

**SLOVENSKI STANDARD
SIST ETS 300 604 E3:2003****01-december-2003**

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European digital cellular telecommunications 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) (GSM 09.07)

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Ta slovenski standard je istoveten z: ETS 300 604 Edition 3

ICS:

33.040.35	Telefonska omrežja	Telephone networks
33.070.50	Globalni sistem za mobilno telekomunikacijo (GSM)	Global System for Mobile Communication (GSM)
33.080	Digitalno omrežje z integriranimi storitvami (ISDN)	Integrated Services Digital Network (ISDN)

SIST ETS 300 604 E3:2003**en**

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EUROPEAN
TELECOMMUNICATION
STANDARD

ETS 300 604

September 1995

Third Edition

Source: ETSI TC-SMG

Reference: RE/SMG-040907PR2

ICS: 33.060.50

Key words: European digital cellular telecommunications system, Global System for Mobile communications (GSM)

**European digital cellular telecommunications 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)
(GSM 09.07)**

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Foreword

This European Telecommunication Standard (ETS) has been produced by the Special Mobile Group (SMG) Technical Committee (TC) of the European Telecommunications Standards Institute (ETSI).

This ETS identifies the Mobile-services Switching Centre (MSC) Interworking Functions (IWFs) and requirements to support interworking between:

- a) Public Land Mobile Network (PLMN) and Public Switched Telephone Network (PSTN);
- b) PLMN and Integrated Services Digital Network (ISDN).

This ETS corresponds to GSM technical specification GSM 09.07 version 4.9.0

The specification from which this ETS has been derived was originally based on CEPT documentation, hence the presentation of this ETS may not be entirely in accordance with the ETSI/PNE rules.

Reference is made within this ETS to GSM-TSs (NOTE).

Reference is also made within this ETS to GSM xx.xx. series. The specifications in the series can be identified, with their full title, within the normative reference clause of this ETS by the first two digits of their GSM reference number e.g. GSM 09.xx series, refers to GSM 09.01, GSM 09.02, etc.

NOTE: TC-SMG has produced documents which give the technical specifications for the implementation of the European digital cellular telecommunications system. Historically, these documents have been identified as GSM Technical Specifications (GSM-TSs). These TSs may have subsequently become -ETSS (Phase 1), or ETSSs (Phase 2), whilst others may become ETSI Technical Reports (ETRs). GSM-TSs are, for editorial reasons, still referred to in current GSM ETSs.

Transposition dates	
Date of adoption of this ETS:	30 September 1995
Date of latest announcement of this ETS (doa):	31 December 1995
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	30 June 1996
Date of withdrawal of any conflicting National Standard (dow):	30 June 1996

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1 Scope

The purpose of this European Telecommunication Standard (ETS) is to identify the MSC/IWFs and requirements to support interworking between:

- i) PLMN and PSTN
- ii) PLMN and ISDN

It is not possible to treat ISDN and PSTN as one type of network, even when both ISDN and PSTN subscribers are served by the same exchange because of the limitations of the PSTN subscribers access ie analogue connection without D-channel signalling.

Within this ETS, the requirements for voice and non-voice (data) calls are considered separately.

2 Normative references

This ETS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

- [1] CCITT Recommendation G.711: "Pulse code modulation (PCM) of voice frequencies".
- [2] CCITT Recommendation I.460: "Multiplexing, rate adaption and support of existing interfaces".
- [3] 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".
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- [4] CCITT Recommendation V.110: "Support of data terminal equipments (DTEs) with V-Series interfaces by an integrated services digital network".
- [5] ETS 300 102-1 (1990): "Integrated Services Digital Network (ISDN); User-network interface layer 3 Specifications for basic call control".
- [6] ETS 300 121: "Integrated Services Digital Network (ISDN); Application of the ISDN User Part (ISUP) of CCITT Signalling System No.7 for international ISDN interconnections (ISUP version 1)".
- [7] GSM 01.04 (ETR 100): "European digital cellular telecommunication system (Phase 2); Abbreviations and acronyms".
- [8] GSM 02.01 (ETS 300 500): "European digital cellular telecommunication system (Phase 2); Principles of telecommunication services supported by a GSM Public Land Mobile Network (PLMN)".
- [9] GSM 02.02 (ETS 300 501): "European digital cellular telecommunication system (Phase 2); Bearer Services (BS) supported by a GSM Public Land Mobile Network (PLMN)".
- [10] GSM 02.03 (ETS 300 502): "European digital cellular telecommunication system (Phase 2); Teleservices supported by a GSM Public Land Mobile Network (PLMN)".
- [11] GSM 02.04 (ETS 300 503): "European digital cellular telecommunication system (Phase 2); General on supplementary services".

