
2	SCH0_REV_2X	19200 bps or 28800 bps (2x SCH rate)
3	SCH0_REV_4X	38400 bps or 57600 bps (4x SCH rate)
4	SCH0_REV_8X	76800 bps or 115200 bps (8x SCH rate)
5	SCH0_REV_16X	153600 bps (16x SCH rate)
6	SCH0_REV_LTU	number of LTUs delivered to the Physical Layer
7	SCH0_REV_LTUOK	reserved
8	SCH1_REV_1X	9600 bps or 14400 bps (1x SCH rate)
9	SCH1_REV_2X	19200 bps or 28800 bps (2x SCH rate)
10	SCH1_REV_4X	38400 bps or 57600 bps (4x SCH rate)
11	SCH1_REV_8X	76800 bps or 115200 bps (8x SCH rate)
12	SCH1_REV_16X	153600 bps (16x SCH rate)
13	SCH1_REV_LTU	number of LTUs delivered to the Physical Layer
14	SCH1_REV_LTUOK	reserved

2.2.3.2 Mobile Station Reception Statistics

For every Physical Layer SDU that the multiplex sublayer receives from the Physical Layer, the mobile station shall perform the following:

- If the associated Physical Layer frame quality is sufficient, the mobile station shall count, by physical channel type, the number and type of Physical Layer SDU.
- For a Physical Layer SCH SDU, if the multiplex sublayer performs LTU processing on the SDU, the mobile station shall count the total number of LTUs in the SDU and the number of successfully recovered LTUs.

Each counter used for this purpose shall be 24 bits long. The mobile station shall initialize each counter that it maintains to zero upon power-on. The mobile station shall not reinitialize any counter except upon command from the base station. Each counter shall be maintained modulo 2^{24}.

2.2.3.2.1 Mobile Station Reception Statistics for the FCH

The mobile station shall maintain counters 1 through 10 in Table 28. If the mobile station also supports secondary traffic on the FCH, it shall also maintain counters 11 through 14 in Table 28. If the mobile station supports MuxPDU Type 4 on the FCH, it shall also maintain counter 16 in Table 28.

Table 28. FCH Reception Counters for Multiplex Option 0x1

Counter Number	Counter Name	Description
1	MUX1_FOR_FCH_1	9600 bps, MuxPDU Type 1 Header = '0' or null traffic MuxPDU
2	MUX1_FOR_FCH_2	9600 bps, MuxPDU Type 1 Header = '1000'
3	MUX1_FOR_FCH_3	9600 bps, MuxPDU Type 1 Header = '1001'
4	MUX1_FOR_FCH_4	9600 bps, MuxPDU Type 1 Header = '1010'
5	MUX1_FOR_FCH_5	9600 bps, MuxPDU Type 1 Header = '1011'
6	MUX1_FOR_FCH_6	4800 bps, MuxPDU Type 1 or null traffic MuxPDU
7	MUX1_FOR_FCH_7	2400 bps, MuxPDU Type 1 or null traffic MuxPDU
8	MUX1_FOR_FCH_8	1200 bps, MuxPDU Type 1 or null traffic MuxPDU
9	MUX1_FOR_FCH_9	9600 bps, Physical Layer frame with insufficient Physical Layer frame quality[20]
10	MUX1_FOR_FCH_10	Insufficient Physical Layer frame quality[21]
11	MUX1_FOR_FCH_11	9600 bps, MuxPDU Type 1 Header = '1100'
12	MUX1_FOR_FCH_12	9600 bps, MuxPDU Type 1 Header = '1101'
13	MUX1_FOR_FCH_13	9600 bps, MuxPDU Type 1 Header = '1110'
14	MUX1_FOR_FCH_14	9600 bps, MuxPDU Type 1 Header = '1111'
15	MUX1_FOR_FCH_15	reserved
16	MUX1_FOR_FCH_5_ms	MuxPDU Type 4

If the mobile station supports multiplex option 0x2 on the FCH, it shall maintain counters 1 through 5, 11 through 14, 19 through 21, 24, and 26 in Table 29. If the mobile station also supports secondary traffic on the FCH, it shall also maintain counters 6 through 10, 15 through 18, 22 through 23, and 25 in Table 29. If the mobile station supports MuxPDU Type 4 on the FCH, it shall also maintain counter 28 in Table 29.

[20] This category is used when the Physical Layer frame quality is insufficient, but other parameters indicate a 9600 bps frame has been received.

[21] This category is used when the Physical Layer frame's bit rate cannot be determined or when the error does not belong to category 9.

