3GPP TSG_CN#7 **NP-000044**

ETSI SMG3 Plenary Meeting #7,

Madrid, Spain

13th – 15th March 2000

Agenda item: **5.3.3**

Source: **TSG_N WG3**

Title: **CRs to 3G Work Item CS Data**

Introduction:

This document contains **"6"** CRs on **Work Item CS Data,** that have been agreed by **TSG_N WG3,** and are forwarded to **TSG_N Plenary** meeting #7 for approval.

WG Tdoc	Spec	CR	Rev	Cat	Phase	Current V.	New V.	Subject
N3-000115	27.001	011		F	R99	3.3.0	3.4.0	Bit transparent services RDI and UDI
N3-000078	27.001	013		C	R99	3.3.0	3.4.0	Alignment to RANAP and other clarifications
N3-000124	29.007	013		B	R99	3.3.0	3.4.0	CR to 29.007 for A-TRAU'
N3-000087	29.007	012		F	R99	3.3.0	3.4.0	Clarification of reference to Q.931 for LLC IE
N3-000084	27.002	003		F	R99	3.2.0	3.3.0	UMTS clean up
N3-000085	27.003	004		F	R99	3.2.0	3.3.0	UMTS clean up

3GPP/SMG Meeting #08
Sophia Antipolis, France, 28 Feb-03 Mar 2000

***Document* N3-000115**
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

27.001	CR	011	Current Version:	3.3.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to: TSGN 07 *list expected approval meeting # here ↑*

for approval [X] for information [ ] strategic [ ] non-strategic [ ] *(for SMG use only)*

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)* (U)SIM [ ] ME [X] UTRAN / Radio [ ] Core Network [X]

Source: TSGN WG3 **Date:** 2000-03-01

Subject: Bit transparent services RDI and UDI.

Work item: CS data bearer services

Category: *(only one category shall be marked with an X)*

F	Correction	[X]
A	Corresponds to a correction in an earlier release	[ ]
B	Addition of feature	[ ]
C	Functional modification of feature	[ ]
D	Editorial modification	[ ]

Release:

Phase 2	[ ]
Release 96	[ ]
Release 97	[ ]
Release 98	[ ]
Release 99	[X]
Release 00	[ ]

Reason for change: The bit transparent services using UTRAN had not been fully specified

Clauses affected: Section B.1.3.1.8 (new section)

Other specs affected:

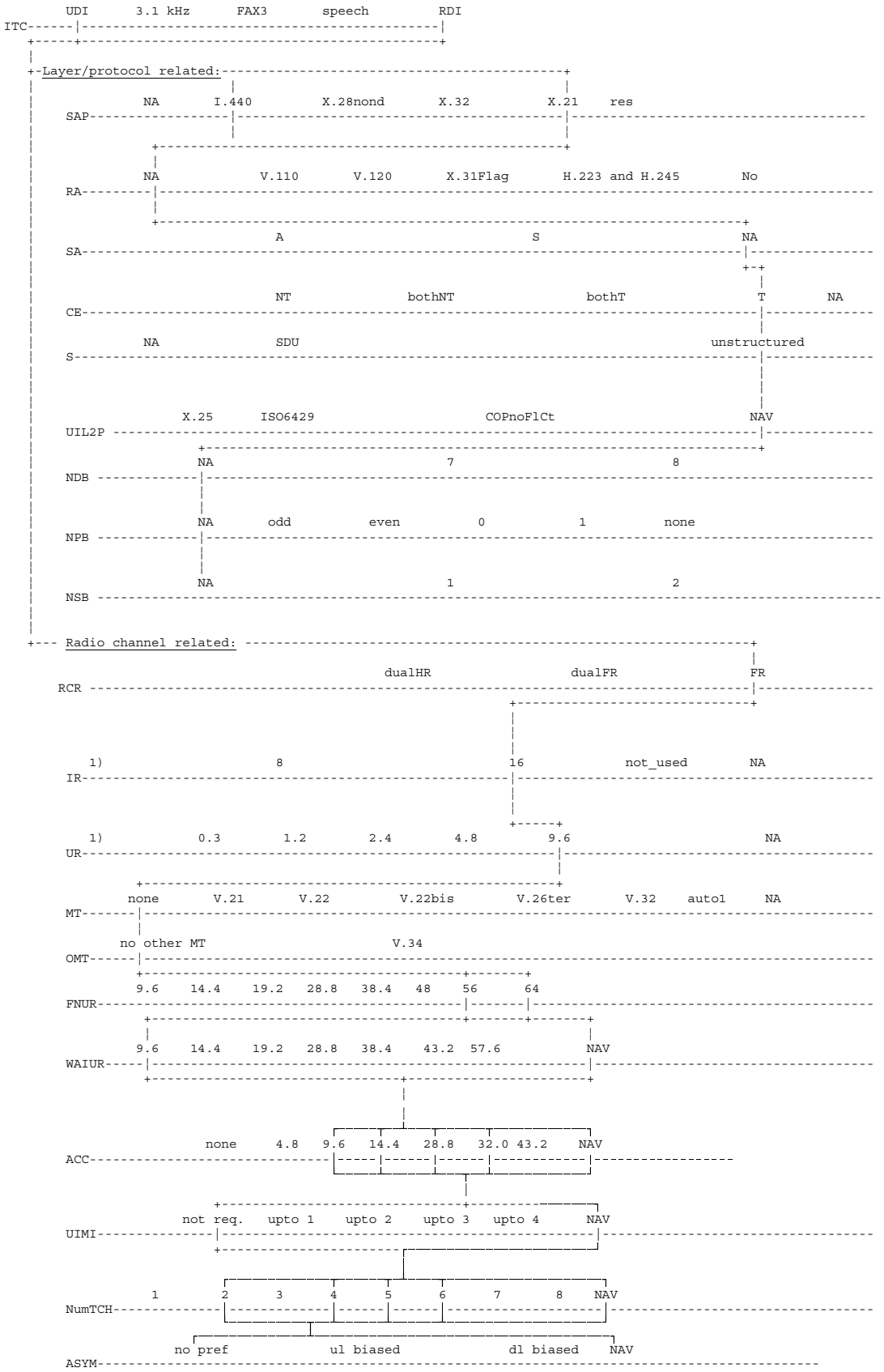
Other 3G core specifications	[ ]	→ List of CRs:
Other GSM core specifications	[ ]	→ List of CRs:
MS test specifications	[ ]	→ List of CRs:
BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

B.1.3.1.8 Bit transparent 56 kbit/s (RDI) and 64kbit/s (UDI) (UTRAN)



WAIUR, UIMI and ASYM shall be available only if the ACC includes TCH/F32.0.

ACC and NumTCH may be available in order to support handover to GSM.

3GPP TSG-N3 meeting #8
Sophia Antipolis, France, 28 Feb - 3 Mar 2000

Document N3-000078
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

27.001	CR	013	Current Version:	3.3.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG_N#7	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)*	(U)SIM		ME	X	UTRAN / Radio		Core Network	X

Source: TSG N WG3 **Date:** 29-02-2000

Subject: Introduction of UMTS – Alignment to RANAP semantics and other clarifications

Work item: CS data bearer services

Category: *(only one category shall be marked with an X)*

F	Correction	
A	Corresponds to a correction in an earlier release	
B	Addition of feature	
C	Functional modification of feature	X
D	Editorial modification	

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
Release 00	

Reason for change:
The RAB setting parameters need to be aligned to the latest semantic changes of the RANAP protocol (R3-000377).
Clarifications related to the QoS parameters guaranteed/maximum bit rate and to maximum SDU size have been made for RAB setting for T and NT data.
The setting of the traffic class is made operator changeable, according to N3 agreement, and a corresponding LS issued towards S2. (S2-99A05)

Clauses affected: B.1.13.1, B.1.13.2

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

B.1.13 Assignment of radio access bearer parameters depending on FNUR and WAIUR

B.1.13.1 Transparent Services

Depending on the FNUR ~~signalled by~~ negotiated between the network and the MS, the network is allowed to assign any radio resources with a radio access bearer parameter indicating a Quality of Service specifying

QoS Parameter	Value	Comments
Traffic Class	Conversational	Subject to operator tuning
RAB Asymmetry Indicator	Symmetric	
Maximum bit rate	= guaranteed bit rate	
Guaranteed bit rate	FNUR = 64 .. 28.8 kbit/s	GBR for FNUR=56 kbit/s is 64 kbit/s
Delivery Order	Yes	
Maximum SDU size	640 .. 288 bits (depending on the FNUR)	Maximum SDU size for FNUR=56 kbit/s is 640 bits
Transfer Delay	< 200 ms	Subject to operator tuning
Traffic Handling Priority	-	Not applicable for the conversational traffic class
Source statistics descriptor	Unknown	
SDU Parameters		
SDU error ratio	-	Not applicable
Residual bit error ratio	10^{-4}	Subject to operator tuning.
Delivery of erroneous SDUs	-	No error detection in the core network
~~**Subflow SDU size parameters**~~		
~~**Rate Control Allowed**~~	~~No~~	
~~**Subflow SDU size**~~	~~Maximum SDU size~~	

The final decision about the radio interface configuration is taken by the RNC during the Assignment procedure.

B.1.13.2 Non-transparent services

Depending on the WAIUR signalled by the MS, the network is allowed to assign any radio resources with a radio access bearer parameter indicating a Quality of Service specifying

QoS Parameter	Value	Comments
Traffic Class	Streaming	Subject to operator tuning
RAB Asymmetry Indicator	Symmetric	
Maximum bit rate	14.4, 28.8, 57.6 kbit/s	Maximum bit rate is set to the highest value ≤ WAIUR (note 1)
Guaranteed bit rate	14.4 kbit/s	
Delivery Order	Yes	
Maximum SDU size	576 bits	
Transfer Delay	< 250 ms	Subject to operator tuning
Traffic Handling Priority	-	Not applicable to the streaming traffic class
Source statistics descriptor	Unknown	
SDU Parameters		
SDU error ratio	< 10 %	Subject to operator tuning
Residual bit error ratio	10^{-3}	Subject to operator tuning.
Delivery of erroneous SDUs	No	
~~Subflow SDU size parameters~~ SDU format information		
RAB Subflow Combination bit rate	57.6 kbit/s	
RAB Subflow Combination bit rate	28.8 kbit/s	
RAB Subflow Combination bit rate	14.4 kbit/s	
~~Rate Control Allowed~~	~~Yes~~	
~~Subflow SDU size~~	~~576 bit~~	
~~Subflow SDU size parameters~~		
~~Rate Control Allowed~~	~~No~~	
~~Subflow SDU size~~	~~0 bit~~	

Note 1: In case the WAIUR is less than 14.4 kbit/s, the maximum bit rate is set to 14.4 kbit/s.

The final decision about the radio interface configuration is taken by the RNC during the Assignment procedure.

3GPP/CN3
Sophia Antipolis, France, 01 March 2000

Document* *N3-000084
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

27.002	**CR**	**003**	Current Version:	3.2.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to: TSG CN#7 *list expected approval meeting # here ↑*	for approval	X	strategic		*(for SMG use only)*
	for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)*	(U)SIM		ME	X	UTRAN / Radio		Core Network	X

Source: 3GPP TSG_CN WG3 **Date:** 01-March-2000

Subject: UMTS clean up

Work item: CS Data

Category: *(only one category shall be marked with an X)*

F	Correction	X
A	Corresponds to a correction in an earlier release	
B	Addition of feature	
C	Functional modification of feature	
D	Editorial modification	

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
Release 00	

Reason for change:
GSM references replaced with the corresponding 3G TS specifications where available.
Unused references deleted.
Some new references included.
Changed CCITT references to ITU-T.
Replaced several “will” with “shall”.
Some minor editorial corrections.

Clauses affected: All

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

3G TS 27.002 V3.2.0 (1999-12

Technical Specificatio

3rd Generation Partnersl
Technical Specification Group Cor[illegible]
Terminal Adaptation Functions (TAF)
for services using asynchronous bearer capabilities
(3G TS 27.002 version 3.2.0)

Reference
DTS/TSGN-0327002U

Keywords
3GPP, CN

3GPP

Postal address

3GPP support office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet
http://www.3gpp.org

Contents

Foreword

This Technical Specification has been produced by the 3GPP.

This TS defines the interfaces and Terminal Adaptation Functions (TAF) integral to a Mobile Termination (MT) which enables the attachment of asynchronous terminals to a MT within the 3GPP system.

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of this TS, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version 3.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 Indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the specification;

1 Scope

This Technical Specification (TS) defines the interfaces and Terminal Adaptation Functions (TAF) integral to a Mobile Termination (MT) which enables the attachment of asynchronous terminals to a MT (see GSM 04.02 [43] and 3G TS 23.101 [6]).

The general aspects of Terminal Adaptation Functions are contained in GSM 07.013G TS 27.001 [107]. This

The TS present document covers support of these services for the following interfaces and procedures:

(i) ITU-T V.14 [1516] procedures
(ii) ITU-T V.21 [1617] DTE/DCE interface
(iii) ITU-T V.22bis [1718] DTE/DCE interface
(iv) ITU-T V.32 [2423] DTE/DCE procedures
(v) ITU-T I.420 [1314] S interface
(vi) ITU-T V.25 bis [2120] signalling procedures
(vii) ITU-T V.25 ter [2221] signalling procedures

The asynchronous data rates between the MT and the TE2 are defined in GSM 02.023G TS 22.002 [52].

Note

NOTE: From GSM R99 onwards the following services are no more required to be provided by a GSM PLMN:

- the dual Bearer Services “alternate speech/data” and “speech followed by data”
- the dedicated services for PAD and Packet access
- the BS 21 ... 26 and BS 31 ... 34

The support of these services is still optional. The specification of these services is not within the scope of this Tsthe present document. For that, the reader is referred to GSM Release 98.

1.1 Normative 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.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] GSM 01.04: "Digital cellular telecommunication system (Phase 2+); Abbreviations and acronyms".

This reference should be replaced by 3G TS 21.905 if this document becomes a part of R99?

[2] GSM 02.02: "Digital cellular telecommunication system (Phase 2+); Bearer Services (BS) supported by a GSM Public Land Mobile Network (PLMN)".

[32] GSM 03.10: "Digital cellular telecommunication system (Phase 2+); GSM Public Land Mobile Network (PLMN) connection types".

[34] GSM 04.02: "Digital cellular telecommunication system (Phase 2+); GSM Public Land Mobile Network (PLMN) access reference configuration".

~~[5] GSM 04.08: "Digital cellular telecommunication system (Phase 2+); Mobile radio interface layer 3 specification".~~

[~~6~~4] GSM 04.21: "Digital cellular telecommunication system (Phase 2+); Rate adaption on the Mobile Station - Base Station System (MS - BSS) interface ".

~~[7] GSM 07.01: "Digital cellular telecommunication system (Phase 2+); General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS)".~~

~~[8] GSM 07.07: "Digital cellular telecommunication system (Phase 2+); AT command set for GSM Mobile Equipment (ME)~~

[5] 3G TS 22.002: “Circuit Bearer Services (BS) supported by a Public Land Mobile Network (PLMN)".

[6] 3G TS 23.101: " General UMTS Architecture”

[7] 3G TR 23.910: " Circuit Switched Data Bearer Services”

[8] 3G TS 24.008: " Mobile Radio Interface Layer 3 specification; Core Network Protocols-Stage 3".

[9] 3G TS 24.022: " Radio Link Protocol (RLP) for Circuit Switched Bearer and Teleservices".

[10] 3G TS 27.001: " General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS)".

[11] 3G TS 27.007: " AT command set for 3G User Equipment (UE).”

[12] 3G TR 21.905 “3G Vocabulary”

[~~12~~13] 3G TS 29.007: " General requirements on Interworking between the PLMN and the ISDN or PSTN".

[~~13~~14] ITU-T Recommendation I.420 (1998):"Basic user-network interface".

~~[9] Reference not used.~~

[~~10~~14~~15~~] ~~CCITT~~ ITU-T Recommendation V.4 (1988): "General structure of signals of international alphabet No.5 code for character oriented data transmission over public telephone networks".

[~~15~~16] ITU-T Recommendation V.14 (1993): "Transmission of start-stop characters over synchronous bearer channels".

[~~16~~17] ITU-T Recommendation V.21 (1988): "300 bits per second duplex modem standardized for use in the general switched telephone network".

[~~17~~18] ITU-T Recommendation V.22bis (1988): "2400 bits per second duplex modem using the frequency division technique standardized for use on the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits".

[~~18~~19] ITU-T Recommendation V.24 (1996): "List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)".

[~~19~~20] ITU-T Recommendation V.25 (1996): "Automatic answering equipment and general procedures for automatic calling equipment on the general switched telephone network including procedures for disabling of echo control devices for both manually and automatically established calls".

[~~11~~20~~21~~] ITU-T ~~CCITT~~ Recommendation V.25 bis (~~1988~~1996): ~~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~~Synchronous and asynchronous automatic dialling procedures on switched networks".

[~~12~~21~~22~~] ITU-T Recommendation V.25 ter: "Serial asynchronous automatic dialling and control".

~~Should V.25 ter. be replaced with V.250 ?~~

[~~22~~23] ITU-T Recommendation V.28 (1993): "Electrical characteristics for unbalanced double-current interchange circuits".

[~~23~~24] ITU-T Recommendation V.32 (1993): "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".

[25] ITU-T Recommendation V.34 (1998): "A modem operating at data signalling rates of up to 33 600 bit/s for use on the general switched telephone network and on leased point-to-point 2-wire telephone-type circuits".

Gan not find this document used in the text.

[25] ITU-T Recommendation V.42 (1996): "Error-correcting procedures for DCEs using asynchronous-to-synchronous conversion".

[26] ITU-T Recommendation V.42 bis (1990): "Data compression procedures for data circuit-terminating equipment (DCE) using error correction procedures"

[~~13~~27] ITU-T ~~CCITT~~ Recommendation V.110 (1996): "Support of data terminal equipments ~~(DTEs)~~ with V-Series interfaces by an integrated services digital network".

