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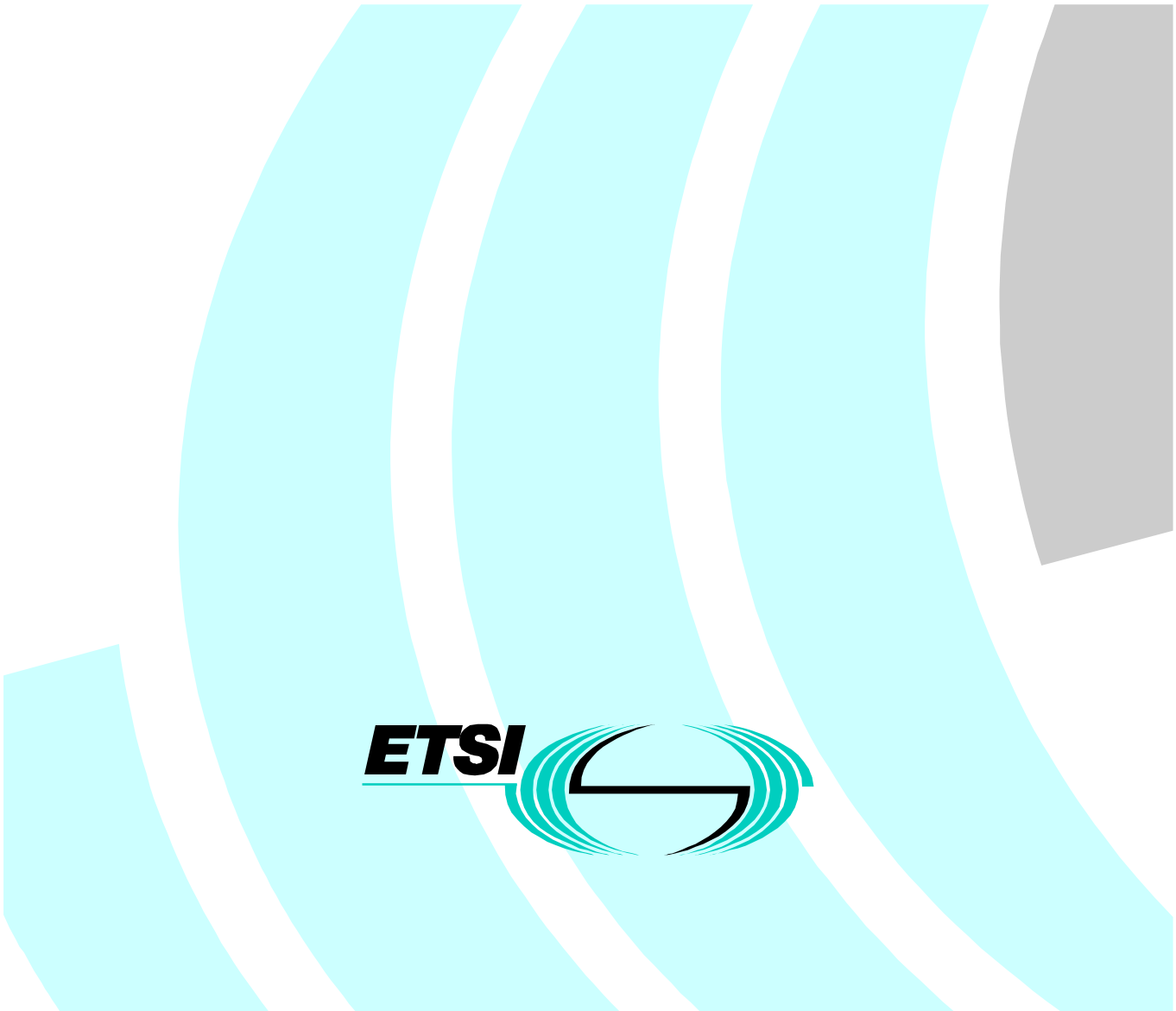
Technical Specification

GEO-Mobile Radio Interface Specifications;
Part 7: Terminal adaptor specifications;
Sub-part 2: Terminal Adaptation Functions (TAF)
for Services Using Asynchronous Bearer capabilities;
GMR-1 07.002



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Contents

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IPRs:

