ETSI/TC SMG
Released by : ETSI/PT 12
Release date: February 1992

RELEASE NOTE

Recommendation GSM 03.44

Support of Teletex in a GSM PLMN

Previously distributed version : 3.0.1   (Release 1/90)
New Released version February 92 : 3.0.1 (Release 92, Phase 1)

---

1. Reason for changes

No changes since the previously distributed version.

ETSI/GSM

Released by: ETSI PT12

Date: February 1992

Recommendation: GSM 03.44

Title: SUPPORT OF TELETEX IN A GSM PLMN

List of contents:

Original language: English

Number of pages: 16

0. Scope

This recommendation describes the support of the teletex service by a GSM PLMN based on the definitions of the teleservice "Teletex" specified in GSM 02.03.

1. References

CCITT F.200, F.201, F.202, F.203,
CCITT T.60, T.61, T.62, T.62bis, T.70, T.90,
CCITT T.300, T.330, T.390,
CCITT V.110,
CCITT X.21, X.21bis, X.25
CCITT X.30, X.31, X.32, X.51, X.75,
CCITT X.200, X.213, X.214, X.215, X.224, X.225,
CCITT X.300, X.301, X.321, X.325,
CCITT X.430

CEPT T/TE 07-01
CEPT T/TE 07-02

GSM 02.02, 02.03, 02.04
GSM 03.10, 03.11, 03.70
GSM 04.08, 04.10, 04.21, 04.22
GSM 07.01, 07.03
GSM 09.01, 09.04, 09.06, 09.07

2. Abbreviations

(alphabetical order)

AU	Access Unit (CCITT X.31)
BSS	Base Station System
CF	Conversion Facility (for Ttx/Tx service interworking)
CSPDN	Circuit Switched Public Data Network
CUG	Closed User Group
FR	Full Rate Channel
GMSC	Gateway MSC
HDLC	High Level Data Link Control
HLC	Higher Layer Compatibility
HLR	Home Location Register
HPLMN	Home PLMN
HR	Half Rate Channel
ISDN	Integrated Services Digital Network
IWF	Interworking Function
IWU	Interworking Unit (CCITT X.71 / CCITT X.75)
LAPB	Link Access Procedure Balanced
LLC	Lower Layer Compatibility
MS	Mobile Station
MSC	Mobile Service Switching Centre
MSRN	Mobile Station Roaming Number
MT	Mobile Termination
PDN	Public Data Network
PF	Packet Function (GSM 09.06)
PH	Packet Handler (CCITT X.31)
PLMN	Public Land Mobile Network

PLP   Packet Layer Protocol
PSPDN   Packet Switched Public Data Network
PSTN   Public Switched Telephone Network
RLP   Radio Link Protocol
RPOA   Recognized Private Operating Agency
TA   Terminal Adaptor
TAF   Terminal Adaptation Function
TDS   Teletex Document Store
TE   Terminal Equipment
TID   Terminal Identification (CCITT F.200)
Ttx   Teletex
Ttx-MS   Teletex Mobile Station (i.e. a MS with Ttx terminal
            connected)
Ttx-TE   Teletex Terminal Equipment
Tx   Telex
VCS   Virtual Circuit Service
VLR   Visitor Location Register
VPLMN   Visited PLMN

3.   Introduction

3.1. Teletex Service Definition

The teletex (Ttx) service is an international telematic service
as defined in CCITT F.200-series of recommendations.

As an essential characteristic it provides a basic level of
compatibility between all terminals participating in the
service.

Normally the service shall operate on a fully automatic basis
and be open continuously.

Teletex subscriber equipment shall be in accordance with the
CCITT recommendations T.60, T.61, T.62, and T.70. Especially it
shall

(a) have unique terminal identifications (TID),

(b) be able to send and/or receive documents without terminal
     operator intervention,

(c) have a certain set of indications to the terminal operator,

(d) in principle be able to accept calls continuously, if call
     numbers are published in the directories (In order to meet
     this requirement, it is allowed to use a document storage
     facility which can be network or customer premises based.)

(e) be able to prepare documents being forwarded to the telex
     service using appropriate conversion facilities within the
     network.