~~[14] CCITT 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".~~

~~[15] CCITT 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".~~

~~[16] CCITT Recommendation V.14 (1988): Blue book, Volume VIII, Fascicle VIII.1 "Transmission of start-stop characters over synchronous bearer channels".~~

~~[17] CCITT Recommendation V.22bis (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".~~

~~[18] Reference not used.~~

~~[19] CCITT 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".~~

~~[20] CCITT Recommendation V.42 (1988): Blue book, Volume VIII, Fascicle VIII.1 "error-correcting procedures for DCEs using asynchronous-to-synchronous conversion".~~

~~[21] ITU-T Recommendation V.42 bis: "Data compression procedures for data circuit-terminating equipment (DCE) using error correction procedures~~

[26] ITU-T Recommendation Q.931: "ISDN user-network interface layer 3 specification for basic call control".

[2~~8~~2] ITU-T ~~CCITT~~ Recommendation X.28 (1997): "DTE/DCE interface for a start-stop mode D~~d~~ata T~~t~~erminal E~~e~~quipment accessing the P~~p~~acket A~~a~~ssembly/D~~d~~isassembly facility (PAD) in a public data network situated in the same country".

~~[23] Recommendations I.310-I.470 (Study Group XVIII): Blue book, Volume III, Fascicle III.8, Overall network aspects and functions, ISDN user-network interfaces.~~

~~[24] CCITT Recommendation I.420: Blue book, Volume III, Fascicle III.8 "Basic user-network interface".~~

[~~25~~29] Personal Computer Memory Card Association: "PCMCIA 2.1 or PC-Card 3.0 electrical specification or later revisions".

[~~26~~30] Infrared Data Association IrDA "IrPHY Physical layer signalling standard".

~~[27] TIA-617: "Data Transmission Systems and Equipment - In-Band DCE Control".~~

~~[28] GSM 02.34: "Digital cellular telecommunications system (Phase 2+); High Speed Circuit Switched Data (HSCSD) - Stage 1"~~

~~[29] GSM 03.34: "Digital cellular telecommunications system (Phase 2+); High Speed Circuit Switched Data (HSCSD) - Stage 2 Service Description"~~

[~~30~~31] ISO 2110: "Data communication -- 25-pole DTE/DCE interface connector and contact number assignments"

~~[31] GSM 09.07 (ETS 300 976): "Digital cellular telecommunication system (Phase 2+); General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN)".~~

~~[32] CCITT Recommendation V.25: "Automatic answering equipment and/or parallel automatic calling equipment on the general switched telephone network including procedures for disabling of echo control devices for both manually and automatically established calls".~~

1.3 Abbreviations

In addition to the a~~A~~bbreviations used in this TS that are listed in either GSM 01.04 [1] or TR 21.905 [12] the following internal abbreviations are used:

ITU	International Telecommunications Union
CFI	Call Failure Indication
CRN	Call Request with Number
DIC	Disregard Incoming Call
IA5	International Alphabet no. 5
INC	INcoming Call
INV	INValid
ITU-T	ITU-Telecommunication Standardization Sector
VAL	VALid
XID~~,~~	Exchange IDentification (frame)???????

2 Reference Configuration

~~GSM 07.01~~3G TS 27.001 [~~7~~10], 3G TS 23.101 [6] ~~-~~and GSM 04.02 [~~3~~4] describe the basic reference configurations.

2.1 Customer Access Configuration

This configuration is as shown in figure 1 of GSM 04.02 [~~4~~3]. The present document~~is TS~~ specifically refers to the Mobile Terminations (MTs) which support terminals of the type TE1 and TE2 with asynchronous capabilities. The TAF is functionally a part of an MT1, MT2 or MT0 with an integral asynchronous data capability.

2.2 Terminal Adaptation Function (TAF)

The TAF provides facilities to allow manual or automatic call control functions associated with circuit switched services. The following functions are also included:

- Conversion of electrical, mechanical, functional and procedural characteristics of the ITU-T V series and ISDN type interfaces to those required by the PLMN.
- Bit rate adaptation of the ITU-T V series data signalling rates and the ISDN 64 kbit/s to that provided in the PLMN.
- The mapping functions necessary to convert automatic calling and/or automatic answering procedures of the ITU-T recommendations V.25 bis [21~~20~~] or V.25 ter [22~~21~~] and parameters for asynchronous operation.
- The mapping functions necessary to convert S interface signalling to the PLMN Dm channel signalling.
- Flow control (in some cases resulting in non-transparency of data as described in ~~subclause~~ 4.3).
- 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. This is described in ~~GSM 07.01~~3G TS 27.001 [~~7~~10].
- Filtering of channel control information as described in ~~GSM 07.01~~3G TS 27.001 [~~7~~10].
- Terminal compatibility checking.
- Splitting and combining of the data flow in case of multiple substream data configurations.

3 Terminal Adaptation Functions for transparent services

~~GSM 03.10 [3] refers to the connection types supporting the transparent services.~~

GSM 03.10 [2] defines connection types for the support of transparent services in GSM whilst 3G TR 23.910 [7] defines connection types for transparent services in UMTS.

3.1 Rate Adaptation in GSM

GSM 04.21 [~~6~~4] describes the rate adaptation scheme to be utilized over the Base Station (BS) to Mobile Station (MS) link. GSM 03.10 [~~3~~2] refers to the rate adaptation elements to be provided in the MS.

3.1.1 Rate Adaptation - R interface

This is provided as indicated in GSM 04.21 [~~6~~4].

3.1.2 Rate Adaptation - S Interface (ITU-T I.420 [~~13~~14])

The ISDN rate adapted frame format is modified to the PLMN rate adapted format as indicated in GSM 04.21 [~~6~~4].

3.2 Interchange Circuit Signalling Mapping ~~–~~ ITU-T V-series interface

The interchange circuit signalling at the interface between the TE2 and the MT shall conform to ITU-T ~~CCITT~~ Recommendation V.24 [~~14~~1~~8~~19]. The signals required at this interface are shown in table 3.

The mapping of these signals to the pins of a 25 pin D-type connector is given in ISO 2110 [31]. The mapping for a commonly used 9 pin connector is given in Annex B.

3.2.1 Mapping of V.24 [19]circuits to status bits

Status bits SA, SB and X are used to convey channel control information associated with the data bits in the data transfer state. Table 1 shows the mapping scheme between the ITU-T V.24 [1819] circuit numbers and the status bits for the transparent mode. It also shows how the unused status bits should be handled. It is derived from the general mapping scheme described in annex C. A binary 0 corresponds to the ON condition, a binary 1 to the OFF condition.

The transport of these status bits by the various channel codings is described in subsequent sections.

Table 1: Mapping scheme at the MT for the transparent mode

Signal at TE2/MT interface or condition within the MT	Mapping direction: MT to IWF	Mapping direction: IWF to MT
CT 105	not mapped (note 1)	
CT 106		from status bit X (note 7)
CT 107		not mapped (note 5)
CT 108/2	not mapped (note 6)	
CT 109		from status bit SB (note 7)
CT 133	not mapped (note 2)	
always ON	to status bit SA (note 3)	
always ON	to status bit SB (note 1)	
always ON	to status bit X (note 4)	
ignored by MT		from status bit SA (note 3)

NOTE 1. The SB bit towards the IWF, according to the General Mapping (annex C), could be used to carry CT 105. However, CT 105 should always be ON in the data transfer state since only duplex operation is supported. Also, many DTEs use the connector pin assigned to CT 105 for CT 133. No interchange circuit shall be mapped to the SB bit, which shall always be set to ON in the data transfer state.

NOTE 2. CT 133 is not mapped since there is no flow control in transparent mode.

NOTE 3. The SA bits in both directions are available only with certain channel codings. Therefore, for maximum compatibility, they should not be mapped.

NOTE 4. The X bit towards the IWF is not mapped and shall always be set to ON in the data transfer state since there is no flow control in transparent mode.

NOTE 5. CT 107 is controlled by the channel synchronisation process (07.01).

NOTE 6. CT 108/2 may be used in the call setup and answering processes.

NOTE 7. The status bits are filtered before being mapped to the ITU-T V.24 [1819] circuits (07.013G TS 27.001 [10]).

3.2.2 Single slot configurations (TCH/F9.6 or TCH/F4.8)

GSM 04.21 [64] refers to the frame structure and identifies the use of the status bits for the carriage of signalling information in transparent mode. The S bits are put into two groups. SA is carried by bits S1, S3, S6, S8 and SB by bits S4,S9, S9 in the ITU-T V.110 [27] 80-bit intermediate rate frame.

3.2.3 Multislot configurations (TCH/F9.6 or TCH/F4.8)

In transparent multislot configurations, status bits S1, S3 and the X-bit between the D12 and D13 - in the ITU-T V.110 [27] 80-bit intermediate rate frame - are used for transferring substream numbering information. The S4-bit is used for

frame synchronization between the parallel substreams (reference GSM 04.21 [4]). The remaining S bits are put into two groups. SA is carried by bits S6~~,S8~~, S8 and SB by bit S9. The remaining X bits can be used as described in section 3.2.1.

3.2.4 Channel codings TCH/F14.4, TCH/F28.8

For information on the mapping of the interchange circuit signalling bits in the 14,5 kbit/s multiframe structure, refer to GSM 04.21 [4]. There is no SA bit in this channel coding. Only the SB and X bits are carried.

3.3 Interface Signal Levels - R interface

The signal levels at the interface between the TE2 and the MT shall conform to ~~CCITT~~ ITU-T V.28 [23~~22~~], or to IrDA IrPHY physical signalling standard specification [30], or to PCMCIA 2.1 [29], or to PC-Card 3.0 [29] electrical specification or to later revisions.

3.4 Call Establishment and Clearing Signalling Mapping

3.4.1 V-series interface Autocalling/answering

The mapping of the ITU-T V.25 bis [21~~11~~20] procedures to the messages of the PLMN signalling in ~~GSM 04.08~~3G TS 24.008 [~~5~~8] is defined in ~~section~~ 5.

a) Auto Calling

This procedure is provided according to ITU-T V.25 bis [21~~11~~20] using only 108/2.

A subset of ITU-T V.25 bis [21~~2~~0] is shown in table 3. This subset gives minimum level of control and indication.

During the call establishment phase, i.e. after signalling, calling tone according to ITU-T V.25 [20~~32~~19] shall be generated in the IWF (~~GSM 09.07~~3G TS 29.007 [3~~11~~2]13]).

An alternative to ITU-T ~~CCITT~~ V.25 bis [21~~11~~20] is to use the ITU-T V.25 ter [22~~12~~21] dial command as specified in ~~GSM 07.07~~3G TS 27.007 [~~8~~11].

b) Auto Answer

This procedure is provided according to ITU-T V.25 bis [21~~11~~20] or to ITU-T V.25 ter [22~~12~~21].

During the call establishment phase:

- the states of the ITU-T V.24 [19~~18~~] interchange circuits shall be according to ~~GSM 07.01~~3G TS 27.001[10~~7~~],
- the data and status bits from the IWF shall not be mapped,
- the data and status bits towards the IWF shall be according to ~~GSM 07.01~~3G TS 27.001[10~~7~~].

3.4.2 S Interface (I.420) Signalling Mapping (applies to GSM only)

The mapping of ITU-T Q.931 [26] signalling to ~~GSM 04.08~~3G TS 24.008 [~~5~~8] signalling requires the inclusion, by the MT, of PLMN specific elements (e.g. transparent or not, half/full rate channel). For asynchronous Bearer services, requests for bearer capabilities not listed in table 4 (or where the "Users information layer 1 protocol" element does not indicate ITU-T V.110 [27]) ~~will~~shall result in call rejection.

3.4.3 Call Establishment Manual Operation - Utilizing the Unrestricted Digital Capability

In this case the user ~~will~~shall not hear network supervisory tones or answer tone. The data transfer phase ~~will~~shall be entered automatically.

3.4.4 V-series interface Call Clearing

This procedure is provided according to ITU-T V.25 bis [21~~11~~20] using CT 108/2. An alternative to ITU-T ~~CCITT~~ V.25 bis [21~~11~~20] is to use the ITU-T V.25 ter [22~~12~~21] hook control command or the hangup commands specified in ~~GSM 07.07~~3G TS 27.007 [~~8~~11]. The mapping of the ITU-T V.25 bis [21~~11~~20] procedures to the messages of the PLMN signalling in ~~GSM 04.08~~3G TS 24.008 [~~5~~8] is defined in ~~section~~ 5.

During the call clearing phase:

- the states of the ITU-T V.24 [19~~18~~] interchange circuits shall be according to ITU-T ~~CCITT~~ V.24 [19~~14~~18],
- the data and status bits from the IWF shall not be mapped or used by the MT in any way,
- the data and status bits towards the IWF have no significance and may be set to 1 and OFF respectively.

4 Terminal Adaptation Functions for non-transparent services

GSM 03.10 [2] defines connection types for the support of non-transparent services in GSM whilst 3G TR 23.910 [7] defines connection types for non-transparent services in UMTS.

~~GSM 03.10 [3] refers to the connection types supporting the non-transparent services.~~

4.1 Data Structure

4.1.1 Data Structure on S Interface (applies to GSM only)

The protocol models for this are described in ~~cases 3a and 3d of~~ GSM 03.10 [2]. The data structure ~~will~~shall be according to ITU-T ~~CCITT~~ V.110~~.~~ [27].

4.1.2 Data Structure on R Interface

The protocol models for this are described in ~~cases 3b and 3e of~~ GSM 03.10 [2]. The data ~~will~~ consists of 7 or 8 bit characters with additional start and stop elements. The 7 bit data can additionally have an associated parity bit, 8 bit data cannot have an additional parity bit.

The interchange circuit signalling at the interface between the TE2 and the MT shall conform to ITU-T ~~CCITT~~ Recommendation V.24 [19~~14~~18]. The signals required at this interface are shown in table 3.

The interface shall provide inband (XON/XOFF) and out of band (CT106) flow control. The use of CT133 for out of band flow control shall be implemented according to ITU-T ~~CCITT~~ Recommendation V.42 [~~20~~25].

4.1.3 Data Structure Provided by the L2R Function to the RLP Function

See annex A.

4.2 Signalling Mapping

4.2.1 Interchange Circuit Signalling Mapping ~~–~~ ITU-T V-series interface

Status bits SA, SB and X are used to convey channel control information associated with the data bits in the data transfer state. Table 2 shows the mapping scheme between the ITU-T V.24 [19~~18~~] circuit numbers and the status bits for the non-transparent mode. It also shows how the unused status bits should be handled. It is derived from the general mapping scheme described in annex C. A binary 0 corresponds to the ON condition, a binary 1 to the OFF condition.

The transport of the status bits by the L2RCOP is described in annex A.

Table 2: Mapping scheme at the MT for the non-transparent mode

Signal at TE2/MT interface or condition within the MT	Mapping direction: MT to IWF	Mapping direction: IWF to MT
CT 105	not mapped (note 1)	
CT 106 (note 4)		from status bit X (note 7)
CT 107		not mapped (note 5)
CT 108/2	not mapped (note 6)	
CT 109		from status bit SB
CT 133 (note 8)	to status bit X (notes 3,8)	
always ON	to status bit SA (note 2)	
always ON	to status bit SB (note 1)	
ignored by MT		from status bit SA (note 2)

NOTE 1. The SB bit towards the IWF, according to the General Mapping (annex C), could be used to carry CT 105. However, CT 105 should always be ON in the data transfer state since only duplex operation is supported. Also, many DTEs use the connector pin assigned to CT 105 for CT 133. No interchange circuit shall be mapped to the SB bit which shall always be set to ON in the data transfer state.

NOTE 2. The SA bits (both directions) are not mapped since CTs 107 and 108/2 are handled locally (notes 5, 6).

NOTE 3. The condition of status bit X towards the IWF may also be affected by the state of the receive buffer in the MT.

NOTE 4. The state of CT 106 (or other local flow control mechanism) may also be affected by the state of the transmit buffer in the MT and the state of the RLP (RR/RNR).

NOTE 5. CT 107 is controlled by the channel synchronisation process (3G TS 27.001 [10]~~07.01~~).

NOTE 6. CT 108/2 may be used in the call setup and answering processes.

NOTE 7. For inband local flow control, changes in the condition of the status bit X from the IWF also result in the sending of XON or XOFF to the DTE.

NOTE 8. For inband local flow control, CT 133 is not mapped and the status bit X towards the IWF is controlled by the reception of XON and XOFF characters from the DTE.

4.2.2 Call Establishment and Clearing Signalling Mapping

This is identical to the transparent case with the exception of the transparent/non-transparent element, see ~~section~~ 5.

In addition, the L2R/RLP ~~will~~shall give an explicit indication when the link into the connected network is established. If the link fails, an explicit "link lost" indication ~~will~~shall be given.

4.3 Flow Control

The passage of flow control information between L2Rs is described in annex A. ~~Subclauses~~ 4.3.1, 4.3.2 and 4.3.3 describe the operation of the flow control mechanisms. These mechanisms apply for all the non-transparent services covered by this specification, with the exception of Character Orientated Protocol with No Flow Control which is treated in ~~subclause~~ 4.3.4.

4.3.1 Conditions Requiring Flow Control towards the Network

The L2R function ~~will~~shall send immediately a "flow control active" indication in the following circumstances:

(i) If the receive buffer from the radio side reaches a preset threshold (BACKPRESSURE).

(ii) If local flow control is initiated by the TE2 (see ~~subclause~~ 4.3.3 a) or c)). On receipt of this flow control indication transmission of data from the receive buffer towards the TE2 is halted.

On removal of the buffer congestion or local flow control the L2R ~~will~~ shall send a "flow control inactive" indication.

In addition, for the local flow control condition, transmission of data from the receive buffers ~~will~~ shall be restarted.