Project	Company	Title	Country of Origin	Patent n°	Countries Applicable
TS 101 376 V1.1.1	Digital Voice Systems Inc		US	US 5,226,084	US
TS 101 376 V1.1.1	Digital Voice Systems Inc		US	US 5,715,365	US
TS 101 376 V1.1.1	Digital Voice Systems Inc		US	US 5,826,222	US
TS 101 376 V1.1.1	Digital Voice Systems Inc		US	US 5,754,974	US
TS 101 376 V1.1.1	Digital Voice Systems Inc		US	US 5,701,390	US

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Project	Company	Title	Country of Origin	Patent n°	Countries Applicable
TS 101 376 V1.1.1	Ericsson Mobile Communication	Improvements in, or in relation to, equalisers	GB	GB 2 215 567	GB
TS 101 376 V1.1.1	Ericsson Mobile Communication	Power Booster	GB	GB 2 251 768	GB
TS 101 376 V1.1.1	Ericsson Mobile Communication	Receiver Gain	GB	GB 2 233 846	GB
TS 101 376 V1.1.1	Ericsson Mobile Communication	Transmitter Power Control for Radio Telephone System	GB	GB 2 233 517	GB

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Project	Company	Title	Country of Origin	Patent n°	Countries Applicable
TS 101 376 V1.1.1	Hughes Network Systems		US	Pending	US

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Project	Company	Title	Country of Origin	Patent n°	Countries Applicable
TS 101 376 V1.1.1	Lockheed Martin Global Telecommunic. Inc	2.4-to-3 KBPS Rate Adaptation Apparatus for Use in Narrowband Data and Facsimile Communication Systems	US	US 6,108,348	US
TS 101 376 V1.1.1	Lockheed Martin Global Telecommunic. Inc	Cellular Spacecraft TDMA Communications System with Call Interrupt Coding System for Maximizing Traffic ThroughputCellular Spacecraft TDMA Communications System with Call Interrupt Coding System for Maximizing Traffic Throughput	US	US 5,717,686	US
TS 101 376 V1.1.1	Lockheed Martin Global Telecommunic. Inc	Enhanced Access Burst for Random Access Channels in TDMA Mobile Satellite System	US	US 5,875,182	
TS 101 376 V1.1.1	Lockheed Martin Global Telecommunic. Inc	Spacecraft Cellular Communication System	US	US 5,974,314	US
TS 101 376 V1.1.1	Lockheed Martin Global Telecommunic. Inc	Spacecraft Cellular Communication System	US	US 5,974,315	US
TS 101 376 V1.1.1	Lockheed Martin Global Telecommunic. Inc	Spacecraft Cellular Communication System with Mutual Offset High-argin Forward Control Signals	US	US 6,072,985	US
TS 101 376 V1.1.1	Lockheed Martin Global Telecommunic. Inc	Spacecraft Cellular Communication System with Spot Beam Pairing for Reduced Updates	US	US 6,118,998	US

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Satellite Earth Stations and Systems (SES).

The contents of the present document are subject to continuing work within TC-SES and may change following formal TC-SES approval. Should TC-SES modify the contents of the present document it will then be republished by ETSI with an identifying change of release date and an increase in version number as follows:

Version 1.m.n

where:

- the third digit (n) is incremented when editorial only changes have been incorporated in the specification;
- the second digit (m) is incremented for all other types of changes, i.e. technical enhancements, corrections, updates, etc.

The present document is part 7, sub-part 2 of a multi-part deliverable covering the GEO-Mobile Radio Interface Specifications, as identified below:

Part 1: "General specifications";

Part 2: "Service specifications";

Part 3: "Network specifications";

Part 4: "Radio interface protocol specifications";

Part 5: "Radio interface physical layer specifications";

Part 6: "Speech coding specifications";

Part 7: "Terminal adaptor specifications";

Sub-part 1: "General on Terminal Adaptation Functions (TAF) for Mobile Earth Stations (MES); GMR-1 07.001";

Sub-part 2: "Terminal Adaptation Functions (TAF) for Services Using Asynchronous Bearer capabilities"; GMR-1 07.002";

Sub-part 3: "Terminal Adaptation Functions (TAF) for Services Using Synchronous Bearer Capacities; GMR-1 07.003".

Introduction

GMR stands for GEO (Geostationary Earth Orbit) Mobile Radio interface, which is used for mobile satellite services (MSS) utilizing geostationary satellite(s). GMR is derived from the terrestrial digital cellular standard GSM and supports access to GSM core networks.