According to the CCITT T.70 (version 1988) the teletex service may be offered in the following types of networks:

(a) the Circuit Switched Public Data Network (CSPDN),

(b) the Packet Switched Public Data Network (PSPDN),

(c) the Public Switched Telephone Network (PSTN) and

(d) the Integrated Services Digital Network (ISDN).

The interworking between the different networks may be based on CCITT X.300-series of recommendations.

3.2. Context for the Support of Teletex in a GSM PLMN

Considering that

(a) the provision of the teletex service in a GSM PLMN is classed as 'A' category (GSM 02.03),

(b) international roaming of teletex subscribers must be supported,

(c) all CEPT countries have PSPDNs,

(d) PSPDNs providing an access unit AU (X.31 case A) support procedures according to CCITT X.32,

(e) each CEPT country will have an ISDN,

(f) ISDNs may provide the VCS,

(g) the teletex service supported by a GSM PLMN can participate in the internationally available teletex service, i.e. all teletex terminals, for which a call number is published in the service directory, can communicate with each other,

the following basic assumptions will apply:

(a) In principle no specific network interworking functions shall be necessary in a VPLMN for the support of teletex.

(b) No specific additional bearer service other than those defined in GSM 02.02 shall be needed in a VPLMN.

(c) Ttx specific IWFs, if any, must not have any impact on the MS of a roaming subscriber.

(d) Both PSTN and ISDN, if available, may be used as a transit network to the PSPDN.

(e) Presently no service interworking (especially for telex) directly from the GSM PLMN is provided. Conversion facilities within the fixed networks shall be used.

Note: A mobile terminated call may be forwarded to a document storage facility called teletex document store (TDS), if available, when the addressed Ttx-MS is temporarily unable to accept a call. The provision and the location of such a store is at the PLMN operator's discretion (e.g. within the PLMN or within a fixed network).

3.3. Reference Configuration of a Teletex Mobile Station

The reference configuration (figure 1 / GSM 03.44) is equivalent to those configurations in GSM 07.03.

An explicit TA may be used between the R- and the S-interface reference point.

The configuration TE1-MT1 can only be supported by means of a sepcialized TAF including protocol conversion, if necessary, to guarantee the compatibility at the radio interface. For the time being this may be a national option.
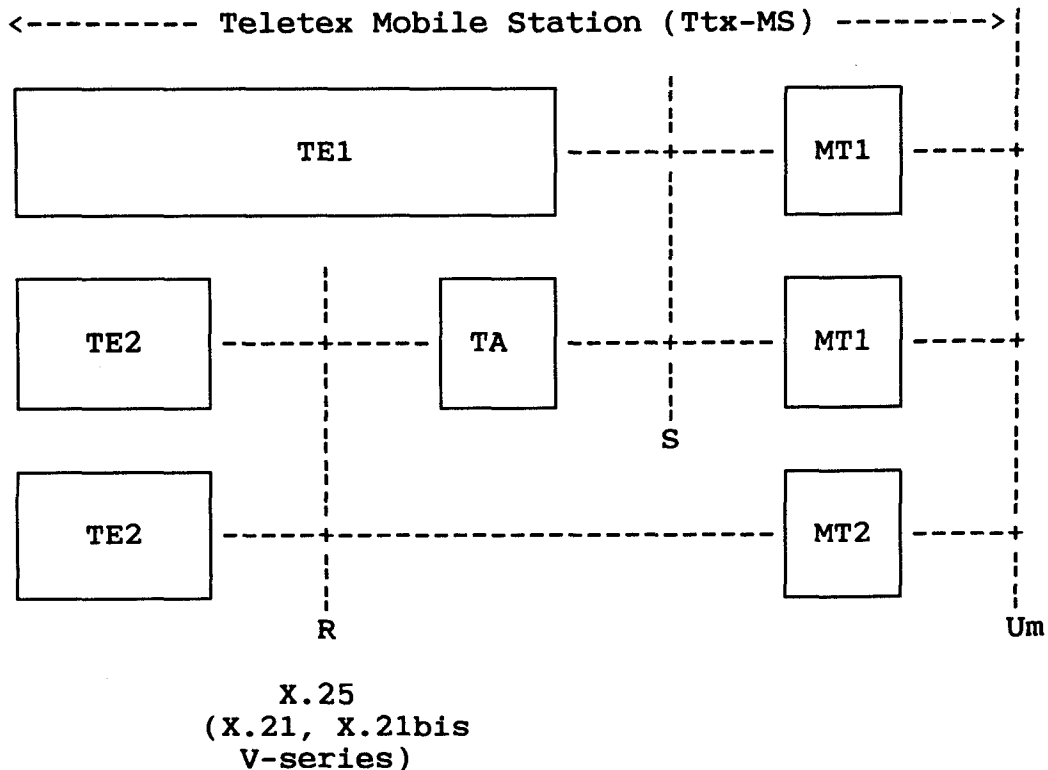
Further configurations may be possible.

```
<--------- Teletex Mobile Station (Ttx-MS) --------->|
                                                     |
   +---------------------------+      +-------+      |
   |                           |      |       |      |
   |            TE1            |------+------| MT1 |-----+
   |                           |      |       |      |
   +---------------------------+      +-------+      |
                                                     |
   +-----------+      +-------+      +-------+        |
   |           |      |       |      |       |        |
   |    TE2    |----+----| TA |----+----| MT1 |-----+
   |           |      |       |      |       |        |
   +-----------+      +-------+      +-------+        |
                                  S                  |
   +-----------+                   +-------+          |
   |           |                   |       |          |
   |    TE2    |----+------------------| MT2 |-----+
   |           |                   |       |          |
   +-----------+                   +-------+          |
               R                              Um
```