Table 29. FCH Reception Counters for Multiplex Option 0x2

Counter Number	Counter Name	Description
1	MUX2_FOR_FCH_1	14400 bps, MuxPDU Type 2 Header = '0' or null traffic MuxPDU
2	MUX2_FOR_FCH_2	14400 bps, MuxPDU Type 2 Header = '10000'
3	MUX2_FOR_FCH_3	14400 bps, MuxPDU Type 2 Header = '10001'
4	MUX2_FOR_FCH_4	14400 bps, MuxPDU Type 2 Header = '10010'
5	MUX2_FOR_FCH_5	14400 bps, MuxPDU Type 2 Header = '10011'
6	MUX2_FOR_FCH_6	14400 bps, MuxPDU Type 2 Header = '10100'
7	MUX2_FOR_FCH_7	14400 bps, MuxPDU Type 2 Header = '10101'
8	MUX2_FOR_FCH_8	14400 bps, MuxPDU Type 2 Header = '10110'
9	MUX2_FOR_FCH_9	14400 bps, MuxPDU Type 2 Header = '10111'
10	MUX2_FOR_FCH_10	14400 bps, MuxPDU Type 2 Header = '11000'
11	MUX2_FOR_FCH_11	7200 bps, MuxPDU Type 2 Header = '0' or null traffic MuxPDU
12	MUX2_FOR_FCH_12	7200 bps, MuxPDU Type 2 Header = '1000'
13	MUX2_FOR_FCH_13	7200 bps, MuxPDU Type 2 Header = '1001'
14	MUX2_FOR_FCH_14	7200 bps, MuxPDU Type 2 Header = '1010'
15	MUX2_FOR_FCH_15	7200 bps, MuxPDU Type 2 Header = '1011'
16	MUX2_FOR_FCH_16	7200 bps, MuxPDU Type 2 Header = '1100'
17	MUX2_FOR_FCH_17	7200 bps, MuxPDU Type 2 Header = '1101'
18	MUX2_FOR_FCH_18	7200 bps, MuxPDU Type 2 Header = '1110'
19	MUX2_FOR_FCH_19	3600 bps, MuxPDU Type 2 Header = '0' or null traffic MuxPDU
20	MUX2_FOR_FCH_20	3600 bps, MuxPDU Type 2 Header = '100'
21	MUX2_FOR_FCH_21	3600 bps, MuxPDU Type 2 Header = '101'
22	MUX2_FOR_FCH_22	3600 bps, MuxPDU Type 2 Header = '110'
23	MUX2_FOR_FCH_23	3600 bps, MuxPDU Type 2 Header = '111'
24	MUX2_FOR_FCH_24	1800 bps, MuxPDU Type 2 Header = '0' or null traffic MuxPDU
25	MUX2_FOR_FCH_25	1800 bps, MuxPDU Type 2 Header = '1'
26	MUX2_FOR_FCH_26	Insufficient Physical Layer frame quality[22]
27	MUX2_FOR_FCH_27	reserved
28	MUX2_FOR_FCH_5_ms	MuxPDU Type 4

2.2.3.2.2 Mobile Station Reception Statistics for the DCCH

If the mobile station supports a DCCH, it shall maintain counters 1 through 5, 10, and 15 in Table 30. If the mobile station supports secondary traffic on the DCCH, it shall also maintain counters 11 through 14 in Table 30. If the mobile station supports MuxPDU Type 4 on the DCCH, it shall also maintain counter 16 in Table 30.

[22] This category is used when the Physical Layer frame's bit rate cannot be determined or when errors are detected.

Table 30. DCCH Reception Counters for Multiplex Option 0x1

Counter Number	Counter Name	Description
1	MUX1_FOR_DCCH_1	9600 bps, MuxPDU Type 1 Header = '0'
2	MUX1_FOR_DCCH_2	9600 bps, MuxPDU Type 1 Header = '1000'
3	MUX1_FOR_DCCH_3	9600 bps, MuxPDU Type 1 Header = '1001'
4	MUX1_FOR_DCCH_4	9600 bps, MuxPDU Type 1 Header = '1010'
5	MUX1_FOR_DCCH_5	9600 bps, MuxPDU Type 1 Header = '1011'
6	MUX1_FOR_DCCH_6	Reserved
7	MUX1_FOR_DCCH_7	Reserved
8	MUX1_FOR_DCCH_8	Reserved
9	MUX1_FOR_DCCH_9	Reserved
10	MUX1_FOR_DCCH_10	Insufficient Physical Layer frame quality
11	MUX1_FOR_DCCH_11	9600 bps, MuxPDU Type 1 Header = '1100'
12	MUX1_FOR_DCCH_12	9600 bps, MuxPDU Type 1 Header = '1101'
13	MUX1_FOR_DCCH_13	9600 bps, MuxPDU Type 1 Header = '1110'
14	MUX1_FOR_DCCH_14	9600 bps, MuxPDU Type 1 Header = '1111'
15	MUX1_FOR_DCCH_15	Null MuxPDU
16	MUX1_FOR_DCCH_5_ms	MuxPDU Type 4