Due to the differences between terrestrial and satellite channels, some modifications to the GSM standard are necessary. Some GSM specifications are directly applicable, whereas others are applicable with modifications. Similarly, some GSM specifications do not apply, while some GMR specifications have no corresponding GSM specification.

Since GMR is derived from GSM, the organization of the GMR specifications closely follows that of GSM. The GMR numbers have been designed to correspond to the GSM numbering system. All GMR specifications are allocated a unique GMR number as follows:

GMR-n xx.zyy

where:

xx.0yy (z=0) is used for GMR specifications that have a corresponding GSM specification. In this case, the numbers xx and yy correspond to the GSM numbering scheme.

xx.2yy (z=2) is used for GMR specifications that do not correspond to a GSM specification. In this case, only the number xx corresponds to the GSM numbering scheme and the number yy is allocated by GMR.

n denotes the first (n=1) or second (n=2) family of GMR specifications.

A GMR system is defined by the combination of a family of GMR specifications and GSM specifications as follows:

- If a GMR specification exists it takes precedence over the corresponding GSM specification (if any). This precedence rule applies to any references in the corresponding GSM specifications.

NOTE: Any references to GSM specifications within the GMR specifications are not subject to this precedence rule. For example, a GMR specification may contain specific references to the corresponding GSM specification.

- If a GMR specification does not exist, the corresponding GSM specification may or may not apply. The applicability of the GSM specifications is defined in GMR-1 01.201 [16].

1 Scope

The present document defines the interfaces and Terminal Adaptation Functions (TAF) integral to a Mobile Termination (MT) which enables the attachment of asynchronous terminals to an MT (see GMR-1 04.002 [3]). The general aspects of Terminal Adaptation Functions are contained in GMR-1 07.001 [5]. The present document covers support of these services for the following interfaces and procedures:

(i) V.14 [11] procedures;

(ii) V.21 DTE/DCE interface [10];

(iii) V.22 bis DTE/DCE interface [12];

(iv) V.23 DTE/DCE interface [13];

(v) V.32 DTE/DCE procedures [14];

(vi) I.420 S interface [15];

(vii) V.25 bis signalling procedures [7];

(viii) V.25 ter signalling procedures.

The asynchronous data rates between the MT and the TE2 are defined in GSM 02.02 [2].

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, subsequent revisions do apply.

[1] GMR-1 01.004 (ETSI TS 101 376-1-1): "GEO-Mobile Radio Interface Specifications; Part 1: General specifications; Sub-part 1: Abbreviations and acronyms; GMR-1 01.004".

[2] GSM 02.02 (ETSI ETS 300 501): "European digital cellular telecommunications system (Phase 2); Bearer Services (BS) supported by a GSM Public Land Mobile Network (PLMN) (GSM 02.02 version 4.2.2)".

[3] GMR-1 04.002 (ETSI TS 101 376-4-2): "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 2: GMR-1 Satellite Network Access Reference Configuration; GMR-1 04.002".

[4] GMR-1 04.008 (ETSI TS 101 376-4-8): "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 8: Mobile Radio Interface Layer 3 Specifications; GMR-1 04.008".

[5] GMR-1 07.001 (ETSI TS 101 376-7-1): "GEO-Mobile Radio Interface Specifications; Part 7: Terminal adaptor specifications; Sub-part 1: General on Terminal Adaptation Functions (TAF) for Mobile Earth Stations (MES); GMR-1 07.001".

[6] ITU-T Recommendation V.4: "General structure of signals of International alphabet No. 5 code for character oriented data transmission over public telephone networks".

[7] ITU-T Recommendation V.25 bis (1988): Blue book, Volume VIII, Fascicle VIII.1 "Automatic Calling and/or Answering Equipment on the General Switched Telephone Network (GSTN) Using the 100-Series Interchange Circuits".

[8] ITU-T Recommendation V.110: "Support by an ISDN of data terminal equipments with V-series type interfaces".

[9] ITU-T Recommendation V.24 (1988): Blue book, Volume VIII, Fascicle VIII.1 "List of Definitions for Interchange Circuits Between Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment".

[10] ITU-T Recommendation V.21 (1988): Blue book, Volume VIII, Fascicle VIII.1 "300 bits per Second Duplex Modem Standardized for Use in the General Switched Telephone Network".