X.25
(X.21, X.21bis
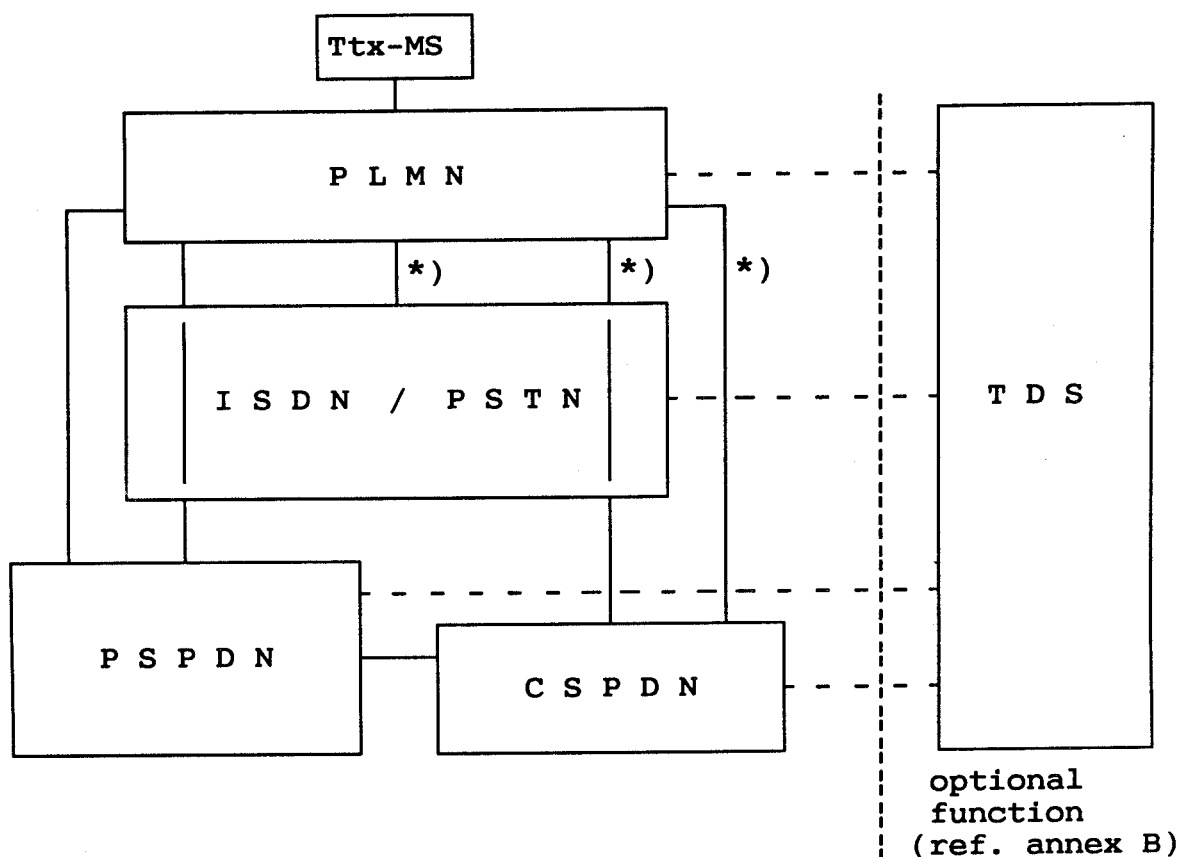V-series)