4.3.2 Conditions Requiring Flow Control towards TE2

The L2R functions ~~will~~shall immediately activate local flow control (see ~~subclause~~ 4.3.3 b) or d)) under the following circumstances:

(i) The transmit buffer reaches a pre-set threshold (BACKPRESSURE).

(ii) The L2R receives a "flow control active" indication.

On removal of buffer congestion or receipt of L2R/RLP "flow control inactive" the local flow control ~~will~~shall be removed.

4.3.3 Local Flow Control

Two methods of local flow control are allowed:

Outband

a) From TE2: CT133 shall be turned OFF to indicate flow control active, and ON to indicate flow control inactive.

b) From TAF: CT106 shall be turned OFF to indicate flow control active, and ON to indicate flow control inactive.

Inband

c) From TE2: XOFF (DC3) is sent to indicate flow control active. XON (DC1) is sent to indicate flow control inactive. The XON/XOFF characters received from the TE2 are extracted by the L2R from the data stream and are not sent across the radio interface. Where XON/XOFF is utilized then the TAF ~~will~~shall generate flow control active/inactive immediately, i.e. the XON/XOFF characters do not enter the transmit buffer.

d) From TAF: As from TE2

If the outband method is used, the L2R ~~will~~shall pass the DC1/DC3 characters as data, i.e. no flow control indications ~~will~~shall be generated on receipt of DC1/DC3.

4.3.4 Character Orientated Protocol with No Flow Control

If the users layer 2 indicates Character Orientated Protocol with no flow control then no flow control is used, i.e. the X-bit is not set to OFF and DC1/DC3 characters are passed through as data.

4.4 Buffers

4.4.1 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 the data. Its size is up to the implementers.

When the buffer is half full, TE2 shall be flow controlled as per ~~subclause~~ 4.3.2, unless Character Orientated Protocol with No Flow Control is being used (see ~~subclause~~ 4.3.4).

4.4.2 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 up to the implementers.

When the buffer becomes half full, the L2R ~~will~~shall send a "flow control active" indication, unless Character Orientated Protocol with No Flow Control is being used.

4.5 Bit Transparency

The ITU-T V.25 bis [21~~20~~] indications generated by the TAF shall be even parity, even if the parity condition for the user's application is different.

4.6 Transportation of "BREAK" condition

The "BREAK" condition must be recognized by the L2R function and passed immediately to the IWF. The L2R ~~will~~shall generate a "BREAK" condition to the TE2 on receipt of a "BREAK" indication from the IWF.

Annex A describes how the L2R ~~will~~shall transport the "BREAK" indication.

4.7 Data Compression

L2R optionally includes a data compression function according to ITU-T V.42bis [26] that spans from the MS to the IWF in the MSC. The error correction function is provided by RLP instead of ITU-T V.42 [25]. RLP XID is used to negotiate compression parameters. L2R includes the ITU-T V.42bis [26] control function especially for reinitializing in case of break recognition or RLP reset and error indication by the data compression function respectively.

Table 3: Minimum set of Interchange Circuits

Circuit Number	Circuit Name	Ground	Data		Control	
			To TE2	From TE2	To TE2	From TE2
CT102	Common return	x				
CT103	Trans-mitted data			x		
CT104	Received data return		x			
CT105	Request to send (Note 2)					x
CT106	Ready for sending				x	
CT107	Data set ready				x	
CT108/2	Data terminal ready					x
CT109	Data channel received line signal detector				x	
CT125	Calling indicator (Note 1)				x	
CT133	Ready for Receiving (Note 2)					x

NOTE 1: CT125 is used with the automatic answering function of the TAF.

NOTE 2: CT105 and CT133 are assigned to the same connector pin on both the standard 25 pin connector (ISO 2110) and the commonly used 9 pin connector (annex B). When this pin is used for CT133 then on the DCE (MT) side of the interface CT 105 is treated as being always in the ON condition. Similarly, when this pin is being used for CT105 then on the DCE (MT) side of the interface CT 133 is treated as being always in the ON condition. As circuit 133 is used only in duplex operation and circuit 105 is used only in half duplex operation (which is not supported by GSM) there should be no conflict.

Table 4: Minimum Set of Call Set-up Commands and Indications

	Description	IA5 Characters
Commands from TE2	Call Request with Number provided 0,1..9,*,#,A,B,C,D	CRN
	Connect Incoming Call	CIC
	Disregard Incoming Call	DIC
Indications to TE2	Call Failure Indication XX = CB,AB,NT,FC (Note)	CFI XX
	INcoming Call	INC
	VALid	VAL
	INValid	INV

NOTE: CB = Local MT busy
AB = Abort call
NT = No answer
FC = Forbidden call *

* Forbidden call indication results from contravention of rules for repeat call attempts as defined by the appropriate national approvals administration. It is recommended that this is the responsibility of the MT, not the TE2.

5 Terminal interfacing to ~~GSM 04.08~~3G TS 24.008 [8] Mapping

Only those elements/messages that are of particular relevance are considered.

Interface procedures not directly mappable to ~~GSM 04.08~~3G TS 24.008 [8~~5~~] (i.e. ITU-T V.25 bis [21~~20~~] VAL/INV) are not considered. Mobile management procedures of ~~GSM 04.08~~3G TS 24.008 [8~~5~~] are not considered applicable.

Mapping of other call establishment or clearing messages to the S interface e.g. "Call proceeding" etc. ~~have~~has not been included. It is assumed these ~~will be able to~~can be mapped directly and as such are of no relevance to the ITU-T V.25 bis [21~~20~~] or manual interfaces.

For the Alternate speech/group 3 facsimile service ~~it will be necessary for~~ the TAF shall be able to generate a "Modify" message for transmission on the Dm channel. This shall be according to the defined procedure in ~~GSM 04.08~~3G TS 24.008 [~~5~~8].

5.1 Mobile Originated Calls

Call establishment is initiated by the keypad or DTE action:

a) Setup

Element	Derived from		
	MMI	ITU-T V.25 bis [21~~20~~] message	S interface message
Called Address	Keypad	CRN/CRI/CRS	Setup
Called Sub Address	Keypad	CRI	Setup
HLC	Derived from internal settings or MMI infor- mation.		Setup
LLC	Same as HLC		Setup
BC	Same as HLC ~~GSM 07.01~~3G TS 27.001 [10] gives allowed values		Setup (with addi- tional information from MMI originated settings)

b) Release Complete

Element	Derived from		
	MMI	ITU-T V.25 bis [21~~20~~] message	S interface message
Cause	Display (optional)	CFI	Release Complete

5.2 Mobile Terminated Calls

Call establishment is initiated by receipt of Setup at the MS:

a) Setup

Element	Mapped on to		
	MMI	ITU-T V.25 bis [21~~20~~] message	S interface message
Called Address	Display (optional)	INC	Setup
Called Sub Address	Display (optional)	Not applicable	Setup
HLC	Display (optional)	Not applicable	Setup
LLC	Display (optional)	Not applicable	Setup
BC	Display (optional)	Not applicable	Setup (with PLMN specific elements removed)

b) Call Confirm

Information for the BC element in the call confirm ~~is~~ shall be derived from e.g. MMI or by internal settings.

c) Connect

Connect is sent in response to connect from the S interface, from MMI, or when the timeout period referred to in ITU-T V.25 bis [21~~20~~] has ~~-~~expired. This period shall be between 5 and 10 seconds. During this time the automatic answering of the incoming call ~~can~~ may be prevented by issuing a DIC command. The CIC can be used to cancel the effect of a preceding DIC command (see ITU-T Recommendation V.25 bis [21~~11~~~~20~~]).

5.3 Call Clearing

5.3.1 Mobile initiated

Call clearing is initiated by the keypad or DTE action:

Disconnect

Element	Derived from		
	MMI	ITU-T V.25 bis [21~~20~~]	S interface message
Cause	Keypad	DTE shall turn CT 108/2 OFF	Disconnect or inband ITU-T V.110 [27] disconnect request

5.3.2 Network initiated

Call clearing is initiated by receipt of Disconnect at the MS:

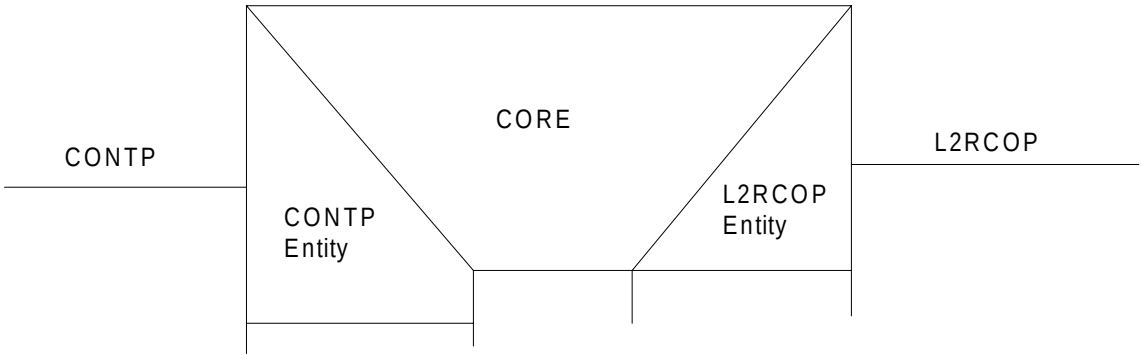
Disconnect

Element	Mapped on to		
	MMI	ITU-T V.25 bis [21~~20~~]	S interface message
Cause	Display (optional)	MS shall turn CT 107 OFF	Disconnect

Annex A (Normative): L2R Functionality

A.1 Introduction

This annex describes the L2R functionality for non-transparent character oriented protocols. The general aspects of L2Rs are described in ~~GSM 07.01~~3G TS 27.001 [~~7~~10]. Figure 1 shows the 3 sub-functions of a character oriented L2R.



CONTP Character Oriented Non-Transparent Protocol

CORE Character Oriented Relay Entity

L2RCOP L2R Character Oriented Protocol

Figure 1

Section 2 describes the L2R Character Oriented Protocol (L2RCOP) and section 3 the use of the L2RCOP.

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 frame information field. The octets within the L2RCOP-PDU are numbered 0 to n-1~~,~~; octet 0 is transmitted first. The value of n depends on the negotiated RLP version and frame type (~~GSM 04.22~~ 3G TS 24.022[9]). The bits within the octets are numbered 1 to 8~~,~~; bit 1 is transmitted first.

The RLP version value 2 indicates RLP multi-link operation. The RLP version value 0 or 1 indicates RLP single-link operation.

- Each octet contains a status octet, an information octet or fill

  Octet 0 contains either a status octet or a user information octet.

- Octet 0 shall always contain a status octet in case at least one status octet is transported in the L2RCOP PDU. In RLP-versions 0 and 1 a PDU always carries at least one status octet. In RLP version 2 a PDU carries status octet(s) only if actual status change(s) has taken place within the period represented by the PDU. Here the L2R status flag in the RLP version 2 header is set to 1 when status octet(s) is carried in the PDU.

- 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 ~~CCITT~~ Recommendation V.110 [27]. The SA, SB and X bits use bit positions 8, 7~~,~~ and 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 corresponds to bit 7. For order of transmission of IA5 characters see ITU-T ~~CCITT~~ Recommendation V.4 [~~10~~14~~14~~15].

  - 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.

- Encoded character octets are provided by the compression function. They are encoded according to ITU-T V.42bis [26].

- Information octets are inserted into L2RCOP-PDUs in order of transmission in octets 1 to n-1 for RLP single-link operation, in octets 1 to n-1 for RLP multi-link operation with status octet transportation, and in octets 0 to n-1 for multi-link operation 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~~shall be defined by m-l-1. Address bit 2^0 corresponds to bit 1 in the status octets. Address bit 2^1 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 (n-2 ≤ 23) ~~-~~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 which 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. In case of a PDU more than 25 octets in length, address field values from 24 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.

- In case when 64 data octets are carried by a 66-octet PDU, a status octet is carried in octet 0 and another status octet within the first 24 data octets. (The first status octet gives the address of the second status octet, which carries value 30 in its address field.)

Three examples of an L2RCOP PDU are shown in Figure 2.

	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 2a Single-link RLP and multi-link RLP 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 2b Multi-link RLP L2RCOP PDU with no status octet transfer

	8	7	6	5	4	3	2	1	
0	SA	SB	X	0	0	0	1	1	
1	1	1	0	0	1	1	0	1	IA5 "M" (odd parity)
2	1	1	0	0	0	0	0	1	IA5 "A" (odd parity)
3	1	1	0	1	0	0	1	0	IA5 "R" (odd parity)
4	SA	SB	X	1	1	0	1	1	
5	R	0	1	0	0	0	1	1	
.				.					
.				.					
41	SA	SB	X	0	0	0	0	1	
42	1	1	0	0	1	1	0	1	IA5 "K" (odd parity)
43	SA	SB	X	1	1	1	1	0	
.				.					
.				.					
65	1	1	0	0	1	1	1	1	IA5 "O" (odd parity)

Figure 2c A 66-octet RLP L2RCOP PDU with status octets separated by more than 23 octets

A.3 Use of the L2RCOP

The CORE relays status changes, break conditions and characters in both directions between the CONTP entity and the L2RCOP entity.

The L2RCOP entity performs the following functions.

A.3.1 Radio Link Connection Control

Given appropriate indications from the signalling mechanisms the L2RCOP entity uses the services of the radio link to establish and release the connection to its peer L2RCOP entity in the IWF.

A.3.2 Data Transfer

The L2RCOP entity ~~will~~shall assemble and disassemble L2RCOP-PDUs. Data characters are assembled into L2RCOP-PDUs until either:

- The PDU is full
- The Radio Link service can accept another Radio Link service Data Unit.

L2RCOP-PDUs are transferred to the peer L2RCOP entity using the data transfer services of the radio link.

A.3.3 Status Transfer

The L2RCOP entity transfers interface status information between L2Rs using bits SA, SB and X in the status octets in L2RCOP-PDUs. Status changes are inserted in the L2RCOP-PDU in the position corresponding to the position in the character stream that the interface status change occurred. When the RLP is established or reset a L2RCOP-PDU with the current status values shall be sent.

The general mapping between ITU-T V.24 [19~~18~~] interface circuit numbers and status bits is described in annex C. A binary 0 corresponds to the ON condition, a binary 1 to the OFF condition. The specific mapping at the MT for the non-transparent bearer service is given in section 4.2.1. The mapping schemes used at the IWF are given in ~~GSM 09.07~~3G TS 29.007 [~~3112~~13].

A.3.4 Flow Control

Flow control information is transferred between L2Rs in 2 ways, these are:

- back pressure caused by L2R buffer conditions
- use of the X-bit in status octets:
  - flow control active, X-bit = ONE
  - flow control inactive, X-bit = ZERO

A.3.5 Break

The transfer of break conditions between L2Rs is via the status octets with appropriate coding of the address field. Where the "Break Signal" is generated it shall conform to the definition shown in ITU-T ~~CCITT~~ Recommendation X.28 [22].

A.3.5.1 Normal Realization

The L2RCOP-PDU contains the mandatory status octet coded as the Destructive Break.

Upon the receipt of the "Break Signal", the L2R ~~will~~shall destroy any existing data in front of the Break Signal in the same direction, and all the buffered data in the other direction. The L2R ~~will~~shall then pass the Break Signal immediately on.

The termination of a break condition is indicated by sending an L2RCOP-PDU containing characters.

A.3.5.2 Realization in case of Data Compression is used

If the data compression function is used L2RCOP has to ensure the synchronization of the encoder and decoder according to ITU-T V.42bis [26].

Upon receipt of a L2RCOP-PDU containing a status octet that signals a Destructive Break L2R destroys all data in the TX and RX buffer and re-initializes the compression function. Then L2R ~~will~~shall transmit ~~a~~an L2RCOP-PDU that contains the mandatory status octet coded as the Destructive Break Acknowledge. After that L2R ~~will~~shall restart the data transfer.

Upon an receipt of the "Break Signal" by the CONTP, the L2R destroys any existing data in the TX and RX buffer and ~~will~~shall then pass the Break Signal immediately by using L2RCOP-PDU containing a status octet coded as the Destructive Break. L2R ~~will~~shall wait for a L2RCOP-PDU containing a mandatory status octet coded as Destructive Break Acknowledge. Following data received by the CONTP ~~will~~shall be stored in the TX buffer. Data received in L2RCOP-PDUs ~~will~~shall be discarded. After reception of the L2RCOP-PDU containing a mandatory status octet coded as Destructive Break Acknowledge L2R ~~will~~shall re-initialize the data compression function and restart the data transfer.

Annex B (Informative): Use of a 9 pin connector as an MT2 type interface

For asynchronous data communications many of the physical pins on a standard 25 pin D-type connector (ISO 2110 [31]) are not used. As a result many communication devices have only a 9 pin connector to allow them to be made smaller. This interface is a MT2 type providing the correct ITU-T V.24 [19~~18~~] signals are supported.

Table B1 gives the pin assignments for a 9 pin connector. Two variants are permitted -

1. Outband flow control

When outband (CT 133) flow control is required, pin number 7 carries CT 133 (Ready for Receiving). In this case CT 105 is not mapped to any physical pin. On the MT2 side of the interface, CT 105 is treated as being always in the ON condition.

2. No outband flow control

When no outband (CT 133) flow control is required, pin number 7 may carry CT 105 (Request to Send). In this case CT 133 is not mapped to any physical pin. On the MT2 side of the interface, CT 133 is treated as being always in the ON condition.

Table B1: Interchange circuit mappings

ITU-T V.24 [19~~18~~] Circuit Number	Circuit Name	Pin Number
CT 102	Common ground	5
CT 103	TxD	3
CT 104	RxD	2
CT 105	RTS	7 (note)
CT 106	RFS (CTS)	8
CT 107	DSR	6
CT 108/2	DTR	4
CT 109	DCD	1
CT 125	CI	9
CT 133	RFR	7 (note)

NOTE: Only one of these mappings may exist at any one time.

