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Mobile Station - Base Station System (MS - BSS) interface;
Data Link (DL) layer specification
(3GPP TS 44.006 version 13.0.0 Release 13)

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1 Scope

The present document defines a data link layer protocol to be used for signalling, and possibly also for other applications, on the MS-BS interface.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TS 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 44.001: "Mobile Station - Base Station System (MS - BSS) Interface General Aspects and Principles".

[3] 3GPP TS 44.003: "Mobile Station - Base Station System (MS - BSS) interface Channel structures and access capabilities".

[4] 3GPP TS 44.004: "Layer 1 General requirements".

[5] 3GPP TS 44.005: "Data Link (DL) layer General aspects".

[6] 3GPP TS 24.007: "Mobile radio interface signalling layer 3; General aspects".

[7] 3GPP TS 44.018: "Mobile radio interface layer 3 specification; Radio Resource Control Protocol".

[8] 3GPP TS 24.010: "Mobile radio interface layer 3 Supplementary services specification; General aspects".

[9] 3GPP TS 44.012: "Short Message Service Cell Broadcast (SMSCB) support on the mobile radio interface".

[10] 3GPP TS 45.002: "Multiplexing and multiple access on the radio path".

[11] 3GPP TS 48.056: "Base Station Controller - Base Transceiver Station (BSC - BTS) interface; Layer 2 specification".

[12] 3GPP TS 48.058: "Base Station Controller - Base Transceiver Station (BSC - BTS) interface; Layer 3 specification".

[13] CCITT Recommendation Z.100: "Specification and description language (SDL)".

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3 Abbreviations

Abbreviations used in the present document are listed in 3GPP TS 21.905.

4 General

The present document describes the frame structure, elements of procedure, format of fields and procedures for the proper operation of the Link Access Procedure on the Dm channel, LAPDm.

NOTE 1: The term Dm channel is used for convenience to designate the collection of all the various signalling channels required in the GSM system. See also 3GPP TS 44.003.

The concepts, terminology, overview description of LAPDm functions and procedures, and the relationship with other Technical Specifications are described in general terms in 3GPP TS 44.005.

The frame formats defined for LAPDm are based on those defined for LAPD. However, there are important differences between LAPDm and LAPD, in particular with regard to frame delimitation methods and transparency mechanisms. These differences are necessary for operation within the constraints set by the radio path.

LAPDm supports two modes of operation:

- unacknowledged operation using UI frames;
- acknowledged operation using the multiple frame procedure.

As a choice of implementation, the two modes of operation may be implemented independently of each other. This is possible since there is no interactions between the two modes, other than queuing at the transmitter, even when they coexist on the same physical channel. For BCCHs and CCCHs only the unacknowledged mode of operation needs to be implemented.

LAPDm is used for information sent on the control channels BCCH, AGCH, NCH, PCH, FACCH, SACCH and SDCCH as defined in 3GPP TS 44.003.

NOTE 2: AGCH, NCH and PCH are sometimes referred to by the collective name CCCH and FACCH, SACCH and SDCCH are, similarly, referred to by the collective name DCCH.

LAPDm may also be used on other types of channel.

NOTE 3: As stated in 3GPP TS 44.005, the term "data link layer" is used in the main text of this Technical Specification. However, mainly in figures and tables, the terms "layer 2" and "L2" are used as abbreviations. Furthermore, in accordance with 3GPP TS 24.007 and 3GPP TS 44.018, the term "layer 3" is used to indicate the layer above the data link layer.

This Technical Specification is organized as follows:

The frame structure for peer-to-peer communication is given in clause 5. The elements of procedure and formats of fields are given in clause 6. The elements of layer-to-layer communication are contained in clause 7. The details of the peer-to-peer procedures are given in clause 8. clause 6 summarizes the special protocol operations used mandatorily with SAPI=0 and SAPI = 3.

The specification for the random access channel is contained in annex A, even though it is not a LAPDm function. The present document is descriptive and does not constrain the implementation of the random access function. The procedure is used for CHANNEL REQUEST on the RACH and HANDOVER ACCESS on the main DCCH.

(Annexes B to F are deleted).

Annex G gives an overview of actions taken on frames containing parameter errors.

4.1 Options

Support of short L2 header type 1 is an option in both the mobile station and the network; under certain conditions the support is mandatory, as specified in other Specifications. A layer 2 protocol entity not implementing short L2 header type 1 shall diagnose an E/A bit error and proceed as defined in annex G.2.3.