Figure 1 / GSM 03.44:   Reference Configuration of a
                               Teletex Mobile Station

4. Interworking for Teletex Support

4.1. Global Network Configuration for Teletex

Presently teletex is offered in the CSPDN, the PSPDN, the PSTN, and in the very next future in the ISDN. Figure 2 / GSM 03.44 shows the different networks to which a GSM PLMN may have to interwork, when supporting the communication between teletex terminals.

```
                    ┌──────────┐
                    │  Ttx-MS  │
                    └────┬─────┘
    ┌────────────────────┴──────────────────┐ ╎        ┌──────────────┐
    │              P L M N                   ├ ─ ─ ─ ─ ╎─             │
    └──┬─────────────┬──────────┬───────┬───┘ ╎        │              │
       │            *)          *)     *) ╎            │              │
    ┌──┼─────────────┼──────────┼────┐    ╎            │              │
    │  │  I S D N  /  P S T N    │    ├ ─ ─ ─ ─ ─ ╎─ ─  │   T D S      │
    │  │             │          │    │    ╎            │              │
    └──┼─────────────┼──────────┼────┘    ╎            │              │
       │             │          │         ╎            │              │
┌──────┴──────────┐  │  ┌───────┴──────┐  ╎            │              │
│                 ├ ─ ─ ─ ─ ─ ─│─ ─ ─ ─ ─ ─ ─ ╎─       │              │
│   P S P D N     │     │              │  ╎            │              │
│                 ├─────┤   C S P D N  ├ ─ ─╎─ ┘       │              │
└─────────────────┘     └──────────────┘  ╎            └──────────────┘
                                          ╎ optional
                                          ╎ function
                                          ╎ (ref. annex B)
```

*) This interworking requires a Ttx-specific IWF within the PLMN (refer annex A)

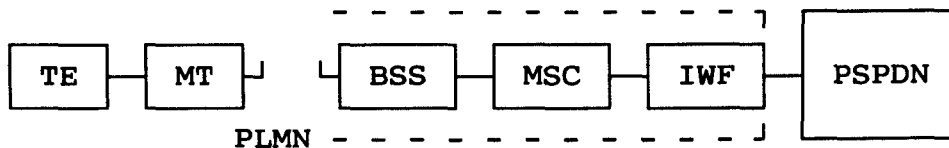**Figure 2 / GSM 03.44:** Global Network Configuration

For service interworking with telex the national fixed network based Ttx/Tx conversion facility (CF) shall be used. For roaming subscribers this results in an international access. Whether the conversion facilities are prepared to receive such calls is not in the scope of this recommendation.
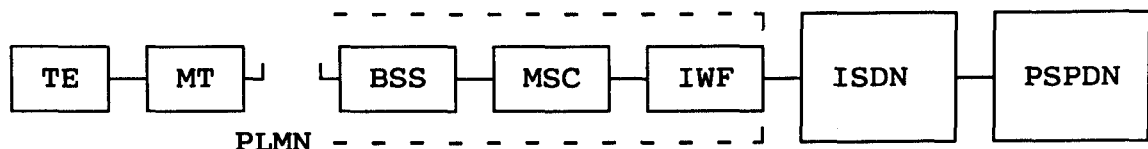
4.2. Network Interworking Scenarios

The following network interworking scenarios may be derived from the global network configuration. Some scenarios allow for different implementations of an IWF. For the interworking functions needed between the PLMN and the different networks refer to GSM 09.06 and annex A / GSM 03.44. The choice of interworking scenario and the IWF is at the PLMN operator's discretion.