Annex C (informative): -General mapping of ITU-T V.24 [19~~18~~] circuits to channel status bits

In the data transfer state, status bits SA, SB and X can be used to convey channel control information associated with the data bits. Table C1 shows the general mapping scheme between the ITU-T V.24 [19~~18~~] circuit numbers and the status bits. A binary 0 corresponds to the ON condition, a binary 1 to the OFF condition. The specific mappings for the various ~~GSM~~ PLMN bearer types are given elsewhere in this specification.

Table C1: General mapping scheme at the MT

Signal at TE2/MT interface	Status bit direction: MT to IWF	Status bit direction: IWF to MT
CT 105 (note 3)	SB	
CT 106 (note 1)		X
CT 107		SA
CT 108/2	SA	
CT 109		SB
CT 133 (note 3)	X (note 2)	

NOTE 1. The condition of CT 106 may also be affected by the state of any transmit buffer in the MT.

NOTE 2. The condition of Status bit X towards the IWF may also be affected by the state of any receive buffer in the MT.

NOTE 3: CT105 and CT133 are assigned to the same connector pin on both the standard 25 pin connector (ISO 2110) and the commonly used 9 pin connector (annex B). When this pin is used for CT133 then on the MT side of the interface CT 105 is treated as being always in the ON condition. SB towards the IWF ~~will~~shall therefore also always be ON.

Similarly, when this pin is being used for CT105 then on the MT side of the interface CT 133 is treated as being always in the ON condition. X towards the IWF ~~will~~shall therefore also always be ON.

As circuit 133 is used only in duplex operation and circuit 105 is used only in half duplex operation (which is not supported by GSM or UMTS) there should be no conflict.

Annex D:
Change history

Change history						
TSG CN#	**Spec**	**Version**	**CR**	**<Phase>**	**New Version**	**Subject/Comment**
Apr 1999	GSM 07.02	7.0.0				Transferred to 3GPP CN1
CN#03	27.002				3.0.0	Approved at CN#03
CN#04	27.002	3.0.0	001	R99	3.1.0	Introduction of EDGE channel codings into the specifications
CN#6	27.002	3.1.0	002	R99	3.2.0	Service clean-up for Release 99

History

Document history		
V3.0.0	May 1999	Approved at TSGN #3. Under TSG TSG CN Change Control.
V3.1.0	September 1999	CR 001 Approved by E-mail after CN#4
V3.2.0	December 1999	CR 002 Approved at TSG #6

3GPP/CN3 Meeting 8
Sophia Antipolis, France, 28 February-03 March 2000

Document N3-000085
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

27.003	CR	004	Current Version:	3.2.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG CN#7	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)*

(U)SIM		ME	X	UTRAN / Radio		Core Network	X

Source: 3GPP TSG_CN WG3 **Date:** 02-March-2000

Subject: UMTS clean up

Work item: CS Data

Category: *(only one category shall be marked with an X)*

			Release:	
F	Correction	X	Phase 2	
A	Corresponds to a correction in an earlier release		Release 96	
B	Addition of feature		Release 97	
C	Functional modification of feature		Release 98	
D	Editorial modification		Release 99	X
			Release 00	

Reason for change:
GSM references replaced with the corresponding 3G TS specifications where available.
Unused references deleted.
Some new or missing references included.
Changed CCITT references to ITU-T.
Removal of basic packet service
Replaced several “will” with “shall”.
Some minor editorial corrections.

Clauses affected: All

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:


help.doc

<--------- double-click here for help and instructions on how to create a CR.

3G TS 27.003 V3.2.0 (2000-01

Technical Specificatio

3rd Generation Partnersl
Technical Specification Group Cor[illegible]
Terminal Adaptation Functions (TAF)
for services using synchronous bearer capabilities
(3G TS 27.003 version 3.2.0 Release 1999)

Reference
DTS/TSGN-0327003U

Keywords
3GPP, CN

3GPP

Postal address

3GPP support office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet
http://www.3gpp.org

Contents

Foreword

This Technical Specification has been produced by the 3GPP.

This TS defines the interfaces and Terminal Adaptation Functions (TAF) integral to a Mobile Termination (MT) which enables the attachment of synchronous terminals to a MT within the 3GPP system.

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of this TS, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version 3.y.z

where:

3 the first digit:

3 Indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the specification;

1 Scope

This Technical Specification (TS) defines Terminal Adaptation Functions (TAF) which are integrated in a Mobile Termination (MT) and which enable the attachment of Synchronous Terminals to an MT (see GSM 04.02 ~~[4]~~[3]). The general aspects of Terminal Adaptation Functions are contained in specification ~~GSM 07.01 [8]~~3G TS 27.001 [9]. ~~This ETS~~The present document covers support of synchronous data services (see ~~GSM 02.02 [2]~~3G TS 22.002 [6]) for the following interfaces and procedures:

- V.22 [~~14~~15] DTE/DCE Interface
- V.22 bis [~~15~~16] DTE/DCE Interface
- V.26 ter [19] DTE/DCE Interface
- V.32 [21] DTE/DCE Interface
- X.21 [23] DTE/DCE Interface
- X.21 bis [24] DTE/DCE Interface
- ~~X.25 [26] Procedure~~
- X.32 [~~31~~30] Procedure
- V.25 bis [18] Procedure
- I.420 [~~10~~11] Interface (S)

LAPB is the only synchronous non-transparent protocol which is considered ~~here~~in the present document.

NOTE~~ote~~: From GSM R99 onwards the following services are no more required to be provided by a GSM PLMN:

- ~~-~~the dual Bearer Services “alternate speech/data” and “speech followed by data”
- ~~-~~the dedicated services for PAD and Packet access
- ~~-~~BS 21 ... 26 and BS 31 ... 34

The support of th~~e~~ose services is still optional. The specification of these services is not within the scope of ~~this Ts~~the present document. For that, the reader is referred to GSM Release 98.

2 Normative references

References may be made to:

a) specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply; or

b) all versions up to and including the identified version (identified by "up to and including" before the version identity); or

c) all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or

d) publications without mention of a specific version, in which case the latest version applies.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] GSM 01.04: "Digital cellular telecommunication system (Phase 2+); Abbreviations and acronyms".

[2] GSM 03.10: "Digital cellular telecommunication system (Phase 2+); GSM Public Land Mobile Network (PLMN) connection types".

[3] GSM 04.02: "Digital cellular telecommunication system (Phase 2+); GSM Public Land Mobile Network (PLMN) access reference configuration".

[4] GSM 04.21: "Digital cellular telecommunication system (Phase 2+); Rate adaption on the Mobile Station - Base Station System (MS - BSS) interface".

[5] GSM 08.20: "Digital cellular telecommunication system (Phase 2+); Rate adaption on the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".

[26] GSM 02.02 3G TS 22.002 : "Digital cellular telecommunication system (Phase 2+);Circuit Bearer Services (BS) supported by a GSM Public Land Mobile Network (PLMN)".

[3] GSM 03.10: "Digital cellular telecommunication system (Phase 2+); GSM Public Land Mobile Network (PLMN) connection types".

[4] GSM 04.02: "Digital cellular telecommunication system (Phase 2+); GSM Public Land Mobile Network (PLMN) access reference configuration".

[57] GSM 04.083G TS 24.008: "Digital cellular telecommunication system (Phase 2+); Mobile Rradio Iinterface Llayer 3 specification; Core Network Protocols-Stage 3".

[6] GSM 04.21: "Digital cellular telecommunication system (Phase 2+); Rate adaption on the Mobile Station - Base Station System (MS - BSS) interface".

[87] GSM 04.223G TS 24.022: "Digital cellular telecommunication system (Phase 2+); Radio Link Protocol (RLP) for Ddata and Ttelematic Circuit Switched Sservices on the Mobile Station(MS - BSS) - Base Station System (MS - BSS) Iinterface and the Base Station System - Mobile-services Switching Centre (BSS - MSC) Iinterface Bearer and Teleservices".

[98] GSM 07.013G TS 27.001: "Digital cellular telecommunication system (Phase 2+); General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS)".

[10] 3G TR 21.905 “3G Vocabulary”

[9] GSM 08.20: "Digital cellular telecommunication system (Phase 2+); Rate adaption on the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".

[10] GSM 09.06: "Digital cellular telecommunication system (Phase 2+); Interworking between a Public Land Mobile Network (PLMN) and a Packet Switched Public Data Network/Integrated Services Digital Network (PSPDN/ISDN) for the support of packet switched data transmission services".

[11] GSM 09.07: "Digital cellular telecommunication system (Phase 2+); General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN)".

[12] CCITT Series V Recommendations: "Data communication over the Telephone network".

[13] CCITT Series X Recommendations: "Data communication networks".

[110] ITU-T Recommendation I.420 (1998):"Basic user-network interface".

[112] ITU-T Recommendation Q.931: “ISDN user-network interface layer 3 specification for basic call control”.

[12413] CCITT ITU-T Recommendation V.10: "Electrical characteristics for unbalanced double-current interchange circuits for general use with integrated circuit equipment in the field of data communications operating at data signalling rates nominally up to 100 kbit/s".

[13514] CCITT ITU-T Recommendation V.11: "Electrical characteristics for balanced double-current interchange circuits operating at data signalling rates nominally up to 10 Mbit/s for general use with integrated circuit equipment in the field of data communications".

[~~14~~15] ITU-T Recommendation V.22 (1988): "1200 bits per second duplex modem standardized for use in the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits".

[~~15~~16] ITU-T Recommendation V.22 bis (1988): "2400 bits per second duplex modem using the frequency division technique standardized for use on the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits".

[~~16~~17] ITU-T Recommendation V.24 (1996):"List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)".

~~[176] ITU-T Recommendation V.25 (1996): CCITT Recommendation V.25: "Automatic answering equipment and general procedures for /or parallel automatic calling equipment on the general switched telephone network including procedures for disabling of echo control devices for both manually and automatically established calls".~~

[18~~7~~] ITU-T Recommendation V.25 bis (1996): ~~CCITT Recommendation V.25 bis:~~ "Synchronous and asynchronous automatic dialling procedures on switched networks ~~"Automatic Calling and/or Answering Equipment on the General Switched Telephone Network (GSTN) using the 100 series interchange circuits".~~

[19] ITU-T Recommendation V.26 ter (1988): "2400 bits per second duplex modem using the echo cancellation technique standardized for use on the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits ".

[20~~18~~] ITU-T Recommendation V.28 (1993): ~~CCITT Recommendation V.28:~~ "Electrical characteristics for unbalanced double-current interchange circuits".

[21] ITU-T Recommendation V.32 (1993): "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".

[19~~22~~] ITU-T Recommendation V.110 (1996): ~~CCITT Recommendation V.110:~~ "Support of data terminal equipments ~~(DTEs)~~ with V-Series interfaces by an integrated services digital network".

~~[20] CCITT Recommendation V.24: "List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment".~~

~~[21] CCITT Recommendation X.24: "List of definitions for interchange circuits between Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) on Public Data Networks".~~

~~[22] CCITT Recommendation X.25: "Interface between Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) for terminals operating in Packet Mode and connected to Public Data Networks by dedicated Circuit".~~

[23~~23~~] ~~CCITT~~ ITU-T Recommendation X.21 (1992): "Interface between Data Terminal Equipment ~~(DTE)~~ and Data Circuit-~~t~~ ~~T~~erminating Equipment ~~(DCE)~~ for synchronous operation o~~i~~n public data networks".

[24] ~~CCITT~~ ITU-T Recommendation X.21 bis (1988): "Use on public data networks of D~~d~~ata T~~t~~erminal E~~e~~quipment (DTE) which is designed for interfacing to synchronous V-Series modems".

[25] ITU-T Recommendation X.24 (1988): "List of definitions for interchange circuits between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) on public data networks".

~~[26] ITU-T Recommendation X.25 (1996): "Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit".~~

[25~~27~~26] ITU-T ~~CCITT~~ Recommendation X.26 (1993): "Electrical characteristics for unbalanced double-current interchange circuits operating at data signalling rates nominally up to 100 kbit/s ~~for general use with integrated circuit equipment in the field of data communications~~".

~~Which reference should be used X.26 or V.10 ?~~

[~~28~~27] ~~CCITT~~ ITU-T Recommendation X.27 (1996): "Electrical characteristics for balanced double-current interchange circuits ~~for general use with integrated circuit equipment in the field of data communications~~operating at data signalling rates up to 10 Mbit/s".

~~Which reference should be used X.27 or V.11 ?~~

[~~29~~28] ITU-T ~~CCITT~~ Recommendation X.30 (1993): "Support of X.21, X.21 bis and X.20 bis based Data Terminal Equipment (DTEs) by an Integrated Services Digital Network (ISDN)".

~~This Recommendation is also included but not published in I series under alias number I.461.~~

[~~30~~29~~28~~] ITU-T ~~CCITT~~ Recommendation X.31 (1995): "Support of p~~P~~acket m~~M~~ode t~~T~~erminal e~~E~~quipment ~~in~~ by an ISDN".

~~This Recommendation is also included but not published in I series under alias number I.462.~~

[~~29~~31~~30~~] ~~CCITT~~ ITU-T Recommendation X.32 (1996): "Interface between Data t~~T~~erminal Equipment (DTE) and Data Circuit-~~t~~ ~~T~~erminating Equipment (DCE) for terminals operating in p~~P~~acket m~~M~~ode and accessing a Packet-Switched Public Data Network through a public switched telephone network or an Integrated Services Digital Network or a Circuit-Switched Public Data Network. ~~PSPDN through a PSTN or an ISDN or a CSPDN~~".

~~[30] CCITT Recommendation I.461: "Support of X.21, X.21 bis and X.20 bis based data terminal equipment (DTEs) by integrated services digital network (ISDN)".~~

~~See ITU-T X.30~~

~~[31] CCITT Recommendation I.463: "Support of data terminal equipment (DTEs) with V-Series type interfaces by an integrated services digital network (ISDN)".~~

~~See ITU-T V.110~~

[~~32~~31~~31~~] ISO Recommendation 8885: "Information technology - Telecommunication and information exchange between systems - High-level data link control (HDLC) procedures - General purpose XID frame information field content and format".

[~~33~~32] ISO Recommendation 8886: "Information technology - Telecommunication and information exchange between systems - Data link service definitions for Open Systems interconnection".

[~~34~~33] Personal Computer Memory Card Association: "PCMCIA 2.1 or PC-Card 3.0 electrical specification or later revisions".

[~~35~~34] Infrared Data Association IrDA "IrPHY Physical layer signalling standard".

~~[36] TIA-617: "Data Transmission Systems and Equipment - In-Band DCE Control".~~

~~[37] GSM 02.34: "Digital cellular telecommunications system (Phase 2+); High Speed Circuit Switched Data (HSCSD) - Stage 1".~~

~~[38] GSM 03.34: "Digital cellular telecommunications system (Phase 2+); High Speed Circuit Switched Data (HSCSD) - Stage 2 Service Description".~~

2.1 Abbreviations

In addition to ~~those below~~the abbreviations ~~used in this Ts~~listed below, the present document also uses terms listed in 3GTR 21.905 [10] and ~~are listed in~~ GSM 01.04 [1].

AU	Access Unit
BORE	Bit Oriented Relay Entity
EDGE	Enhanced Data for ~~GSM~~Global Evolution
FFS	For further studies
IrDA	Infrared Data Association

IrPHY	InfraredPHYsical layer
ITU-T	ITU-Telecommunication Standardization Sector
~~International telecommunication Union~~	
MUX	Multiplexer
PCMCIA	Personal Computer Memory Card Association
PC	Personal Computer

3 General

3.1 Customer access configuration

The GSM PLMN access reference configuration is described in figure 1 of GSM 04.02 [3~~4~~]. ~~This specification~~The present document ~~(GSM 07.03)~~ specifically refers to the MTs which support terminal equipments (TE1 or TE2) that use synchronous bearer capabilities.

3.2 Terminal Adaptation Function

The TAF is functionally part of an MT0, MT1 or MT2 (see GSM 04.02 ~~[4]~~[3]). The terminal adaptation provides facilities to allow manual or automatic call control functions associated with ~~alternate speech/data, speech followed by data and~~ circuit switched data services, in case of ITU-T V series interfaces. The ITU-T X.21[23] DTE/DCE interface allows only for automatic call control functions. The following functions are included:

- Conversion of electrical, mechanical, functional and procedural characteristics of the ITU-T V-series, ITU-T X-series and ISDN type interfaces to those required by a GSM PLMN.
- Bit rate adaptation of ITU-T V-series and ITU-T X-series data signalling rates and the ISDN 64 kbit/s to that provided in the GSM PLMN.
- The mapping of ITU-T V.25 bis [18] AUTO CALL/AUTO ANSWER procedures and ITU-T X.21[23] procedures to the GSM PLMN Dm-channel signalling.
- The mapping functions necessary to convert ITU-T S-interface signalling to PLMN Dm-channel signalling.
- Synchronization procedure, which means the task of synchronizing the entry to and the exit from the data transfer phase between two subscriber terminals. This is described in the specification ~~GSM 07.01 [8]~~3G TS 27.001 [9].
- Filtering of channel control information. This is described in the specification ~~GSM 07.01 [8]~~3G TS 27.001 [9].
- Compatibility checking (see ~~GSM 07.01 [8]~~3G TS 27.001 [9])
- Layer 2 relaying (see annex 1)
- Flow control
- In Call Modification function (see section 4)
- Splitting and combining of the data flow in case of multi substream data configurations

3.3 TAF Interfacing to other MT functions

TAF interfacing is shown in figure 1.