- [12] GSM 02.81 (ETS 300 514): "European digital cellular telecommunication system (Phase 2); Line identification supplementary services - Stage 1".
- [13] GSM 02.82 (ETS 300 515): "European digital cellular telecommunication system (Phase 2); Call Forwarding (CF) supplementary services - Stage 1".
- [14] GSM 02.83 (ETS 300 516): "European digital cellular telecommunication system (Phase 2); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 1".
- [15] GSM 02.84 (ETS 300 517): "European digital cellular telecommunication system (Phase 2); MultiParty (MPTY) supplementary services - Stage 1".
- [16] GSM 02.85 (ETS 300 518): "European digital cellular telecommunication system (Phase 2); Closed User Group (CUG) supplementary services - Stage 1".
- [17] GSM 02.86 (ETS 300 519): "European digital cellular telecommunication system (Phase 2); Advice of charge (AoC) supplementary services - Stage 1".
- [18] GSM 02.88 (ETS 300 520): "European digital cellular telecommunication system (Phase 2); Call Barring (CB) supplementary services - Stage 1".
- [19] GSM 03.03 (ETS 300 523): "European digital cellular telecommunication system (Phase 2); Numbering, addressing and identification".
- [20] GSM 03.08 (ETS 300 526): "European digital cellular telecommunication system (Phase 2); Organisation of subscriber data".
- [21] GSM 03.11 (ETS 300 529): "European digital cellular telecommunication system (Phase 2); Technical realization of supplementary services".
- [22] GSM 03.45 (ETS 300 538): "European digital cellular telecommunication system (Phase 2); Technical realization of facsimile group 3 transparent".
- [23] GSM 03.46 (ETS 300 539): "European digital cellular telecommunication system (Phase 2); Technical realization of facsimile group 3 non-transparent".
- [24] GSM 03.50 (ETS 300 540): "European digital cellular telecommunication system (Phase 2); Transmission planning aspects of the speech service in the GSM Public Land Mobile Network (PLMN) system".
- [25] GSM 04.08 (ETS 300 557): "European digital cellular telecommunication system (Phase 2); Mobile radio interface layer 3 specification".
- [26] GSM 04.21 (ETS 300 562): "European digital cellular telecommunication system (Phase 2); Rate adaption on the Mobile Station - Base Station System (MS - BSS) interface".
- [27] GSM 04.22 (ETS 300 563): "European digital cellular telecommunication system (Phase 2); Radio Link Protocol (RLP) for data and telematic services on the Mobile Station - Base Station System (MS - BSS) interface and the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".
- [28] GSM 07.01 (ETS 300 582): "European digital cellular telecommunication system (Phase 2); General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS)".
- [29] GSM 07.02 (ETS 300 583): "European digital cellular telecommunication system (Phase 2); Terminal Adaptation Functions (TAF) for services using asynchronous bearer capabilities".

- [30] GSM 07.03 (ETS 300 584): "European digital cellular telecommunication system (Phase 2); Terminal Adaptation Functions (TAF) for services using synchronous bearer capabilities".
- [31] GSM 07.05 (ETS 300 585): "European digital cellular telecommunication system (Phase 2); Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE - DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)".
- [32] GSM 07.06 (ETS 300 586): "European digital cellular telecommunication system (Phase 2); Use of the V series Data Terminal Equipment - Data Circuit terminating Equipment (DTE - DCE) interface at the Mobile Station (MS) for Mobile Termination (MT) configuration".
- [33] GSM 08.20 (ETS 300 591): "European digital cellular telecommunication system (Phase 2); Rate adaption on the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".
- [34] GSM 08.60 (ETS 300 597): "European digital cellular telecommunication system (Phase 2); Inband control of remote transcoders and rate adaptors".
- [35] GSM 09.02 (ETS 300 599): "European digital cellular telecommunication system (Phase 2); Mobile Application Part (MAP) specification".
- [36] GSM 09.03 (ETS 300 600): "European digital cellular telecommunication system (Phase 2); Signalling requirements on interworking between the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN) and the Public Land Mobile Network (PLMN)".
- [37] GSM 09.05 (ETS 300 602): "European digital cellular telecommunication system (Phase 2); Interworking between the Public Land Mobile Network (PLMN) and the Packet Switched Public Data Network (PSPDN) for Packet Assembly/Disassembly facility (PAD) access".
- [38] GSM 09.06 (ETS 300 603): "European 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".

NOTE: As regards ETS 300 102-1 [5], the edition 1 of this ETS from 1990 shall be used, with one exception: the encoding of the field modem type in the ISDN BC-IE shall be handled as specified in table 6A and 6B of this ETS.

3 Definitions and abbreviations

Use is made of the following terms within this ETS. These terms refer to information requirements necessary to support interworking functions, some of these terms will be identifiable with their use in other GSM TS.

- **Bearer capability information:**
Specific information defining the lower layer characteristics required within the network.
- **Low layer compatibility information:**
Information defining the lower layer characteristics of the terminal.
- **High layer compatibility information:**
Information defining the higher layer characteristics of the terminal.