[11] ITU-T Recommendation V.14 (1988): Blue book, Volume VIII, Fascicle VIII.1 "Transmission of Start-Stop Characters Over Synchronous Bearer Channels".

[12] ITU-T Recommendation V.22 bis (1988): Blue book, Volume VIII, Fascicle VIII.1 "2400 Bits Per Second Duplex Modem Using the Frequency Division Technique Standardized for Use on the General".

[13] ITU-T Recommendation V.23 (1988): Blue book, Volume VIII, Fascicle VIII.1 "600/1200-Baud Modem Standardized for Use in the General Switched Telephone Network".

[14] ITU-T Recommendation V.32 (1988): Blue book, Volume VIII, Fascicle VIII.1 "A Family of 2-Wire, Duplex Modems Operating at Data Signalling Rates of up to 9600 bit/s for Use in the General Switched Telephone Network and on Leased Telephone-Type Circuits".

[15] ITU-T Recommendation I.420: Blue book, Volume III, Fascicle III.8 "Basic user-network interface".

[16] GMR-1 01.201 (ETSI TS 101 376): "GEO-Mobile Radio Interface Specifications; Part 1: General specifications; Sub-part 2: Introduction to the GMR-1 Family; GMR-1 01.201".

[17] GSM 07.02 (ETSI ETS 300 914): "Digital cellular telecommunications system (Phase 2+); Terminal Adaptation Functions (TAF) for services using asynchronous bearer capabilities (GSM 07.02 version 5.5.1)".

[18] GSM 07.07 (ETSI ETS 300 916): "Digital cellular telecommunications system (Phase 2+); AT command set for GSM Mobile Equipment (ME) (GSM 07.07 version 5.9.1)".

3 Abbreviations

Abbreviations used in the present document are listed in GMR-1 01.004 [1].

4 Reference configuration

GMR-1 07.001 [5] and GMR-1 04.002 [3] describe the basic reference configurations.

4.1 Customer access configuration

Same as clause 2.1 of GSM 07.02 [17].

4.2 Terminal adaptation function

The TAF provides facilities to allow manual or automatic call control functions associated with alternate speech/ data, speech followed by data, and circuit switched services. The following functions are also included:

- Conversion of electrical, mechanical, functional, and procedural characteristics of the V series and ISDN type interfaces to those required by the satellite system;
- Bit rate adaptation of the V series data signalling rates and the ISDN 64 kbps to that provided in the satellite system;
- The mapping functions necessary to convert automatic calling and/or automatic answering procedures of recommendation V.25 bis [7] or V.25 ter and parameters for asynchronous operation;
- The mapping functions necessary to convert S-interface signalling to the satellite system Dm channel signalling;
- Flow control (in some cases resulting in nontransparency of data as described in clause 6.3);
- Layer 2 relaying (see annex A);
- In-call modification function;
- Synchronization procedure, which means the task of synchronizing the entry to and the exit from the data transfer phase between two user terminals, as described in GMR-1 07.001 [5];
- Filtering of channel control information as described in GMR-1 07.001 [5];
- Terminal compatibility checking.

5 Terminal adaptation functions for transparent services

Same as clause 3 of GSM 07.02 [17].

5.1 Rate adaptation

Same as clause 3.1 of GSM 07.02 [17].

5.1.1 Rate adaptation - V series

Same as clause 3.1.1 of GSM 07.02 [17].

5.1.2 Rate adaptation - S-interface (I.420)

Same as clause 3.1.2 of GSM 07.02 [17].

5.2 Interchange circuit signaling mapping

5.2.1 V.24 interchange circuits mapping

Same as clause 3.2.1 of GSM 07.02 [17].

5.3 Call establishment signaling mapping

5.3.1 Autocalling/answering

The mapping of the V.25 bis [7] procedures to the messages of the satellite system signaling in GMR-1 04.008 [4] is defined in clause 7.

a) Auto Calling

- This procedure is provided according to ITU-T Recommendation V.25 bis [7] using only CT108/2.
- A subset of V.25 bis [7] is shown in table 3 in GSM 07.02 [17]. This subset gives minimum level of control and indication.
- During the call establishment phase, i.e., after signalling, call tone according to V.25 bis [7] shall be generated in the IWF.
- An alternative to ITU-T Recommendation V.25 bis [7] is to use the ITU-T Recommendation V.25 ter dial command as specified in GSM 07.07 [18].

b) Auto Answer

- This procedure is provided according to ITU-T Recommendation V.25 bis [7] or V.25 ter.