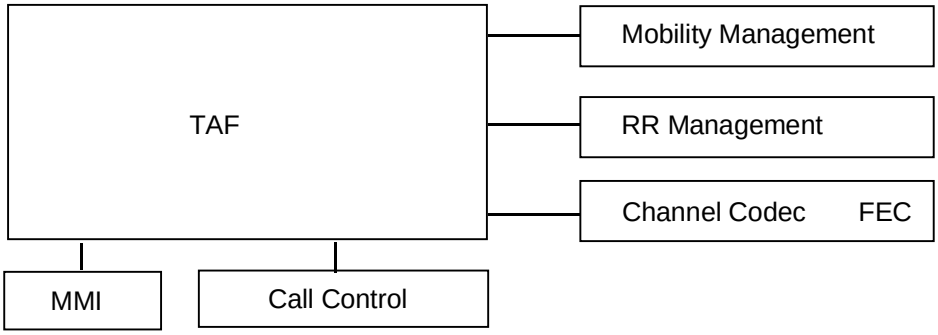


Figure 1: TAF interfacing to other MT functions

4 Terminal Adaptation Functions for synchronous transparent services

Specification GSM 03.10 ~~[3]~~[2] refers to the models for connection types supporting synchronous transparent services.

4.1 Rate Adaptation in GSM

Rate adaptation on the MS-BS interface is described in GSM 04.21[4]. The synchronous data services make use of the following rate adaptation functions: RA1, RA2, RA1/RA1', RA1' and in case of TCH/F28.8 usage, EDGE-MUX. See also Figures 6, 7 and 8 in GSM 03.10 [2]. The D-bits of the rate adaptation frames are used to convey user data and the S- and X-bits are used to convey channel status information associated with the data bits in the data transfer state, or to carry substream numbering between the Split/Combine functions in case of mult substream operation. For the S- and X-bits, a ZERO corresponds to the ON condition, a ONE to the OFF condition.

4.1.1 Rate adaptation - ITU-T V-series

This is provided as indicated in specification GSM 04.21 [~~4~~6]. The functions applied in this case are shown in figure 2 (see model 2b in figures 6, 7 and 8 of GSM 03.10 ~~[3]~~[2]).

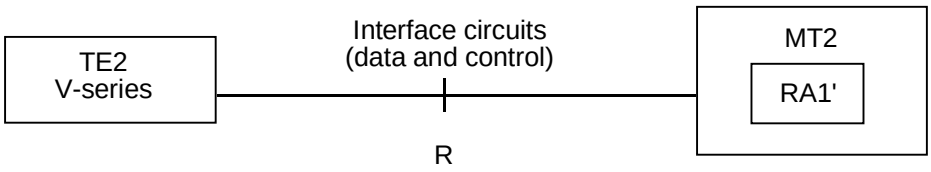


Figure 2: Rate adaptation for V-series terminals

4.1.2 Rate adaptation ~~-~~ ITU-T X.21 [23]

This is provided as indicated in specification GSM 04.21 [~~4~~6]. The functions applied in this case are shown in figure 3 (see model 2b in figures 6, 7 and 8 of GSM 03.10 ~~[3]~~[2]).

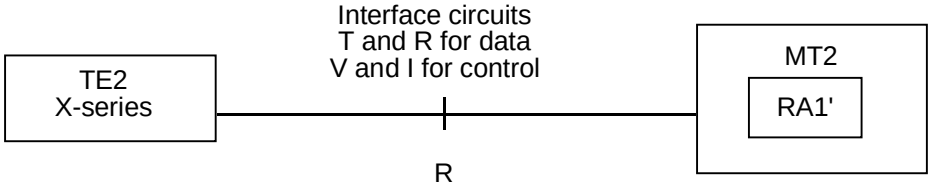


Figure 3: Rate adaptation for ITU-T X.21 [23] terminals

4.1.3 Rate adaptation - ITU-T S-interface

The functions applied in this case are shown in figure 4 (see model 2a in figures 6, 7 and 8 of GSM 03.10 [3][2]).

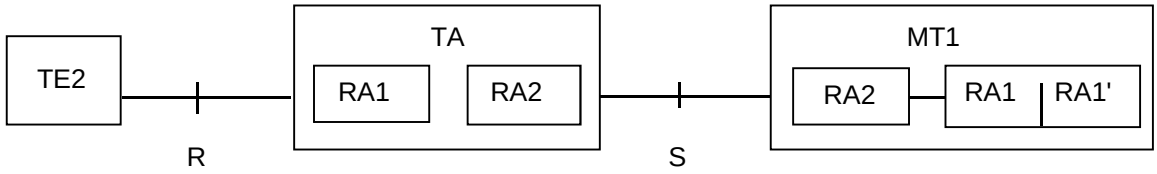


Figure 4a: Rate adaptation for ITU-T S-interface

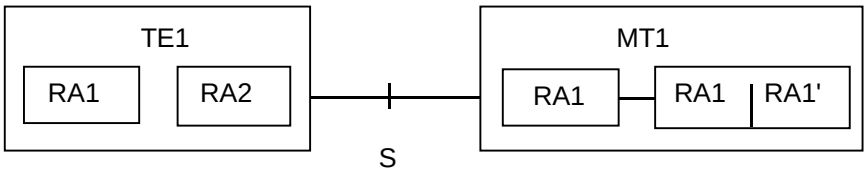


Figure 4b: Rate adaptation for ITU-T S-interface (continued)

There are two cases to be considered for the RA1 function:

a) V-series interface

For the V-series type of terminal equipments the rate adaptation functions are as described in GSM 04.21 [46].

b) ITU-T X.21 [23]-interface

For terminal equipments using the ITU-T X.21 [23]-interface the rate adaptation functions are identical to those described in GSM 04.21 [46], but the notation used is as described in ~~CCITT~~ITU-T recommendation X.30~~/I.461~~ [~~29~~28].

The notation used is as follows:

The conversion of the user rates of 2.4 kbit/s and 4.8 kbit/s to 8 kbit/s and user rate of 9.6 kbit/s to 16 kbit/s shall be implemented by means of the 40 bit frame structure shown in figure 5.

Figure 5 shows that in addition to the basic frame, a two frame multiframe is employed. In odd frames, octet 0 contains all zeros, whilst in even frames octet 0 consists of a one followed by seven E bits. The order of bit transmission of the 40 bit frame is from left-to-right and top-to-bottom.

This two frame multiframe corresponds to the 80 bit frame structure presented in GSM 04.21 [46] as shown in figure 6. The 24 information bits P1,..,P8, Q1,..Q8, R1,..,R8 of odd frames correspond with D1,..,D24 and those of even frames correspond with D25,..,D48 respectively. For the status bits there is the following correspondence: odd frame SQ, X, SR, SP = S1,X,S3,S4 and even frame SQ, X, SR, SP = S6, X, S8, S9.

Option for a manufacturer of mobile stations:

In transparent mode support of a packet mode TE1 or TE2/TA, which uses flag stuffing.

		Bit number							
		1	2	3	4	5	6	7	8
Octet 0	Odd frames	0	0	0	0	0	0	0	0
	Even frames	1	E1	E2	E3	E4	E5	E6	E7
Octet 1		1	P1	P2	P3	P4	P5	P6	SQ
Octet 2		1	P7	P8	Q1	Q2	Q3	Q4	X
Octet 3		1	Q5	Q6	Q7	Q8	R1	R2	SR
Octet 4		1	R3	R4	R5	R6	R7	R8	SP

NOTE: Bit X, if not used for the optional flow control or for the indication of the far end synchronization, shall be set to 0 (see ~~CCITT~~ITU-T Recommendation ~~I.463/~~V.110 [22]).

Figure 5: 40 bit frame structure of ~~CCITT~~ITU-T X.30 [28~~29~~]

	X.30 [28] Two frame multifr.								V.110 [22]80-bit frame							
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
odd	1	P1	P2	P3	P4	P5	P6	SQ	1	D1	D2	D3	D4	D5	D6	S1
frame	1	P7	P8	Q1	Q2	Q3	Q4	X	1	D7	D8	D9	D10	D11	D12	X
	1	Q5	Q6	Q7	Q8	R1	R2	SR	1	D13	D14	D15	D16	D17	D18	S3
	1	R3	R4	R5	R6	R7	R8	SP	1	D19	D20	D21	D22	D23	D24	S4
	1	E1	E2	E3	E4	E5	E6	E7	1	E1	E2	E3	E4	E5	E6	E7
even	1	P1	P2	P3	P4	P5	P6	SQ	1	D25	D26	D27	D28	D29	D30	S6
frame	1	P7	P8	Q1	Q2	Q3	Q4	X	1	D31	D32	D33	D34	D35	D36	X
	1	Q5	Q6	Q7	Q8	R1	R2	SR	1	D37	D38	D39	D40	D41	D42	S8
	1	R3	R4	R5	R6	R7	R8	SP	1	D43	D44	D45	D46	D47	D48	S9

Figure 6: Correspondence of ITU-T X.30 [28~~29~~] and ITU-T V.110 [22] frames

4.2 Interchange Circuit Signalling Mapping

4.22.1 ITU-T V-series interchange circuit mapping

The interchange circuit signalling mapping at the interface between the TE2 and the MT shall conform to ~~CCITT~~ITU-T recommendation V.24 [~~16~~17]; while the signal levels at the interface shall conform either to ~~CCITT~~ITU-T recommendation V.28 [20], or to IrDA IrPHY Physical signalling standard specification [~~35~~34], or to PCMCIA 2.1 [~~34~~33], or to PC-Card 3.0 [~~34~~33] electrical specifications or to later revisions.

The signals required at this interface are shown in table 2.

Specification GSM 04.21 [4] refers to the frame structure and identifies the use of status bits for the carriage of signalling information

Status bits SA, SB and X are used to convey channel control information associated with the data bits in the data transfer state. Table 1 shows the mapping scheme between the ITU-T V.24 [17~~16~~]circuit numbers and the status bits for the transparent mode. It also shows how the unused status bits should be handled. It is derived from the general mapping scheme described in annex C. A binary 0 corresponds to the ON condition, a binary 1 to the OFF condition.

The transport of these status bits by the various channel codings is described in subsequent sections.

Table 1: Mapping scheme at the MT for the transparent mode

Signal at TE2/MT interface or condition within the MT	Mapping direction: MT to IWF	Mapping direction: IWF to MT
CT 105	not mapped (note 1)	
CT 106		from status bit X (note 7)
CT 107		not mapped (note 5)
CT 108/2	not mapped (note 6)	
CT 109		from status bit SB (note 7)
CT 133	not mapped (note 2)	
always ON	to status bit SA (note 3)	
always ON	to status bit SB (note 1)	
always ON	to status bit X (note 4)	
ignored by MT		from status bit SA (note 3)

NOTE 1. The SB bit towards the IWF, according to the General Mapping (27.002, annex C), could be used to carry CT 105. However, CT 105 should always be ON in the data transfer state since only duplex operation is supported. Also, many DTEs use the connector pin assigned to CT 105 for CT 133. No interchange circuit shall be mapped to the SB bit which shall always be set to ON in the data transfer state.

NOTE 2. CT 133 is not mapped since there is no flow control in transparent mode.

NOTE 3. The SA bits in both directions are available only with certain channel codings. Therefore, for maximum compatibility, they should not be mapped.

NOTE 4. The X bit towards the IWF is not mapped and shall always be set to ON in the data transfer state since there is no flow control in transparent mode.

NOTE 5. CT 107 is controlled by the channel synchroniz~~s~~ation process (3G TS 27.001 [9]).

NOTE 6. CT 108/2 may be used in the call setup and answering processes.

NOTE 7. The status bits are filtered before being mapped to the ITU-T -V.24 [17~~16~~] circuits (3G TS 27.001 [9]).

Table 2: Minimum set of V-series interchange circuits

Circuit Number	Circuit Name	Ground	Data		Control	
			to TE2	from TE2	to TE2	from TE2
CT102	Common Return	X				
CT103	Transmitted data			X		
CT104	Received data		X			
CT105	Request to send					X
CT106	Ready for sending				X	
CT107	Data set ready				X	
CT108.2	Data terminal ready					X
CT109	Data channel received line signal detector				X	
CT114	Transmitter signal element timing				X	
CT115	Receiver signal element timing				X	
CT125	Calling in-dicator (note)				X	

NOTE: CT125 is used with the AUTO ANSWER function of the TAF.

Use of Network Independent Clocking:

Network Independent Clocking is only applicable to calls using ITC value "3.1 kHz audio ex PLMN".

Within the GSM network the coding of the values for bits associated with NIC is specified in GSM specifications GSM 04.21 [~~4~~6] and ~~/~~GSM 08.20 [~~5~~9]. In the forward (transmitting) direction the multiframes shall be coded in exact accordance with that specified in those specifications. Bit E6 is set to "1" in alternate modified ITU-T V.110 [22] frames at the transmitter. However, the use of this bit at the receiver for monitoring frame Synchronization, or any other purpose, is not specified and is left to the discretion of the implementor.

A "perfect linear block Code" is used in C1-C5, whose error correction properties may be utilized in the receiver, in order to ensure reliable operation of NIC.

The NIC sending function has to recognize when the difference between the applicable clock speed of the GSM network and the interface speed generates a positive or negative whole bit requirement. When this positive or negative condition occurs, the NIC codewords specified in specification GSM 04.21 [~~4~~6] are used to transport this condition to the receiving NIC function. Transmission of the codeword shall clear the positive or negative condition related to that codeword at the sending function. The sending function shall not send more than one positive or negative compensations within a contiguous period of time corresponding to 10 000 user data bits minus the number of user data bits necessary to make up an even number of ITU-T V.110 [22] frames between compensations (NIC compensation is coded in two ITU-T V.110 [22] frames). This results from the requirements to compensate for maximum clock differences of

± 100 parts per million. If the receiving function receives NIC compensations more often than a contiguous period of time corresponding to 10 000 user data bits, there is no guarantee that data will ~~may~~ not be lost.

The NIC receiving function has to provide the capability to support the compensation requirements of the sending function. This compensation is managed by manipulating the clock speed of the interface, within the standard constraints of that interface.

Overall, the compensation functions have to be capable of managing clock tolerances of ± 100 parts per million.

The NIC function has to recognize and manage the conversion of the NIC information received incoming from an ISDN terminal Interface. The conversion has to be made to the NIC format used within the GSM System as defined in specifications GSM 04.21 [4] and GSM ~~/~~08.20 [5]). The NIC function has to manage the conversion of the GSM NIC format into that used within the ISDN in the traffic direction towards the ISDN terminal interface.

Due to the incompatibility between the ISDN and the GSM requirements NIC interworking is nor provided between these two formats. as such no NIC function is required in providing interworking to the ISDN for unrestricted digital.

Action on loss of synchronization:

If five consecutive NIC multiframes have incorrect framing bit values in E7, the receiver shall stop applying clocking compensation to the received data. Resynchronization ~~will~~shall be attempted and compensation ~~will~~shall resume when synchronization is achieved.

Signal element timing:

Receiver signal element timing (CT115) is generated by MT2. In the transparent case, this shall be synchronized to the output of RA1' function. In the non transparent case it is output from the L2R on the basis of the current user data rate. A transition from ON to OFF condition shall nominally indicate the centre of each signal element on CT104.

Transmitter signal element timing is generated by MT2 (CT114), this may be synchronized to CT115.

In the case of alternate Speech/Group 3 Facsimile in GSM, there may be a Channel Mode Modify during the course of the facsimile portion of the call. If this occurs in GSM, the user data rate changes and this is reflected to the ITU-T V.24 [17~~16~~] interface as a change in the clock speed on CT 114 and CT 115.

4.2.1.1 Multislot configurations (Channel coding TCH/F9.6 or TCH/F4.8 kbit/s)

In transparent multislot configurations status bits S1, S3 and the X-bit between the D12 and D13 in the ITU-T V.110 [22] 80-bit intermediate rate frame - are used for transferring substream numbering information. The S4-bit is used for frame synchronization between the parallel substreams (ref GSM 04.21[4]).

4.2.1.2 Channel coding TCH/F14.4 and TCH/F28.8

For information on the mapping of the interchange circuit signalling bits in the 14.5 multiframe structure, refer to GSM 04.21[4].

4.2.2 ITU-T X.21 [23] Interchange circuit mapping

The interchange circuit signalling mapping at the interface between the TE2 and the MT shall conform to ~~CCITT~~ITU-T recommendations ITU-T X.21 [23] and ITU-T X.24 [25]; while the signal levels at the interface shall conform either to ~~CCITT~~ITU-T recommendation ITU-T X.26 [~~27~~26]/-(ITU-T V~~.~~.10 [~~12~~13]), or to ITU-T X.27 [~~28~~27] /(ITU-T V.11 [~~13~~14]) - see also paragraph 2.1 of ~~CCITT~~ITU-T recommendation X.21 [23], or to IrDA IrPHY Physical signalling standard specification [~~35~~34], or to PCMCIA 2.1 [~~34~~33], or to PC-Card 3.0 [~~34~~33] electrical specifications or to later revisions.

The signals required at this interface are shown in table 3.

Specification GSM 04.21 [4] refers to the frame structure and identifies the use of status bits for the carriage of signalling information.

Status bits (S1, S3, S4, S6, S8, S9):

For the purpose of alignment with the case where the ITU-T X.21 [23] TE2 is connected to the MT via a TA conforming to ~~CCITT~~ITU-T recommendation X.30 [28~~29~~] ~~(I.461)~~, the notation for the S-bits ~~will~~shall be SP, SQ and SR as in figure 5 in ~~GSM 07.03~~. For the bits SP, SQ and SR, a ZERO corresponds to the ON condition, a ONE to the OFF condition.

The bits SP, SQ and SR are used to convey channel associated status information. The mapping of the information on circuit C of the ITU-T X.21 [23] interface to the S bits and from the S bits to the circuit I in the distant interface should be done in such a way that the SP, SQ and SR bits are associated with the bit-groups P, Q and R. To assure proper and secure operation the mapping scheme has to be consistent with ~~CCITT~~ITU-T recommendations X.21 [23]and X.24~~.~~ [25].