If the mobile station supports a DCCH and also supports multiplex option 0x2 on the DCCH, it shall maintain counters 1 through 5, 26, and 27 Table 31. If the mobile station also supports secondary traffic on the DCCH, it shall also maintain counters 6 through 10 in Table 31. If the mobile station supports MuxPDU Type 4 on the DCCH, it shall also maintain counter 28 in Table 31.

Table 31. DCCH Reception Counters for Multiplex Option 0x2

Counter Number	Counter Name	Description
1	MUX2_FOR_DCCH_1	14400 bps, MuxPDU Type 2 Header = '0'
2	MUX2_FOR_DCCH_2	14400 bps, MuxPDU Type 2 Header = '10000'
3	MUX2_FOR_DCCH_3	14400 bps, MuxPDU Type 2 Header = '10001'
4	MUX2_FOR_DCCH_4	14400 bps, MuxPDU Type 2 Header = '10010'
5	MUX2_FOR_DCCH_5	14400 bps, MuxPDU Type 2 Header = '10011'
6	MUX2_FOR_DCCH_6	14400 bps, MuxPDU Type 2 Header = '10100'
7	MUX2_FOR_DCCH_7	14400 bps, MuxPDU Type 2 Header = '10101'
8	MUX2_FOR_DCCH_8	14400 bps, MuxPDU Type 2 Header = '10110'
9	MUX2_FOR_DCCH_9	14400 bps, MuxPDU Type 2 Header = '10111'
10	MUX2_FOR_DCCH_10	14400 bps, MuxPDU Type 2 Header = '11000'
11	MUX2_FOR_DCCH_11	Reserved
12	MUX2_FOR_DCCH_12	Reserved
13	MUX2_FOR_DCCH_13	Reserved
14	MUX2_FOR_DCCH_14	Reserved
15	MUX2_FOR_DCCH_15	Reserved
16	MUX2_FOR_DCCH_16	Reserved
17	MUX2_FOR_DCCH_17	Reserved
18	MUX2_FOR_DCCH_18	Reserved
19	MUX2_FOR_DCCH_19	Reserved
20	MUX2_FOR_DCCH_20	Reserved
21	MUX2_FOR_DCCH_21	Reserved
22	MUX2_FOR_DCCH_22	Reserved
23	MUX2_FOR_DCCH_23	Reserved
24	MUX2_FOR_DCCH_24	Reserved
25	MUX2_FOR_DCCH_25	Reserved
26	MUX2_FOR_DCCH_26	Insufficient Physical Layer frame quality
27	MUX2_FOR_DCCH_27	Null Physical Layer frame
28	MUX2_FOR_DCCH_5_ms	MuxPDU Type 4

2.2.3.2.3 Mobile Station Reception Statistics for the SCCH

If the mobile station supports multiplex option 0x3 or 0x4, it shall support counters 1 and 2 in Table 32. If the mobile station supports multiplex option 0x5 or 0x6, it shall support counters 1 through 4 in Table 32. If the mobile station supports multiplex option 0x7 or 0x8, it shall support counters 1 through 6 in Table 32. If the mobile station supports multiplex option 0x9 or 0xa, it shall support counters 1 through 8 in Table 32. If the mobile station supports multiplex option 0xb or 0xc, it shall support counters 1 through 10 in Table 32. If the mobile station supports multiplex option 0xd or 0xe, it shall support counters 1 through 12 in Table 32. If the mobile station supports multiplex option 0xf or 0x10, it shall support counters 1 through 14 in Table 32.