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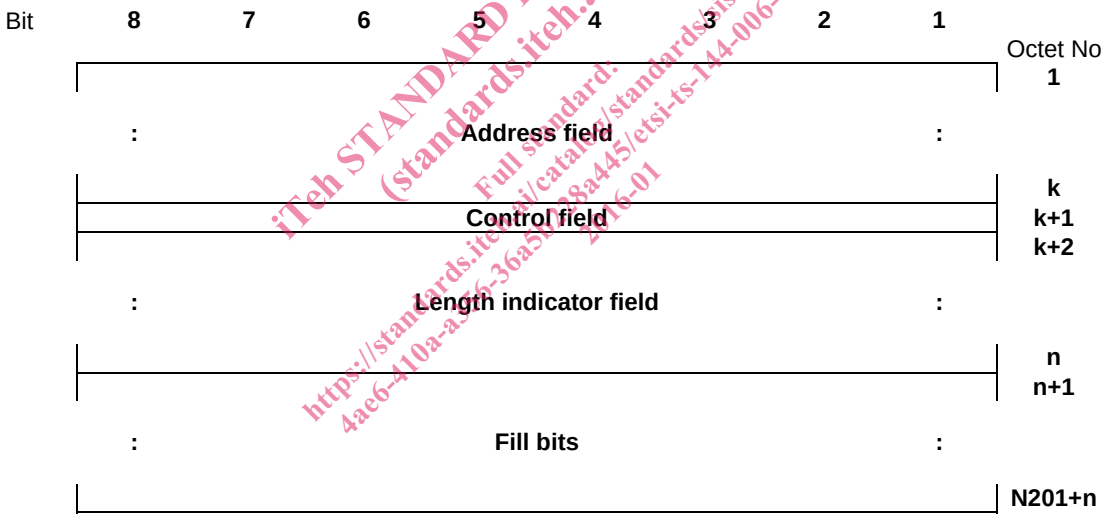
5 Frame structure for peer-to-peer communication

5.1 General

All data link layer peer-to-peer exchanges are in frames conforming to one of the formats shown in figure 1. Several format types are shown in the figure:

- Format A is used on DCCHs for frames where there is no information field.
- Formats B, Bter and B4 are used on DCCHs for frames containing an information field:
  - format Bter is used on request of higher layers if and only if short L2 header type 1 is supported and a UI command is to be transmitted on SAPI 0;
  - format B4 is used for UI frames transmitted by the network on SACCH;
  - format B is applied in all other cases.
- Format Bbis is used only on BCCH, PCH, NCH, and AGCH.
- In addition there is a Format C for transmission of random access signals.

Format C frames are described in annex A. Format A, B, Bbis, Bter and B4 frames are described in the remainder of the present document.



Format type A

Figure 1 (sheet 1 of 3): General frame formats

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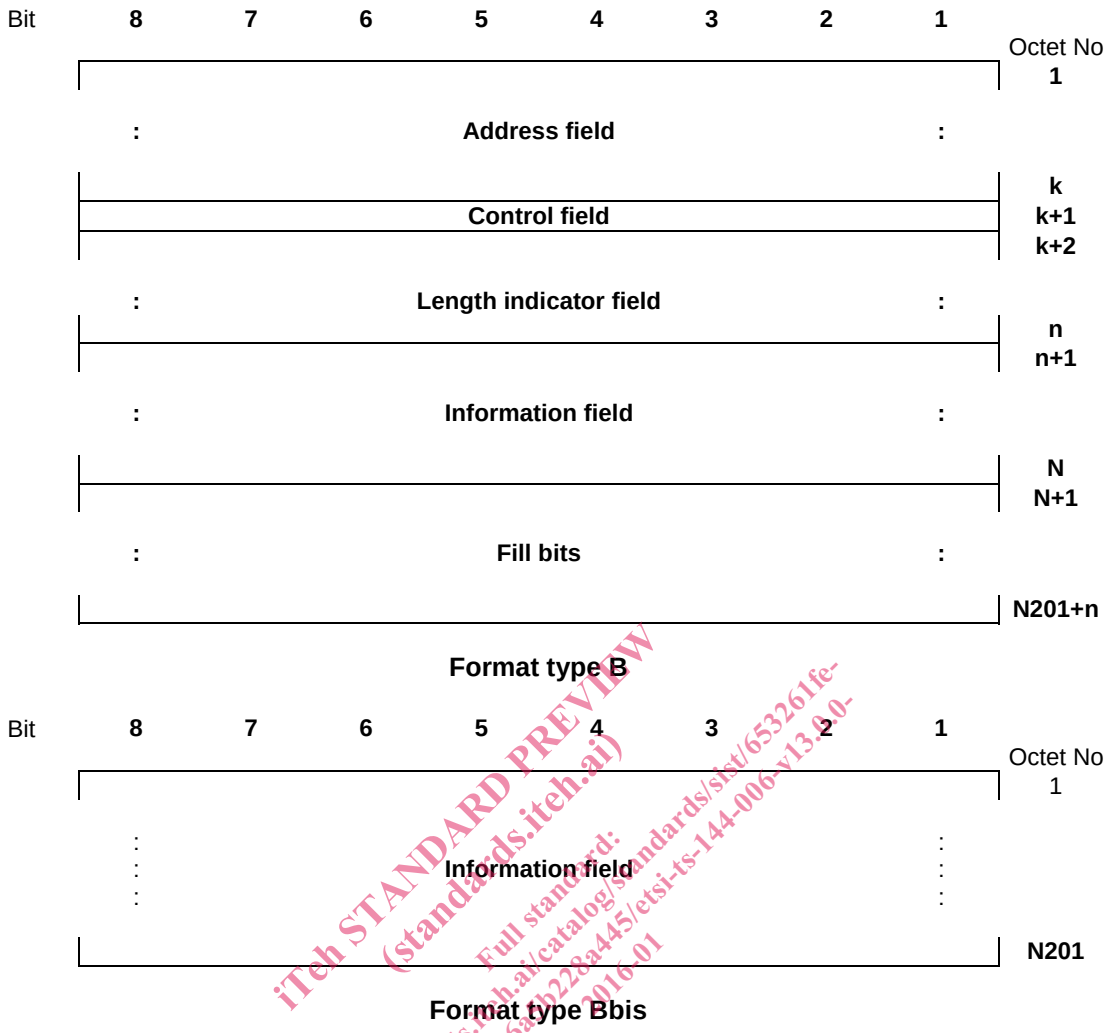