The mechanism for mapping is as follows:

- In all cases where ITU-T X.21 [23]-byte timing interchange circuit B is not provided, the status bits SP, SQ and SR of the bit groups P, Q and R are evaluated by sampling the circuit C in the middle of the 8th bit of the respective preceding bit group. On the other hand, the conditions of the status bits SP, SQ and SR are adopted by the circuit I beginning with transition of the respective 8th bit of a bit-group P, Q and R to the first bit of the consecutive bit group on the circuit R.

- In the case where ITU-T X.21 [23]-byte timing interchange circuit B is provided for character alignment, the circuit C is sampled together with the bit 8 of the preceding octet and the circuit I is changing its state at the boundaries between the old and new octets at the circuit R. This operation is defined in ~~CCITT~~ITU-T recommendation X.24 [25].

Table 3: ITU-T X.21 [23] interchange circuits

Interchange circuit	Interchange circuit name	Data		Control		Timing toTE2
		to TE2	from TE2	to TE2	from TE2	
G	Common return					
Ga	TE2 common return					
T	Transmit		X		X	
R	Receive	X				
C	Control				X	
I	Indication			X		
S	Signal element timing					X
B	Byte timing (note)					X

NOTE: According to ~~CCITT~~ITU-T recommendation X.21 [23] the provision of the 8 bit timing interchange circuit B is not mandatory.

4.2.3 Case of ITU-T S-interface

At the S-interface an ITU-T X.30 [28~~29~~] rate adapted bit stream is provided by the TE1 or TE2-TA combination (see figure 4). The terminal adaptation function within the MT does not have any interchange circuit signalling mapping function to perform.

4.3 Call establishment signalling mapping at TE/MT interface

4.3.1 ITU-T V-series interfaces

4.3.1.1 VOID ~~Call establishment manual operation - utilizing Alternate Speech/Data or Speech followed by Data Capabilities~~

~~During manual call establishment, the mobile user shall be able to hear network supervisory tones and answer tone.~~

~~On hearing answer tone, the user invokes the transition from speech to data in both Mobile Station and the IWF. The mapping for this is shown in section 6.~~

4.3.1.2 Call establishment manual operation - utilizing the Unrestricted Digital Capability

In this case the user ~~will~~shall not hear network supervisory tones or answer tone. The data transfer phase ~~will~~shall be entered automatically.

4.3.1.3 ITU-T V.25 bis [18]auto call/auto answer

The mapping of the ITU-T V.25 bis [18] procedures to the messages of the PLMN Dm-channel signalling (~~GSM 04.08 [5]~~3G TS 24.008 [7]) is defined in section 4.

Auto Call:

This procedure is provided according to ITU-T V.25 bis [18] using only circuit 108/2. A subset of ITU-T V.25 bis [18] is shown in table 4. This subset gives minimum level of control and indication.

During the call establishment phase, i.e. after signalling, call tone according to ITU-T V.25 bis [18] shall be generated in the IWF, where appropriate.

Auto Answer:

This procedure is provided according to ITU-T V.25 bis [18].

Table 4: Minimum set of ITU-T V.25 bis [18] Call Set-up Commands and Indications

	Description	IA5 Characters
Commands from TE2	Call Request with Number provided 0,1..9,*,#,A,B,C,D	CRN
	Disregard Incoming Call	DIC
	Connect Incoming Call	CIC
Indications to TE2	Call Failure Indication XX = CB,AB,NT,FC (Note)	CFI XX
	INcoming Call	INC
	VALid	VAL
	INValid	INV

NOTE to table 4: CB = Local MT busy
AB = Abort call
NT = No answer
FC = Forbidden call *

* Forbidden call indication results from contravention of rules for repeat call attempts as defined by the appropriate national approvals administration. It is recommended that this is the responsibility of the MT, not the TE2.

4.3.2 ITU-T X-series interfaces

4.3.2.1 ITU-T X.21 bis [24] call establishment manual operation - utilizing the Unrestricted Digital Capability

In this case the user ~~will~~shall not hear network supervisory tones or answer tone. The data transfer phase ~~will~~shall be entered automatically.

4.3.2.2 ITU-T X.21 bis [24] /ITU-T V.25 bis [18] call establishment signalling mapping

The mapping of the ITU-T V.25 bis [18] procedures to the messages of the PLMN Dm-channel signalling (~~GSM 04.08 [5]~~3G TS 24.008 [7]) is defined in section 6.

Auto Call:

This procedure is provided according to ITU-T V.25 bis [18] using only circuit 108/2. A subset of ITU-T V.25 bis [18] is shown in table 4. This subset gives minimum level of control and indication.

Auto Answer:

This procedure is provided according to ITU-T V.25 bis [18].

4.3.2.3 ITU-T X.21 [24] call establishment signalling mapping

The mapping of the ITU-T X.21 [24] procedures to the messages of the PLMN Dm-channel signalling (~~GSM 04.08 [5]~~3G TS 24.008 [7]) is defined in section 7.

4.3.3 ITU-T S-interface (ITU-T I.420 [10~~1~~]) signalling mapping

The mapping of ITU-T Q.931 [~~11~~12] signalling to ~~04.08~~3G TS 24.008 [7] signalling requires the inclusion, by the MT, of PLMN specific elements (eg. transparent or not, half or full rate channel). The required Bearer Capability Elements are shown in ~~GSM 07.01 [8]~~3G TS 27.001 [9] Annex 2.

4.3.4 VOID ~~X.25 procedures mapping~~

~~User terminals are connected to mobile termination either at S reference point (TE1 or TE2/TA) or at R reference point (TE2). For the physical interface of TE2s all different possibilities are shown in table 9 in section 8.~~

~~For more details, see CCITT X.25 and the appropriate interface recommendations.~~

~~The mapping is described in section 8.~~

5 Terminal Adaptation Functions for synchronous non-transparent services in GSM

~~This section deals with the specific requirements for non-transparent X.25 access. Other cases, e.g. teletex, are dealt within other specifications.~~

~~Layer 2 Relay function is described in annex 1.~~

~~Is this section required for references to V.120 and GSM NT Fax GSM 03.45??????????~~

5.1 Rate Adaptation and protocol model

5.1.1 ITU-T R-interface

For the protocol model and rate adaptation function applied in this case see Models 4b and 4e of Figures 6, 7 and 8 in ~~/~~GSM 03.10 [2]).

5.1.2 ITU-T S-interface

For the cases where the method indicated in ~~CCITT~~ITU-T X.30 [28~~29~~] is used see Models 4a and 4d of Figures 6, 7 and 8 in ~~/~~GSM 03.10 [2]).

For the cases where the HDLC interframe flag stuffing shown in the recommendation ~~CCITT~~ITU-T X.31 [~~30~~29] is used see Models 4c and 4f of Figures 6, 7 and 8 in ~~/~~GSM 03.10 [2]).

5.2 Signalling Mapping (GSM only)

5.2.1 Interchange circuit signalling mapping

Status bits SA, SB and X are used to convey channel control information associated with the data bits in the data transfer state. Table 2 shows the mapping scheme between the ITU-T V.24 [17~~16~~] circuit numbers and the status bits for the non-transparent mode. It also shows how the unused status bits should be handled. It is derived from the general mapping scheme described in annex C. A binary 0 corresponds to the ON condition, a binary 1 to the OFF condition.

The transport of the status bits by the L2RCOP is described in annex A.

Table 2: Mapping scheme at the MT for the non-transparent mode

Signal at TE2/MT interface or condition within the MT	Mapping direction: MT to IWF	Mapping direction: IWF to MT
CT 105	not mapped (note 1)	
CT 106 (note 4)		from status bit X (note 7)
CT 107		not mapped (note 5)
CT 108/2	not mapped (note 6)	
CT 109		from status bit SB
CT 133 (note 8)	to status bit X (notes 3,8)	
always ON	to status bit SA (note 2)	
always ON	to status bit SB (note 1)	
ignored by MT		from status bit SA (note 2)

NOTE 1. The SB bit towards the IWF, according to the General Mapping (27.002, annex C), could be used to carry CT 105. However, CT 105 should always be ON in the data transfer state since only duplex operation is supported. Also, many DTEs use the connector pin assigned to CT 105 for CT 133. No interchange circuit shall be mapped to the SB bit, which shall always be set to ON in the data transfer state.

NOTE 2. The SA bits (both directions) are not mapped since CTs 107 and 108/2 are handled locally (notes 5, 6).

NOTE 3. The condition of status bit X towards the IWF may also be affected by the state of the receive buffer in the MT.

NOTE 4. The state of CT 106 (or other local flow control mechanism) may also be affected by the state of the transmit buffer in the MT and the state of the RLP (RR/RNR).

NOTE 5. CT 107 is controlled by the channel synchronisation process (3G TS 27.001 [9]).

NOTE 6. CT 108/2 may be used in the call setup and answering processes.

NOTE 7. For inband local flow control, changes in the condition of the status bit X from the IWF also result in the sending of XON or XOFF to the DTE.

NOTE 8. For inband local flow control, CT 133 is not mapped and the status bit X towards the IWF is controlled by the reception of XON and XOFF characters from the DTE.

5.2.2 ~~VOID~~ Call establishment signalling mapping

~~The physical interfaces are mentioned in section 4.3.4 and the signalling mapping is described in section 8.~~

~~Is this section required for Call establishment in other cases V.120 GSM NT-Fax??????~~

FFS

5.3 Flow Control

The passage of flow control information between L2Rs is described in annex 1.

5.3.1 Conditions requiring flow control towards the network

The L2R function ~~will~~shall send immediately a "flow control active" indication in the following circumstances:

(i) If the receive buffer from the radio side reaches a preset threshold.

(ii) If local flow control is initiated by the TE2 (see section 5.3.3 a)). On receipt of this flow control indication transmission of data from the receive buffer towards the TE2 is halted.

On removal of the buffer congestion or local flow control the L2R ~~will~~shall send a "flow control inactive" indication.

In addition, for the local flow control condition, transmission of data from the receive buffers ~~will~~shall be restarted.

5.3.2 Conditional requiring flow control towards TE2

The L2R function ~~will~~shall immediately activate local flow control (see section 5.3.3 b)) under the following circumstances:

(i) The transmit buffer reaches a pre-set threshold.

(ii) The L2R receives a "flow control active" indication.

On removal of the buffer congestion or receipt of L2R/RLP "flow control inactive" the local flow control ~~will~~shall be removed.

5.3.3 Local flow control

Only inband flow control is allowed:

a) from TE2:

RNR is sent to indicate flow control active. RR is sent to indicate flow control inactive. Where RR/RNR is utilized then the TAF ~~will~~shall generate flow control active/inactive immediately.

b) From TAF: As from TE2.

Where this method is used, the L2R ~~will~~shall pass the RNR/RR frames to the TE2.

5.4 Buffers

5.4.1 TX buffers

Data received 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 n1 bytes. When the buffer is half full, TE2 shall be flow controlled as per section 5.3.2. The value for n1 is up to the implementors.

5.4.2 RX buffers

Data for transfer to the TE2 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 n2 bytes. The value for n2 is up to the implementors.

When the buffer becomes half full, the L2R ~~will~~shall send a "flow control active" indication.

6 V- and S-series interface procedures to ~~04.08~~3G TS 24.008 [7] mapping

Interface procedures not directly mappable to ~~GSM 04.08 [5]~~3G TS 24.008 [7] (ie. ITU-T V.25 bis [18] VAL/INV) are not considered. Mobile management procedures of ~~GSM 04.08~~3G TS 24.008 [7] are not considered applicable.

Mapping of other call establishment or clearing messages to the S interface e.g. "Call proceeding", etc. have not been included. It is assumed that these ~~will be able to~~may be mapped directly and thus are of no relevance to the ITU-T V.25 bis [18] or manual interface.

~~For Alternate speech/data and Speech followed by data digital services it will be necessary for the TAF to generate a "Modify" message for transmission, this shall be generated manually derived from MMI. This shall be according to the defined procedure in GSM 04.08 [5].~~

6.1 Mobile Originated calls

a) SETUP

Element	Derived from		
	MMI	ITU-T V.25 bis [18] message	ITU-T S interface message
Called Address	Keypad	CRN/CRI/CRS	Setup
Called Sub Address	Keypad	CRI	Setup
HLC	Derived from internal settings or MMI information.		Setup
LLC	Same as HLC		Setup
BC	Same as HSC		Setup (with additional information from MMI oriented settings)
	~~GSM 07.01~~3G TS 27.001 [9] gives allowed values		

b) RELEASE COMPLETE

Element	Derived from		
	MMI	ITU-T V.25 bis [18] message	ITU-T S interface message
Cause	Display (optional)	CFI	Release complete

6.2 Mobile Terminated calls

Call establishment is initiated by receipt of Setup at the MS:

a) SETUP

Element	Mapped on to		
	MMI	ITU-T V.25 bis [18] message	ITU-T S interface message
Called Address	Display (optional)	INC	Setup
Called Sub Address	Display (optional)	Not applicable	Setup
HLC	Display (optional)	Not applicable	Setup
LLC	Display (optional)	Not applicable	Setup
BC	Display (optional)	Not applicable	Setup (with PLMN specific elements removed)

b) CALL CONFIRM

Information for the BC element in the call confirm is derived from e.g. MMI or by internal settings.

c) CONNECT

Connect is sent in response to connect from the S-interface, CIC from ITU-T V.25 bis [18] or from MMI.

7 ITU-T X.21 [23] interface procedures to ~~04.08~~3G TS 24.008 [7] mapping

7.1 ITU-T X.21 [23] procedures mapping

The ITU-T X.21 [23] procedures mapping is shown in figures 10 and 11. The Bearer Capability Elements required on Dm channel are shown in ~~GSM 07.01 [8]~~3G TS 27.001 [9] Annex 2.

NOTE: DTE corresponds to TE2 and DCE corresponds to MT2 in the signal names of ITU-T X.21 [23] interface.

7.1.1 Mobile originated call (see figure 10)

Call Request of TE2 to Dm channel SET-UP:

At R interface: In Ready state both TE2 and MT transmit (1,OFF). When the calling TE2 indicates Call Request (0,ON), the MT transmits Proceed to Select (+,OFF). Then the TE2 sends the Selection signals (IA5,ON) and End of Selection (+,ON) and enters the state DTE Waiting (1,ON). The MT shall transmit DCE Waiting (SYN,OFF).

At MS-MSC interface: By receiving Call Request at R-interface, the MT shall start mobile originated call establishment (CHANNEL REQUEST message etc.). When the MT has received Selection signals and End of Selection from TE2, it shall send SET-UP, when possible.

CALL PROCEED:

After the traffic channel assignment is complete, the MT shall start sending (1,OFF) within the 40 bit frames (see sections 4.1.3 and 4.2.2) via the Bm (Lm) channel.

Dm channel ALERT to Call Progress to TE2:

This is applicable only to manually answered calls.

When the MT receives ALERT from Dm channel, it shall transmit Call Progress signals (IA5,OFF) to TE2 and then enter the state DCE Waiting (SYN,OFF).

Dm channel CONN to Ready For Data to TE2:

When the MT receives CONN from Dm channel, it shall respond with CONN ACK message and it may send DCE Provided Information to the calling TE2. The MT transmits then Connection in Progress (1,OFF) to TE2.

When the MT receives a frame with all data bits set to ONE, it performs the switch-through of data and control lines to TE2.

7.1.2 Mobile terminated call (see figure 10)

Dm channel SET-UP to Incoming Call to TE2:

When the TE2 is in Ready state and the MT receives SET-UP via Dm channel, the MT shall respond with ALERT in case of manual answering. Via R interface the MT transmits Incoming Call (Bell, OFF) to TE2.

Call Accepted of TE2 to Dm channel CONN:

When the MT receives Call Accepted via R interface (1,ON), it shall send CONN message via Dm channel.

Dm channel CONN ACK to Ready For Data to TE2:

When the MT receives CONN ACK from Dm channel, it shall start sending (1,OFF) within the 40 bit frames via the Bm (Lm) channel. Via R interface the MT transmits Connection in Progress (1,OFF) to TE2 after delivering DCE Provided Information if any.

When the MT receives a frame with all data bits set to ONE, it performs the switch-through of data and control lines to TE2.