5.3.2 S-interface (I.420) signaling mapping

Same as clause 3.3.2 of GSM 07.02 [17].

5.3.3 Call establishment manual operation utilizing alternate speech/data or speech followed by data capabilities

Same as clause 3.3.3 of GSM 07.02 [17].

5.3.4 Call establishment manual operation utilizing the unrestricted digital capability

Same as clause 3.3.4 of GSM 07.02 [17].

6 Terminal adaptation functions for nontransparent services

Same as clause 4 of GSM 07.02 [17].

6.1 Data structure

6.1.1 Data structure on S-interface

Same as clause 4.1.1 of GSM 07.02 [17].

6.1.2 Data structure on R-interface

Same as clause 4.1.2 of GSM 07.02 [17].

6.1.3 Data structure provided by the L2R function to the RLP function

See annex A.

6.2 Signaling mapping

Same as clause 4.2 of GSM 07.02 [17].

6.3 Flow control

Same as clause 4.3 of GSM 07.02 [17].

6.3.1 Conditions requiring flow control towards the network

Same as clause 4.3.1 of GSM 07.02 [17].

6.3.2 Conditions requiring flow control towards TE2

Same as clause 4.3.2 of GSM 07.02 [17].

6.3.3 Local flow control

Same as clause 4.3.3 of GSM 07.02 [17].

6.3.4 Character-orientated protocol with no flow control

Same as clause 4.3.4 of GSM 07.02 [17].

6.4 Buffers

6.4.1 TX buffers

Data received on CT103 from the TE2 shall be buffered such that if the MT is unable to transfer the data over the radio path then data is not lost.

The buffer shall be capable of holding at least 64 kbits.

When the buffer is half full, TE2 shall be flow controlled as per clause 6.3.2, unless character-orientated protocol with no flow control is being used (see clause 6.3.4).

6.4.2 RX buffers

Data for transfer to the TE2 on CT104 shall be buffered such that if the TE2 is unable to accept data, then data transferred from the MT is not lost.

The buffer size should be at least 64 kbits.

When the buffer becomes half full, the L2R will send a "flow control active" indication, unless character-orientated protocol with no flow control is being used.

6.5 Bit transparency

Same as clause 4.5 of GSM 07.02 [17].

6.6 Transportation of "break" condition

Same as clause 4.6 of GSM 07.02 [17].

6.7 Data compression

Not applicable.

7 Terminal interfacing to GMR-1 04.008 mapping

Same as clause 5 of GSM 07.02 [17].

Refer to GMR-1 04.008 [4].

8 Functionality for the support of dedicated PAD services

Not applicable.

Annex A (normative): L2R functionality

A.1 Introduction

Same as annex A of GSM 07.02 [17].

A.2 The L2RCOP

Information is transferred between L2Rs in fixed length n octet protocol data units (PDUs). This corresponds to the fixed length of the RLP information field of the RLP (24 or 25 octets RLP information field). The octets within the L2RCOP-PDU are numbered 0 to n-1, octet 0 is transmitted first. The bits within the octets are numbered 1 to 8; bit 1 is transmitted first. The value of n depends on the negotiated RLP version and frame type. For RLP version 2, n equals 24 and RLP versions 0 and 1, n equals 25.