Figure 1 (sheet 2 of 3): General frame formats

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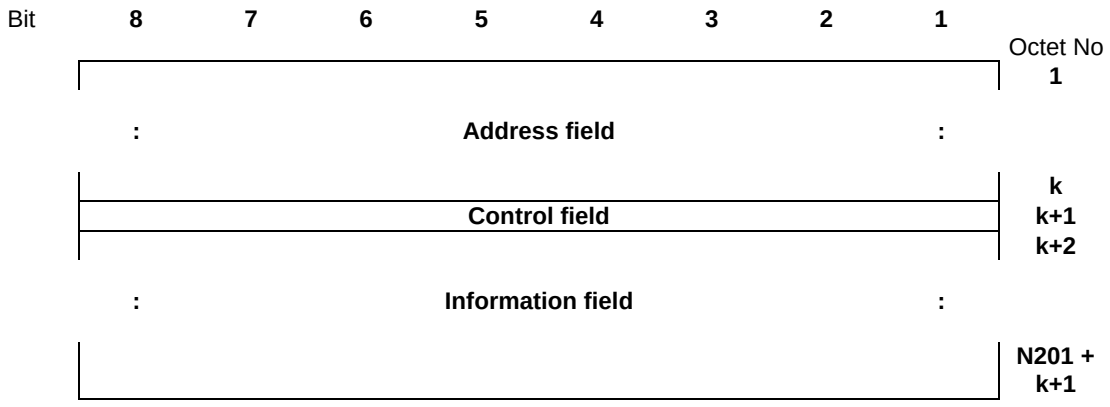
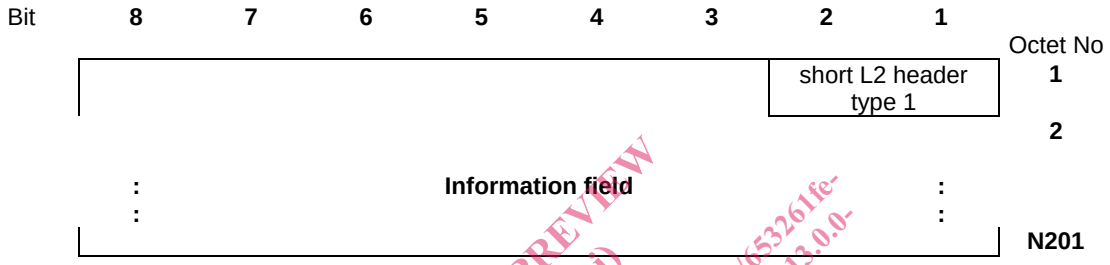


Format type B4



Format type Bter

Figure 1 (sheet 3 of 3): General frame formats

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The parameter N201 is the maximum number of octets which are partially or entirely available for the information field of a frame. It depends on the type of channel and the format, see sub-clause 8.8.3.

5.2 Frame delimitation and fill bits

Frame delimitation is provided by the physical layer:

- in format type A, B and B4 frames at the beginning of the frame for determining the start of the first octet in the address field, in format type Bter frames for determining the start of the octet containing the short L2 header type 1 (which is also the first octet used for the information field), and in format type Bbis frames for determining the start of the first octet for the information field;

- at the end of the frame for determining the last bit of the frame.

The end of the useful part of the frame, i.e. the end of the length indicator field in type A frames and the end of the information field in type B frames, is determined by a length indicator contained in the length indicator field. The useful part of a Bbis frames takes all N201 octets of that frame. The useful part of a Bter frame takes all N201 octets of that frame except those bits of octet 1 which contain the short L2 header type 1. The useful part of a B4 frame takes all N201 octets of that frame except those octets which contain the address field and the control field.

If a frame contains a length indicator that has a value less than N201, the frame contains fill bits. Each fill bit shall be set to a random value when sent by the mobile station. Except for the first octet containing fill bits which shall be set to the binary value "00101011", each fill bit should be set to a random value when sent by the network. Otherwise, the network shall set all octets containing fill bits to the binary value "00101011".

5.3 Address field

The address field may consist of a variable number of octets. However, for applications on control channels the field consists of only one octet. The address field identifies the SAP for which a command frame is intended and the SAP transmitting a response frame. The format of the address field is defined in sub-clause 6.2.