7.1.3 Mobile termination clearing (see figure 11)

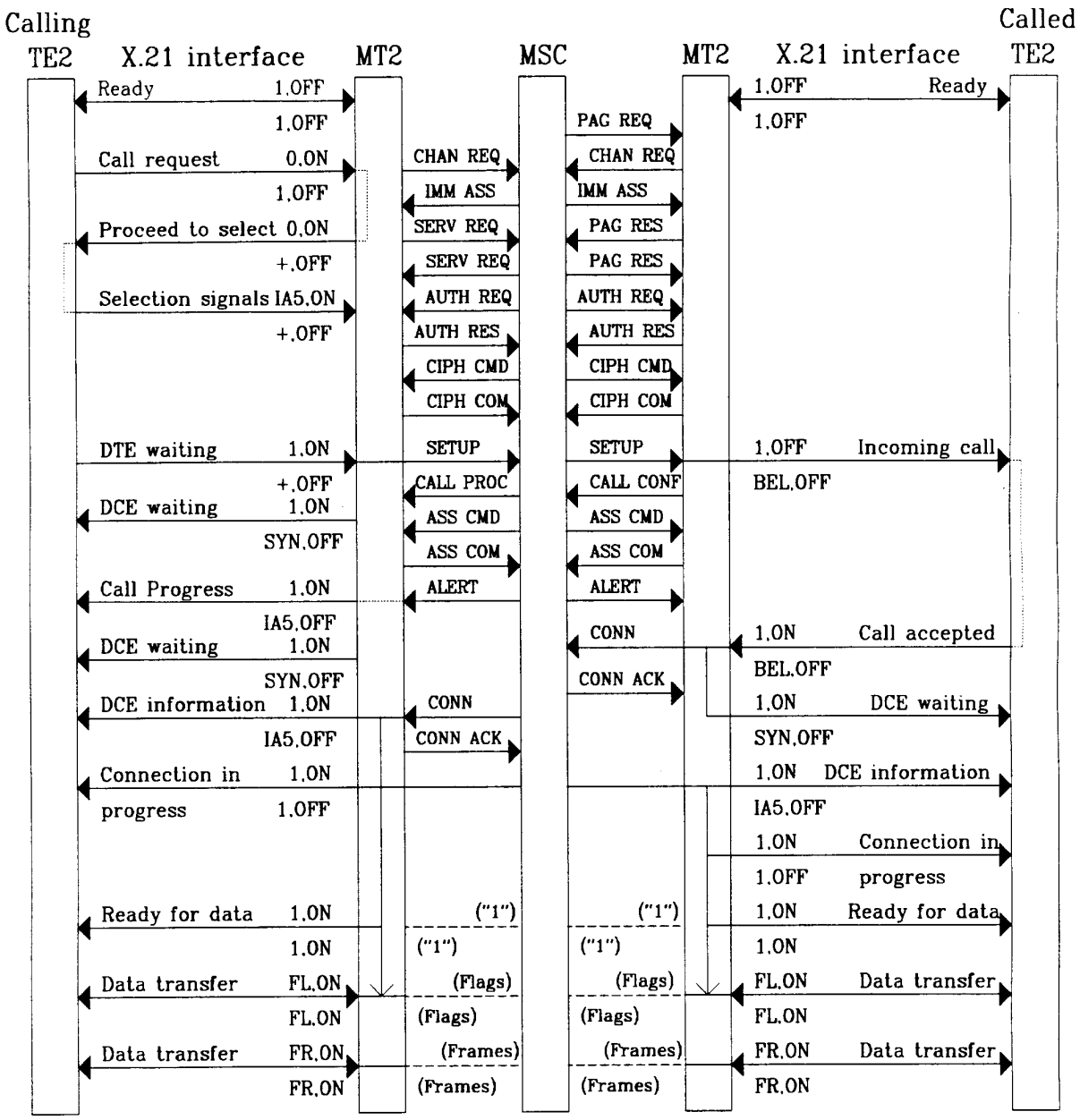
DTE Clear Request (0,OFF) is transmitted via Bm (Lm) channel to the cleared terminal. The MT at the clearing TE2 recognizes the Clear Request, transmits DCE Clear Confirmation (0,OFF) to TE2 and sends DISCONNECT message via Dm channel. When the radio channel is released, the MT shall transmit DCE Ready (1,OFF) and TE2 shall then enter the state DTE Ready (1,OFF).

7.1.4 Distant end terminal clearing

When the MT receives DCE Clear Request via Bm (Lm) channel, it shall transmit DCE Clear Indication (0,OFF) to its TE2 via R interface. After the MT has received DTE Clear Confirmation (0,OFF), it sends DISCONNECT message via Dm channel. When the radio channel is released, the MT shall transmit DCE Ready (1,OFF) and TE2 shall then enter the state DTE Ready (1,OFF).

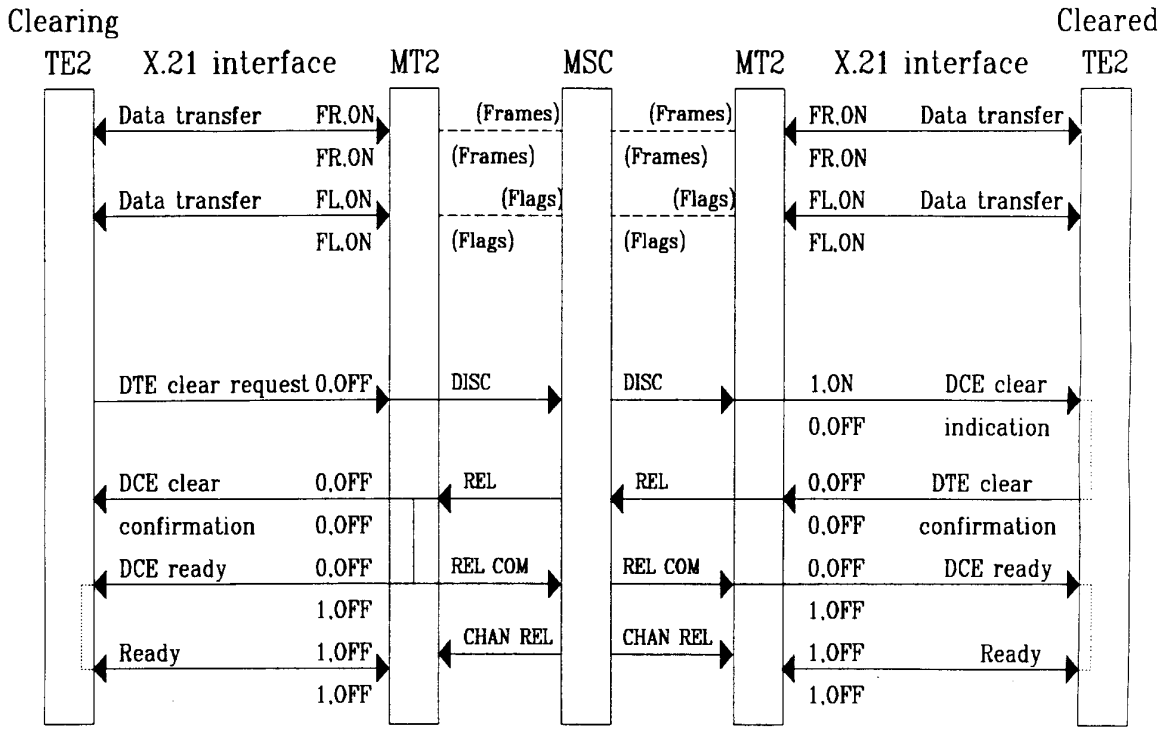
7.1.5 Network generated clearing (see figure 11)

When the MT has received DISCONNECT message via Dm channel, it shall transmit DCE Clear Indication (0,OFF) to its TE2 via R interface. After the MT has received DTE Clear Confirmation (0,OFF) and the radio channel is released, the MT shall transmit DCE Ready (1,OFF) and TE2 shall then enter the state DTE Ready (1,OFF).



NOTE: In the signal names of ITU-T X.21 [23] interface DTE corresponds with TE2 and DCE corresponds with MT2.

Figure 10: Example of a calling and a called TE2 (ITU-T X.21 [23])



NOTE: In the signal names of ITU-T X.21 [23] interface DTE corresponds with TE2 and DCE corresponds with MT2.

Figure 11: Example of a clearing and a cleared TE2 (ITU-T X.21 [23])

7.2 Dm Signalling causes mapping to ITU-T X.21 [23] call progress signals

The mapping of PLMN Dm channel signalling to ITU-T X.21 [23] call progress signals and DCE Provided Information is shown in table 7.

7.3. ITU-T X.21 [23] FACILITIES MAPPING

The ITU-T X.21 [23] facilities are shown in table 8. The mapping of these to PLMN supplementary services is for FFS.

Table 7: Mapping of Dm cause fields to ITU-T X.21 [23] call progress signals

Item	——Dm signalling cause	Code	ITU-T X.21 -call progress signal sign.	Code
01	Unassigned (unallocated) number	01	Not obtainable	43
02	No route to destination	03	Not obtainable	43
03	Channel unacceptable	06	Not obtainable	43
04	Normal call clearing	16	----	
05	User busy	17	Number busy	21
06	No user responding	18	No connection	20
07	User alerting, no answer	19	No connection	20
08	Call rejected	21	Controlled not ready	45
09	Number changed	22	Changed number	42
10	Destination out of order	27	Uncontrolled not ready	46
11	Invalid number format (incomplete)	28	Selection sign. procedure error	22
12	Facility rejected	29	Invalid facility request	48
13	Response to status enquiry	30	----	
14	Normal, unspecified	31	----	
15	No circuit/channel available	34	No connection	20
16	Network out of order	38	Out of order	44
17	Temporary failure	41	Out of order	44
18	Switching equipment congestion	42	Network congestion	61
19	Access information discarded	43	----	
20	Requested circuit/channel not available	44	No connection	20
21	Resources unavailable, unspecified	47	Network congestion	61
22	Quality of service unavailable	49	----	
23	Requested facility not subscribed	50	Invalid facility request	48
24	Bearer capability not authorized	57	Incompat. user class of service	52
25	Bearer capability not presently available	58	Network congestion	61
26	Service or option not available, unspecified	63	No connection	20
27	Bearer service not implemented	65	Invalid facility request	48
28	Only restricted digital information bearer capability is available	70	Invalid facility request	48
29	Service or option not implemented, unspecified	79	Invalid facility request	48
30	Invalid call reference value	81	Not obtainable	43
31	Incompatible destination	88	Not obtainable	43
32	Invalid transit network selection	91	Not obtainable	43
33	Invalid message, unspecified	95	Selection signal transmis. error	23
34	Mandatory info. element error	96	Selection signal procedure error	22
35	Message type non-existent or not implemented	97	Selection signal procedure error	22
36	Message not compatible with call state or message type non-existent or not implemented	98	Selection signal procedure error	22
37	Information element non-existent or not implemented	99	Selection signal procedure error	22
38	Invalid info. element contents	100	Selection signal transm. error	23
39	Message not compatible with call state	101	Selection signal procedure error	22
40	Recovery on timer expiry	102	Not obtainable	43
41	Protocol error, unspecified	111	Selection signal procedure error	22
42	Interworking, unspecified	127	RPOA out of order	72

Table 8: ITU-T X.21 [23] facilities

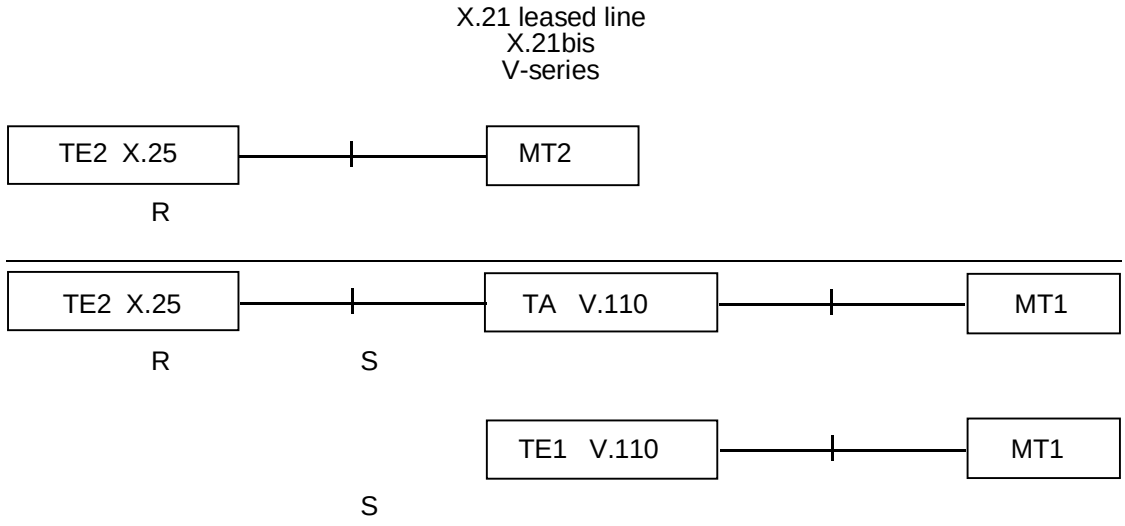
Facility request code	Facility
1	Closed user group
45	DTE inactive registration
45	DTE inactive cancellation
60	Multiple address calling
61	Charging information
62	Called line identification
63	Redirection of callactivation
63	Redirection of callcancellation
63	Redirection of callstatus
64	Reverse status
65	Direct call registration
65	Direct call cancellation
66	Abbreviated address registration
66	Abbreviated address cancellation

8 VOID ~~Support for packet service~~

~~There is one way of supporting packet services via a circuit switched connection, namely as Basic PacketMode Service. In the Basic Packet Access case the GSM PLMN provides a connection to the PSPDN port or the PH of other networks (see GSM 09.06 [10]).~~

~~8.1~~ VOID ~~Terminal configurations~~

~~The terminal configurations are shown in figure 12. The TE2 can be connected to MT2 or TA via X.21, X.21 bis or V-series interface. Table 9 shows various interface types at R reference point.~~



~~Figure 12: Packet mode terminal configurations~~

~~NOTE: For all configurations:~~

~~The proper operation of LAPB requires fixing of working parameters, this is detailed in specification GSM 09.06 [10].~~

Table 9: TE2/MT2 layer 1 specifications and procedures to initiate Bm channel establishment

Condition	TE2/MT2 Layer 1 specification		Events at the R reference point	Procedures according to:
Hot-line access (note)	X.25	X.21 leased circuit	TE2 sets C=N	CCITT Rec X.25 section 1.1
		X.21 bis	TE2 sets circuit 108=ON	CCITT Rec X.25 section 1.2
		V-series interface	TE2 sets circuit 108=ON	CCITT Rec X.25 section 1.3
	X.21 circuit-switched		TE2 signals direct call	CCITT Rec X.21 section 4.4
	X.21 bis direct call		TE2 signals direct call	CCITT Rec X.21 bis section 2.3.1
Full circuit-switched access	X.21 addressed call		TE2 enters call control phase	CCITT Rec X.21 section 4
	X.21 bis addressed call		TE2 performs automatic address call	CCITT Rec X.21 bis section 2.3.2 iii
	V25 bis addressed call		TE2 uses address call mode	CCITT Rec V.25 section 4

NOTE: In this case the terminal equipment assumes a semipermanent connection. After appropriate event at R reference point the MT2 will establish Bm channel to the PSPDN port or the PHF. MT2 requires the address of the PSPDN port or the PH and the setting of the parameters of the BC/LLC IEs as described in sections 8.2 and 8.3.

8.2 VOID Support for basic packet access

The GSM PLMN shall support the Basic Packet Mode Service in line with TS 09.06, thus the definitions laid down therein apply accordingly to the subject matter of this section.

For mobile originated call the Call Set-up message contains the E.164 address of the PSPDN port or the PHAU. This address will be provided by TE1 or TA in the case of S interface or by TE2 (R interface). The address must be provided either by MMI or by internal settings of MT2, if the TE2 is an ordinary X.25 terminal connected via "X.21 leased line", "X.21 bis" or "V series" interface.

The required settings of the parameters of the BC/LLC IE is shown in GSM 07.01 [8]. This setting might be performed via the MMI or being based on internal settings within the MT2.

For an incoming call the connection establishment is in line with GSM 09.06, 09.07 and 04.08. In the case of V series interface (full circuit switched access) the TE2 must support V.25 bis Auto Answer procedure.

When the connection between the PSPDN port and the PH, respectively, and the TE is established, the TAF shall take care of mapping Bm channel to/from:

a) V series or X series interface data circuits

b) B channel in case of S interface

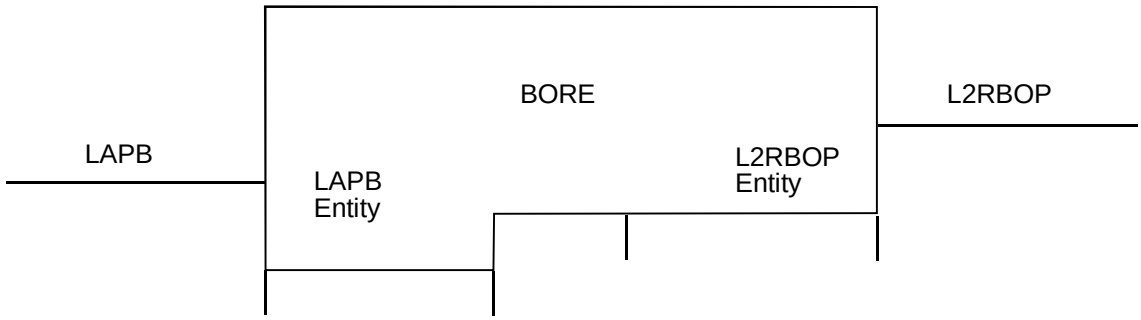
TE/MT and PSPDN port and the PH, respectively, take care of higher layer protocols, e.g. X.32 identification and X.25 LAPB and PLP.

8.3 VOID

Annex A (normative): L2R Functionality

A.1 Introduction

This annex describes the Layer 2 Relay (L2R) functionality required to support LAPB non-transparently. The general aspects of L2Rs are described in specification ~~GSM 07.01 [8]~~3G TS 27.001 [9]. Figure 1 shows the three sub-functions of the L2R.



LAPB Link Access Protocol Balanced
BORE Bit Oriented Relay Entity
L2RBOP L2R Bot Oriented Protocol

Figure 1: Sub-functions of the L2R

Section 2 describes the L2R Bit Oriented Protocol (L2RBOP) and section 3 describes the use of the L2RBOP to transport LAPB information fields.

A.2 L2RBOP

The LAPB user information fields and interface status changes are transferred between L2Rs using the services of the radio link. The L2RBOP entity segments and reassembles the LAPB user information fields to fit into the service data units (SDUs) handled by the radio link. I.e. segments of LAPB user information fields and interface status changes are transferred between L2Rs in n octet Protocol Data Units (PDUs). This corresponds to the fixed length of the RLP frame information field. The octets within the L2RBOP-PDU are numbered 0 to n-1, octet 0 is transmitted first. The value of n depends on the negotiated RLP version and frame type (~~GSM 04.22~~3G TS 24.002 [8]). The bits within the octets are numbered 1 to 8, bit 1 is transmitted first.

The RLP version value 2 indicates RLP multi-link operation. The RLP version value 0 or 1 indicates RLP single-link operation.

The L2RBOP also provides facilities for transferring LAPB connection control information between L2Rs. This LAPB connection control information allows concatenated LAPB connections to be established, reset and released.