Table 32. SCCH Reception Counters

Counter Number	Counter Name	Description
1	SCCH1_FOR_P	9600 bps, MuxPDU Type 1 Header = '0' or 14400 bps, MuxPDU Type 2 Header = '0'
2	SCCH1_FOR_S	9600 bps, MuxPDU Type 1 Header = '1111' or 14400 bps, MuxPDU Type 2 Header = '10111
3	SCCH2_FOR_P	9600 bps, MuxPDU Type 1 Header = '0' or 14400 bps, MuxPDU Type 2 Header = '0'
4	SCCH2_FOR_S	9600 bps, MuxPDU Type 1 Header = '1111' or 14400 bps, MuxPDU Type 2 Header = '10111
5	SCCH3_FOR_P	9600 bps, MuxPDU Type 1 Header = '0' or 14400 bps, MuxPDU Type 2 Header = '0'
6	SCCH3_FOR_S	9600 bps, MuxPDU Type 1 Header = '1111' or 14400 bps, MuxPDU Type 2 Header = '10111
7	SCCH4_FOR_P	9600 bps, MuxPDU Type 1 Header = '0' or 14400 bps, MuxPDU Type 2 Header = '0'
8	SCCH4_FOR_S	9600 bps, MuxPDU Type 1 Header = '1111' or 14400 bps, MuxPDU Type 2 Header = '10111
9	SCCH5_FOR_P	9600 bps, MuxPDU Type 1 Header = '0' or 14400 bps, MuxPDU Type 2 Header = '0'
10	SCCH5_FOR_S	9600 bps, MuxPDU Type 1 Header = '1111' or 14400 bps, MuxPDU Type 2 Header = '10111
11	SCCH6_FOR_P	9600 bps, MuxPDU Type 1 Header = '0' or 14400 bps, MuxPDU Type 2 Header = '0'
12	SCCH6_FOR_S	9600 bps, MuxPDU Type 1 Header = '1111' or 14400 bps, MuxPDU Type 2 Header = '10111
13	SCCH7_FOR_P	9600 bps, MuxPDU Type 1 Header = '0' or 14400 bps, MuxPDU Type 2 Header = '0'
14	SCCH7_FOR_S	9600 bps, MuxPDU Type 1 Header = '1111' or 14400 bps, MuxPDU Type 2 Header = '10111

2.2.3.2.4 Mobile Station Reception Statistics for the SCH

If the mobile station supports SCH0 and multiplex option 0x3 or 0x4, it shall maintain counter 1 in Table 33. If the mobile station supports SCH0 and multiplex option 0x809, 0x80a, 0x905, or 0x906, it shall maintain counters 1 and 2 in Table 33. If the mobile station supports SCH0 and multiplex option 0x811, 0x812, 0x909, or 0x90a, it shall maintain counters 1 through 3 in Table 33. If the mobile station supports SCH0 and multiplex option 0x821, 0x822, 0x911, or 0x912, it shall maintain counters 1 through 4 in Table 33. If the mobile station supports SCH0 and multiplex option 0x921 or 0x922, it shall maintain counters 1 through 5 in Table 33. If the mobile station supports LTU reception on SCH0, it shall maintain counters 6 and 7 in Table 33.

If the mobile station supports SCH1 and multiplex option 0x3 or 0x4, it shall maintain counter 8 in Table 33. If the mobile station supports SCH1 and multiplex option 0x809, 0x80a, 0x905, or 0x906, it shall maintain counters 8 and 9 in Table 33. If the mobile station supports SCH1 and multiplex option 0x811, 0x812, 0x909, or 0x90a, it shall maintain counters 8 through 10 in Table 33. If the mobile station supports SCH1 and multiplex option 0x821, 0x822, 0x911, or 0x912, it shall maintain counters 8 through 11 in Table 33. If the mobile station supports SCH1 and multiplex option 0x921 or 0x922, it shall maintain counters 8 through 12 in Table 33. If the mobile station supports LTU reception on SCH1, it shall maintain counters 13 and 14 in Table 33.

Table 33. SCH Reception Counters

Counter Number	Counter Name	Description
1	SCH0_FOR_1X	9600 bps or 14400 bps (1x SCH rate)
2	SCH0_FOR_2X	19200 bps or 28800 bps (2x SCH rate)
3	SCH0_FOR_4X	38400 bps or 57600 bps (4x SCH rate)
4	SCH0_FOR_8X	76800 bps or 115200 bps (8x SCH rate)
5	SCH0_FOR_16X	153600 bps (16x SCH rate)
6	SCH0_FOR_LTU	number of LTUs received from the Physical Layer
7	SCH0_FOR_LTUOK	number of LTUs received from the Physical Layer with a correct CRC
8	SCH1_FOR_1X	9600 bps or 14400 bps (1x SCH rate)
9	SCH1_FOR_2X	19200 bps or 28800 bps (2x SCH rate)
10	SCH1_FOR_4X	38400 bps or 57600 bps (4x SCH rate)
11	SCH1_FOR_8X	76800 bps or 115200 bps (8x SCH rate)
12	SCH1_FOR_16X	153600 bps (16x SCH rate)
13	SCH1_FOR_LTU	number of LTUs received from the Physical Layer
14	SCH1_FOR_LTUOK	number of LTUs received from the Physical Layer with a correct CRC

No text.