- **Compatibility information:**
This term subsumes the entirety of Bearer Capability, Low Layer Compatibility, High Layer Compatibility, Progress Indicator and Address Information conveyed out-of-band prior to call establishment for the support of compatibility checking and terminal/function/service selection at the ISDN-type user-network interface.
- **Protocol identifier:**
Information defining the specific protocols utilised for the support of data transfer by a terminal.
- **Progress indicator:**
Information supplied to indicate to the terminal that network interworking has taken place.
- **Out-of-band parameter exchange:**
Information exchanged via an associated or non-associated signalling link e.g. SS No 7.
- **PSTN:**
Subscriber to network interface supports only analogue terminals.
- **ISDN:**
Subscriber to network interface supports digital or analogue terminals, plus a standardised user to network associated signalling system and a standardised internetwork signalling system.
- **Autobauding type 1:**
This information element value may be contained in the setup or call confirm messages from the mobile station in association with a non transparent data service. This implies that the MSC/IWF may select any speed and modem type according to what it can negotiate with the remote modem on the PSTN/ISDN. The maximum speed to be used by the MSC/IWF is the user speed indicated in the setup/call confirm message.
- **Multi self selecting speed modem:**
This term applies to V series modems capable of handling one or more lower speeds as a fall back position. When such a modem is requested in the call setup or call confirm message from the MS in association with a non transparent service, the MSC/IWF may select any of the speeds supported according to the negotiation with the remote modem on the PSTN/ISDN. In this instance the maximum starting negotiation speed to be used by the MSC/IWF is the one indicated by the user speed in the setup/call confirm message.

In addition to those below abbreviations used in this ETS are listed in GSM 01.04.

ADPCM	Adaptive Differential Pulse Coded Modulation
DP	Dial Pulse
ITC	Information Transfer Capability
LE	Local Exchange
NT	Network Termination
PABX	Private Automatic Branch Exchange
SPC	Stored Program Control
SS No.7	Signalling System No.7
TE	Terminal Equipment
TA	Terminal Adaptor
TUP	Telephone User Part (of Signalling System No.7)
DSS1	Digital Subscriber Signalling 1
UNI	User Network Interface

4 Introduction

General Network Interworking Scenarios are described in GSM 09.01. Since the numbering plan for the ISDN era (E.164) includes the numbering plan for the telephone network (E.163), it is not possible to distinguish by the number whether a given subscriber is a PSTN or ISDN subscriber. Further, in some countries both PSTN and ISDN subscribers will be connected to the same exchange, so the only difference for this type of combined network will be in the nature of the customer access. In this document a PSTN is considered to support only an analogue interface towards the subscriber. An ISDN shall be considered to support digital interface towards the subscriber. In addition, the ISDN is considered to support a standardised outband signalling protocol both between the subscriber and the network and within the network, i.e DSS1 and ISUP, thus enabling the generation and transport of Compatibility Information for compatibility checking and terminal/function/service selection at the user-network interface as well as for MSC/IWF selection.

There now exist networks which do not fall into either of these categories in that they provide for digital connectivity from subscriber to subscriber through the network. The subscribers have access to a wide range of services by a limited set of standard multi-purpose user network interfaces. However, these networks do not support the standardised inter-exchange signalling protocol throughout, in that they are e.g using TUP or National User Part (NUP). These types of network support 64kbit/s connections, so in service support are comparable to ISDN, however, the signalling system provided may not support transport of all Compatibility Information allowed for in the standardised ISDN signalling. This document will therefore identify interworking to PSTN and ISDN on the principle of the network characteristics as identified in the previous paragraph. The aforementioned existing networks then constitute one particular case in the ISDN interworking scenarios. These cases will be itemised when the implication of the various degrees of exhaustiveness of the Compatibility Information - delivered via the ISDN - used for deducting a GSM Basic Service needs to be set forth.

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When two dissimilar networks are required to interwork in order to support a communication between two subscribers, one on each network, a number of Interworking Functions (MSC/IWFs) are required to support the communication. Some of these are related to the differences in signalling and are dealt with in GSM 09.03.

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Examples of other aspects of interworking are:

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- i) the need or otherwise of echo control devices
- ii) the need or otherwise of modem pools and network-based rate adaptation

For the purposes of determining the required MSC/IWFs, it is necessary, however, to consider separately each type of interworking (ie PLMN-ISDN and PLMN-PSTN) since, in the worst case, "PSTN" could refer to an essentially analogue network with electromechanical switching not controlled by software and without common-channel signalling.

Some facilities associated with alternate speech and data may not be available with version 1 of the MAP. Version 1 of the Mobile Application Part (MAP) does not support transfer between the HLR and VLR, and VLR and VMSC of multiple bearer capabilities. In addition, version 1 of the MAP does not support in-call modification and channel mode modification following an inter-MSC handover.