The L2RBOP PDUs are coded as follows:

- Each octet contains a status octet, 1 - 8 bits of user information, control information or fill.
- Octet 0 shall always contain a status octet in case at least one status octet is transportet in the L2RBOP PDU. In RLP-versions 0 and 1 a PDU always carries at least one status octet. In RLP version 2 a PDU carries status octet(s) only if actual status change(s) has taken place within the period represented by the PDU. Here -the L2R status flag in the RLP version 2 header is set to 1 when status octet(s) is carried in the PDU.
- 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 are used to convey the interface conditions that are conveyed by the S and X bits in ~~CCITT~~ITU-T recommendations V.110 [22] and X.30 [28~~29~~]. In the case of ITU-T V series interfaces the 3 status bits correspond to SA, SB and X bits specified in ITU-T V.110 [22]. In the case of ITU-T X series interfaces only 2 bits are used and these correspond to S and X bits specified in ITU-T X.30 [28~~29~~]. The ITU-T V series SA, SB and X bits use bit positions 8, 7 and 6 respectively in the status octets. The ITU-T X series S and X bits use bit positions 7 and 6 respectively, in this case bit position 8 is unused.

- LAPB user information is carried in L2RBOP-PDU information octets such that the first LAPB user information bit, in any consecutive group of 8, received or transmitted corresponds to bit position 1 in the octet. The second to bit position 2, etc.

- Information octets are inserted into the L2RBOP-PDU in order of arrival in octets 1 to n-1 for RLP single-link operation, in octets 1 to n-1 for RLP multi-link operation with status octet transportation and in octets 0 to n-1 for multi-link operation with no status octet transportation.

- The address field in the status octets indicates the position of the next status octet within the L2RBOP-PDU. This indicates the number of information octets between status octets. Thus if two status octets are inserted into an L2RBOP-PDU at offsets l and m the address field value for the status octet at offset 1 ~~will~~shall be defined by m-l-1 (m>l+1). The low order bit of the address corresponds to bit 1 of the octet and the high order bit to bit 5.

- Status octets are inserted in the information stream whenever a status change needs to be transmitted.

- Only address values 1 to n-2 (n-2 ≤ 23) 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 can not be sent after each other. The remaining codes are used to indicate:

  - Last status change, remainder of L2RBOP-PDU is empty. Address field value is 31.

  - Last status change, remainder of L2RBOP-PDU full of information octets. Address field value is 30.

  - End of a LAPB user information field. Address field value is 29. This is used to delimit LAPB user information fields. In this case the 3 status bits do not have their usual meaning. They are used to indicate the number of information bits in the previous information octet. A binary number in the range 0 to 7 is contained in bit positions 8, 7 and 6, bit 6 is the low order bit. The values 1-7 indicates the number of information bits used, value 0 indicates all bits used. If this octet is not on the last position in a L2RBOP-PDU another status octet follows (e.g. an End of LAPB user information field in octet 0 is followed by a status octet in octet 1).

  - Abort a LAPB user information field transfer. The address field value is 28. This is used to abort the transmission of a LAPB user information field after sending one or more segments in L2RBOP-PDUs. If this octet is not on the last position in a L2RBOP-PDU another status octet is following (e.g. an Abort a LAPB user information field transfer in octet 0 is followed by a status octet in octet 1).

    - L2RBOP-PDU contains at least two status octets which 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. In case of a PDU more than 25 octets in length, address field values from 24 to 26 are reserved.

- When it is necessary to insert a status octet into the information stream when no status change has occurred, e.g. to indicate that the remainder of an L2RBOP-PDU is empty or to indicate end of a LAPB user information field, the current status shall be repeated.

- In case when 64 data octets are carried by a 66-octet PDU, a status octet is carried in octet 0 and another status octet within the first 24 data octets. (The first status octet gives the address of the second status octet, which carries value 30 in its address field.)

- LAPB connection control information is transferred between L2Rs by use of a connection control PDU. Connection control PDUs consists of an L2RBOP PDU with the status octet in octet 0 containing address field value 0. The coding of the remainder of the L2RBOP connection control PDU is as follows:

  - Octet 1 contains the connection number, always 0 for LAPB. Other values are reserved for future use.

  - Octet 2 contains the connection control information. The connection control information values are 1 for Connect, 2 for Reset, 3 for Disconnect and 4 for loss of LAPB interframe fill. This octet is coded as a binary number with the low order bit corresponding to bit 1.

  - The use of octets 3 to n-1 is reserved.

- LAPB exchange identification frames (XID) are transferred between L2Rs by use of exchange identification PDUs. These PDUs consist of L2RBOP PDUs with the status octet in octet 0 containing address field values 0. The coding of the remainder of the PDU is as follows:

  - Octet 1 contains the connection number, always 0 for LAPB. Other values are reserved for future use.

  - Octet 2 contains the exchange identification indication. The values are 5 for an Exchange Identification Request and 6 for an Exchange Identification Acknowledge. The values 7 to 255 are reserved. This octet is coded as a binary number with the low order bit corresponding to bit 1.

  - The octet 3 contains a normal status octet. The rest of the PDU and of the following PDUs, if any, is used to transfer the XID information and it is treated like normal user data information PDUs as far as the coding is concerned.

A.3 Use of the L2RBOP

The L2R function required to support LAPB non-transparently consists conceptually of the three sub-functions shown in figure 1, i.e. the LAPB entity, the BORE and the L2RBOP entity. These perform the following functions:

- LAPB entity - This terminates the LAPB protocol from the terminal or the network. The service provided by the LAPB entity to the BORE is described in ISO DIS 8886.2 [33]32] - OSI Data link service definition.

- L2RBOP entity - This uses the services provided by the radio link, see specification GSM 04.223G TS 24.022 [87]. The service provided by the LAPB entity to the BORE.

- BORE - This concatenates the data link services provided by the use of the L2RBOP and LAPB.

The functions are described in more detail in the following sections.

A.3.1 Radio Link Connection Control

The L2RBOP entity uses the services of the radio link to establish, reset and release the connection to its peer L2RBOP entity. The radio link connection willshall be established and released as a result of indications from the signalling mechanisms when the supporting circuit switched connection is established.

After an RLP reset or RLP disconnect the L2RBOP entities shall assume that the remote LAPB connection is in disconnected state. No data can therefore be transported between the L2RBOP entities before an exchange of the connection control PDU "Connect" has taken place. All connection control PDUs transferred before the RLP reset are no longer valid and must not be acknowledged. All PDUs (except XID) received by the L2RBOP entities after an RLP reset or disconnect and before a new connection control PDU "Connect" has been received willshall be discarded by the L2RBOP entity.

A.3.2 Status transfer

The L2RBOP entity transfers interface status information between L2Rs via the status octets in the L2RBOP-PDUs. The meaning of the bits is exactly the same as that defined in CCITTITU-T recommendation V.110 [22]and X.30 [2829]. Status changes are inserted in the L2RBOP-PDU in the position corresponding to the position in the information stream

at the DTE/DCE interface that the interface status change occurred. When the RLP is established or reset a L2RBOP-PDU with the current status octet shall be sent.

A.3.3 LAPB connection control

The L2RBOP entity transfers LAPB connection control information between L2Rs via the L2RBOP connection control PDUs. This allows a LAPB connection to be established, reset and released when the remote LAPB connection is established, reset and released or vice versa. L2RBOP connection control PDUs containing connect or reset requests shall be acknowledged by a similarly coded L2RBOP connection control PDU in the reverse direction. Data transfer between L2Rs is not allowed until the connection control acknowledge PDU is received.

In the case of requests crossing they shall each be treated as acknowledgements of the other.

A.3.4 LAPB exchange identification

The L2RBOP entity transfers a LAPB exchange identification request/acknowledge between L2Rs via the L2RBOP exchange identification PDUs. This allows transfer of identification information prior to link establishment and/or during the link (especially with respect to ISO 8885 [3231]/DADI). A L2RBOP exchange identification request PDU shall be answered by an associated exchange identification acknowledge PDU. In case of crossing of two requests each request shall be answered individually. A LAPB exchange identification request with identification information ~~will~~shall be acknowledged by the LAPB entity from L2R only when the acknowledge from the remote LAPB connection is indicated by an exchange identification acknowledge PDU sent by the remote L2RBOP entity.

A.3.5 Data Transfer

The L2RBOP entity assembles and disassembles L2RBOP-PDUs by segmenting and reassembling the LAPB user information fields.

A.3.6 Flow control

Flow control information is transferred between L2Rs in two ways, these are:

- back pressure caused by L2R buffer conditions
- use of the X-bit in the status octet,

  X = 1 flow control active

  X = 0 flow control inactive

Annex B:
Change history

Change history						
TSG CN#	**Spec**	**CR**	**<Phase>**	**Version**	**New Version**	**Subject/Comment**
Apr 1999	GSM 07.03			6.0.0		Transferred to 3GPP CN1
CN#03	27.003				3.0.0	Approved at CN#03
CN#04	27.003	001	R99	3.0.0	3.1.0	Introduction of EDGE
CN#06	27.003	002	R99	3.1.0	3.2.0	Introduction of Asynchronous interface for Real-time non-transparent FAX
CN#06	27.003	003	R99	3.1.0	3.2.0	R99 service clean-up (also Clause 8.3 removed)

3GPP/SMG Meeting #08
Sophia Antipolis, France, 28 Feb-03 Mar 2000

Document N3-000087
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

29.007	CR	012	Current Version:	3.3.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG_N#7	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)*	(U)SIM		ME		UTRAN / Radio		Core Network	X

Source:	TSG_CN WG3	**Date:** 02/03/00
Subject:	Change of reference from ETS 300-102-1 to Q.931	
Work item:	CS Data Services	

Category: *(only one category Shall be marked With an X)*

F	Correction	X
A	Corresponds to a correction in an earlier release	
B	Addition of feature	
C	Functional modification of feature	
D	Editorial modification	

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
Release 00	

Reason for change: Adding backward compatibility to support previously referenced ETS 300-102-1

Clauses affected: 10.2.2.2

Other specs Affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

10.2.2.2 Functions in GMSC

At call Set-up, the interrogating node passes in the "send routing information" to the HLR, the ISDN BC, LLC and HLC received in the initial address message. The coding of these parameters shall comply with Q.931 (05/98). For MT calls, and for backward compatibility purposes only, the mapping of the modem type according to ETS 300-102-1 (12/90) shall also be accepted, see note 12 of Table 7B.

3GPP/SMG Meeting #08
Sophia Antipolis, France, 28 Feb-03 Mar 2000

***Document* N3-000124**
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

29.007	CR	013	Current Version:	3.3.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG_CN#7	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)*	(U)SIM		ME		UTRAN / Radio		Core Network	X

Source: TSG_CN WG3 **Date:** 02/03/00

Subject: Handover between GSM and UMTS

Work item: CS Data Services

Category: *(only one category Shall be marked With an X)*

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature	X		Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: To support handover between GSM and UMTS the definition of the user plane protocols on the interface between the anchor and the visited MSC is required.

Clauses affected: New section created

Other specs Affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

11 Interworking between GSM and UMTS

11.1 Handover from UMTS to GSM

After a handover from UMTS to GSM the user plane between the anchor MSC and the visited MSC shall comply to the standard GSM A-interface protocols, i.e

- A-TRAU or modified V.110 frames as defined in [27] and [28]
- up to four 16kbit/s substreams are multiplexed in one 64kbit/s channel (Split/Combine function and Multiplexing function as defined in [27] and [28])

11.2 Handover from GSM to UMTS

After a handover from GSM to UMTS the user plane between the anchor MSC and the visited MSC shall comply to the A-TRAU' protocol.

The A-TRAU' protocol is defined as follows:

- A-TRAU' frames are transmitted in regular intervals of 10ms
- an A-TRAU' frame consists of two consecutive A-TRAU frames (as defined in [28]) each with a length of 320 bit
- the A-TRAU' protocol is used on a plain 64 kbit/s channel without substreams
- the same A-TRAU' format is used for the transparent and non-transparent transmission mode.
- in transparent mode the number of data bits in an A-TRAU' frame depend on the user rate only, each user rate corresponds to a fixed number of data bits (see below)
- in non-transparent mode A-TRAU' frames contain always complete RLP frames, rate adaptation is performed by means of the M2 bit
- the M1-bit is used to identify 1st and 2nd frame in both transmission modes.

11.2.1 Frame layout for the different transparent user rates:

The number of data bits in an A-TRAU' frame depend on the user rate only, each user rate corresponds to a fixed number of data bits in an A-TRAU' frame:

Table xx: A-TRAU' frame layout for transparent user rate

Date Rate	Number of data bits per A-TRAU' frame
33.6 kbit/s	336
32 kbit/s	320
28.8 kbit/s	288

The data bits are inserted in the A-TRAU' frame starting with D1 of Data field 1 of the first A-TRAU frame. The unused bits are filled with binary '1'.

11.2.2 A-TRAU' frame format

One A-TRAU' frame consists of two consecutive A-TRAU frames. The following figure shows the format of one A-TRAU frame:

Octet number	bit number 0	1	2	3	4	5	6	7	
0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	
2	1	**C1**	**C2**	**C3**	**C4**	**C5**	**M1**	**M2**	
3	**Z1**	D1	D2	D3	D4	D5	D6	D7	
4	D8	D9	D10	D11	D12	D13	D14	D15	36 bit data field 1
5	D16	D17	D18	D19	D20	D21	D22	D23	
6	D24	D25	D26	D27	D28	D29	D30	D31	
7	D32	D33	D34	D35	D36	**Z2**	D1	D2	
8	D3	D4	D5	D6	D7	D8	D9	D10	
9	D11	D12	D13	D14	D15	D16	D17	D18	36 bit data field 2
10	D19	D20	D21	D22	D23	D24	D25	D26	
11	D27	D28	D29	D30	D31	D32	D33	D34	
12	D35	D36	**Z3**	D1	D2	D3	D4	D5	
13	D6	D7	D8	D9	D10	D11	D12	D13	
14	D14	D15	D16	D17	D18	D19	D20	D21	36 bit data field 3
15	D22	D23	D24	D25	D26	D27	D28	D29	
16	D30	D31	D32	D33	D34	D35	D36	**Z4**	
17	D1	D2	D3	D4	D5	D6	D7	D8	
18	D9	D10	D11	D12	D13	D14	D15	D16	36 bit data field 4
19	D17	D18	D19	D20	D21	D22	D23	D24	
20	D25	D26	D27	D28	D29	D30	D31	D32	
21	D33	D34	D35	D36	**Z5**	D1	D2	D3	
22	D4	D5	D6	D7	D8	D9	D10	D11	
23	D12	D13	D14	D15	D16	D17	D18	D19	36 bit data field 5
24	D20	D21	D22	D23	D24	D25	D26	D27	
25	D28	D29	D30	D31	D32	D33	D34	D35	
26	D36	**Z6**	D1	D2	D3	D4	D5	D6	
27	D7	D8	D9	D10	D11	D12	D13	D14	
28	D15	D16	D17	D18	D19	D20	D21	D22	36 bit data field 6
29	D23	D24	D25	D26	D27	D28	D29	D30	
30	D31	D32	D33	D34	D35	D36	**Z7**	D1	
31	D2	D3	D4	D5	D6	D7	D8	D9	
32	D10	D11	D12	D13	D14	D15	D16	D17	
33	D18	D19	D20	D21	D22	D23	D24	D25	36 bit data field 7
34	D26	D27	D28	D29	D30	D31	D32	D33	
35	D34	D35	D36	**Z8**	D1	D2	D3	D4	
36	D5	D6	D7	D8	D9	D10	D11	D12	
37	D13	D14	D15	D16	D17	D18	D19	D20	36 bit data field 8
38	D21	D22	D23	D24	D25	D26	D27	D28	
39	D29	D30	D31	D32	D33	D34	D35	D36	

Figure xx: A-TRAU 320 bit frame

Data Bits (Dxx):

The 288 data bits of an A-TRAU frame are divided in eight fields of 36 bits.

Control bits (C Bits):

C1 to C4:

The Control bits C1 to C4 define the used data rate. C1 to C4 in the first A-TRAU frame indicate the data rate in send direction.

C1 to C4 in the second A-TRAU frame indicate the used data rate in backward direction. This is required for Rate Control that is required in uplink direction. For details on Rate Control see [42].

Table xx: A-TRAU' control bits

C1	C2	C3	C4	Date Rate
1	0	1	1	57.6 kbit/s
1	0	1	0	33.6 kbit/s
1	0	0	1	32 kbit/s
1	0	0	0	28.8 kbit/s
0	1	1	1	14.4 kbit/s

C5:

C5 is not used, it is set to binary '1'.

Bit M1:

An A-TRAU' frame is made of two consecutive A-TRAU which build the transport container for 576 data bits. Bit M1 is used to determine the order of the A-TRAU frames within an A-TRAU' frame.

The two M1 bits are referred to as the Frame Start Identifier. The FSI value is 01. These values are assigned to the M1 bit as shown below:

Table xx: Frame Start Identifier

	M1 bit
First A-TRAU frame	0
Second A-TRAU frame	1

Bit M2:

The M2 bit is used to indicate 'valid' A-TRAU' frames. The M2 bit in both of the two consecutive A-TRAU frames relating to an A-TRAU' frame shall have the same value.

In transparent mode M2 is used for synchronization, for details on synchronization see chapter 9.2.3.4 and 10.2.3.4. The IWF (downlink direction) sets M2 to binary '1' until synchronization with the fixed netwok is achieved. When synchronized M2 is set to binary '0'. The 3G MSC (uplink direction) sets M2 to binary '1' until it receives valid SDUs. When receiving valid SDUs M2 is set to binary '0'.

In non-transparent mode M2 is used for DTX. If DTX is applied, M2 is set to binary '1'. If DTX is not to be applied, M2 bit is set to binary '0'. The DTX handling is used in both directions for rate adaptation purpose. This means that the sending entity will insert 'fill RLP-frames' with DTX set to binary '1' in case no RLP-frame is available.

Z bits:

The bits Zi are used for Framing Pattern Substitution mechanism. This mechanism is defined in [28].