- Each octet contains a status octet, an information octet or fill.
- Octet 0 contains either a status octet or a user information octet.
  - The octet 0 shall always contain a status octet in case at least one status octet is transported in the L2RCOP PDU. In case of RLP version 2, octet 0 contains user information data only if no status octet will be transported in the L2RCOP PDU. In RLP-versions 0 and 1, a PDU always carries at least one status octet. In the case of RLP version 2, the L2R status flag in the RLP header is set to 1 indicates status octet in position 0.
  - Status octets contain 3 status bits and 5 address bits. In cases where two status octets within the PDU are separated by more than 23 octets, the first status octet in octet m is followed by a pointer octet in octet m+1 forming a two-octet status field. The pointer octet contains one reserved bit and seven address bits indicating the number of characters between the status field and the second status octet.
- The 3 status bits correspond to SA, SB and X in ITU-T Recommendation V.110 [8]. The SA, SB and X bits use bit positions 8,7,6 in the status octets. When a status bit changes the current state of all three bits shall be transmitted.
- Information octets are character octets or encoded character octets.
- Character octets are coded in the following way:
  - The first bit of the character received/transmitted corresponds to bit position 1 in the octet, the second bit to bit 2, ... and the seventh bit to bit 7. For order of transmission of IA5 characters see ITU-T Recommendation V.4 [6].
  - 7 bit characters are padded with a 0 in bit position 8. Received parity (if used) is inserted in bit position 8, if parity is not used bit 8 is set to 0.
  - Any start/stop bits are removed by the L2R.
- Information octets are inserted into L2RCOP-PDUs in order of transmission in octets 1 to n-1 for RLP versions 0 and 1 (n equals 25). For RLP version 2, information octets are inserted into L2RCOP-PDUs in order of transmission in octets 1 to n-1 (n equals 24) with status octet transportation and in octets 0 to n-1 (n equals 24) with no status octet transportation.
- The address field in the status octets indicates the position of next status octet within the L2RCOP-PDU. This indicates the number of characters between status octets. Thus, if two status octets are inserted into L2RCOP-PDU at offsets l and m the address value will be defined by m-l-1. Address bit 20 corresponds to bit 1 in the status octets, address bit 21 to bit 2, etc.
- Status octets are inserted in the character stream whenever a status change needs to be transmitted.

- Only address values 1 to n-2 (currently expected to be 23 or 22) in the address field of status octets are used for addressing purposes. The implication of not allowing address value 0 to be used for addressing is that two status octets cannot be sent after each other. The remaining codes are used to indicate:
  - Last status change, remainder of L2RCOP-PDU empty. Address field value 31.
  - Last status change, remainder of L2RCOP-PDU full of characters. Address field value 30.
  - Destructive break signal, remainder of L2RCOP-PDU empty. Address field value 29.
  - Destructive break acknowledge, remainder of L2RCOP-PDU empty. Address field value 28.
  - L2RCOP-PDU contains at least two status octets that are separated by more than 23 characters; the address-field value in the first octet of the two-octet status field is 27 and the address bits in the pointer octet of the status field indicate the number of characters between the two-octet status field and the next status octet.
  - Address field values from n-1 to 26 are reserved.
- When it is necessary to insert a status octet into the character stream when no status change has occurred, e.g., to indicate that the reminder of a L2RCOP-PDU is empty or to indicate a break signal, the current status shall be repeated.

Two examples of an L2RCOP PDU are shown in figure 1.

	8	7	6	5	4	3	2	1	
0	SA	SB	x	0	0	0	1	1	
1	1	1	0	0	0	1	1	1	IA5 "G" (odd parity)
2	1	1	0	1	0	0	1	1	IA5 "S" (odd parity)
3	1	1	0	0	1	1	0	1	IA5 "M" (odd parity)
4	SA	SB	x	1	1	1	1	1	(last status change, rest of PDU empty)
.									
.									
.									
n-1									

Figure A.1a: RLP Version 0 and 1 (n=25) and RLP Version 2 (n=24) with Status Octet Transfer in PDU

	8	7	6	5	4	3	2	1	
0	1	1	0	1	0	0	1	1	IA5 "S" (odd parity)
1	1	1	0	0	0	1	1	1	IA5 "G" (odd parity)
2	1	1	0	1	0	0	1	1	IA5 "S" (odd parity)
3	1	1	0	0	1	1	0	1	IA5 "M" (odd parity)
4									
.									
.									
.									
n-1	1	1	0	0	1	1	0	1	IA5 "M" (odd parity)

Figure A.1b: L2RCOP PDU with No Status Octet Transfer for RLP Version 2

A.3 Use of the L2RCOP

Same as A.3 of GSM 07.02 [17].

A.3.1 Radio link connection control

Same as A.3.1 of GSM 07.02 [17].

A.3.2 Data transfer

Same as A.3.2 of GSM 07.02 [17].

A.3.3 Status transfer

Same as A.3.3 of GSM 07.02 [17].

A.3.4 Flow control

Same as A.3.4 of GSM 07.02 [17].

A.3.5 Break

Same as A.3.5 of GSM 07.02 [17].

Annex B (informative): Use of the 9-pin version of V.24 as an MT2 type

Same as annex B of GSM 07.02 [17].

Refer to ITU-T Recommendation V.24 [9].

History

Document history		
V1.1.1	March 2001	Publication