The PLMN and the particular PDN may be connected directly or via (a) transit network(s).
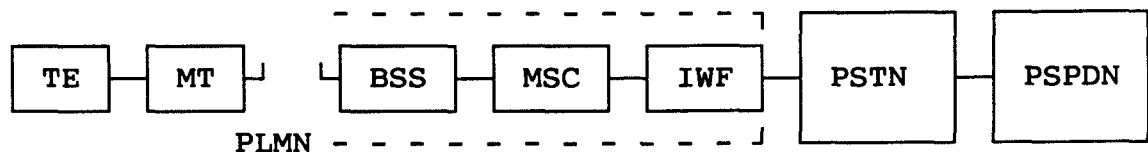
(1) Direct interworking PLMN to PSPDN

```
             ┌ - - - - - - - - - - - ┐
 ┌─────┐   ┌─────┐ │   │ ┌─────┐   ┌─────┐   ┌─────┐   ┌─────────┐
 │ TE  ├───┤ MT  ├─┘   └─┤ BSS ├───┤ MSC ├───┤ IWF ├───┤  PSPDN  │
 └─────┘   └─────┘       └─────┘   └─────┘   └─────┘   └─────────┘
              PLMN - - - - - - - - - - - - ┘
```

(2) Interworking PLMN to PSPDN via ISDN

```
             ┌ - - - - - - - - - - - ┐
 ┌─────┐   ┌─────┐ │   │ ┌─────┐   ┌─────┐   ┌─────┐   ┌───────┐   ┌───────┐
 │ TE  ├───┤ MT  ├─┘   └─┤ BSS ├───┤ MSC ├───┤ IWF ├───┤ ISDN  ├───┤ PSPDN │
 └─────┘   └─────┘       └─────┘   └─────┘   └─────┘   └───────┘   └───────┘
              PLMN - - - - - - - - - - - - ┘
```

(3) Interworking PLMN to PSPDN via PSTN

```
             ┌ - - - - - - - - - - - ┐
 ┌─────┐   ┌─────┐ │   │ ┌─────┐   ┌─────┐   ┌─────┐   ┌───────┐   ┌───────┐
 │ TE  ├───┤ MT  ├─┘   └─┤ BSS ├───┤ MSC ├───┤ IWF ├───┤ PSTN  ├───┤ PSPDN │
 └─────┘   └─────┘       └─────┘   └─────┘   └─────┘   └───────┘   └───────┘
              PLMN - - - - - - - - - - - - ┘
```

(4) Interworking PLMN to PSPDN via ISDN/PSTN

```
             ┌ - - - - - - - - - - - ┐
 ┌─────┐   ┌─────┐ │   │ ┌─────┐   ┌─────┐   ┌─────┐   ┌───────┐   ┌───────┐
 │ TE  ├───┤ MT  ├─┘   └─┤ BSS ├───┤ MSC ├───┤ IWF ├───┤ ISDN/ ├───┤ PSPDN │
 └─────┘   └─────┘       └─────┘   └─────┘   └─────┘   │ PSTN  │   └───────┘
              PLMN - - - - - - - - - - - - ┘           └───────┘
```
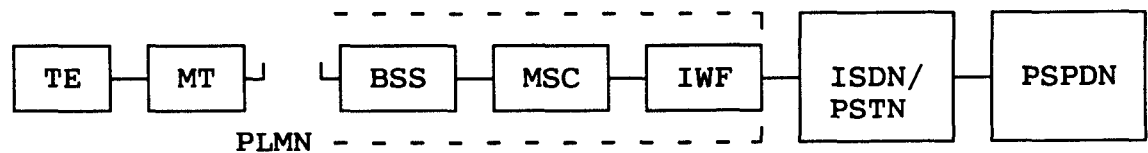
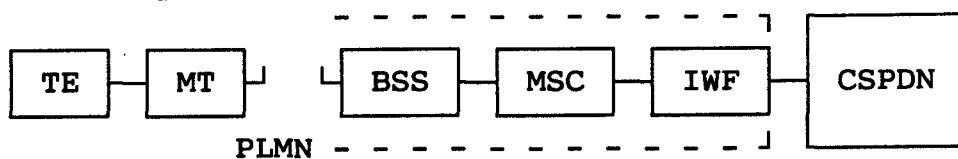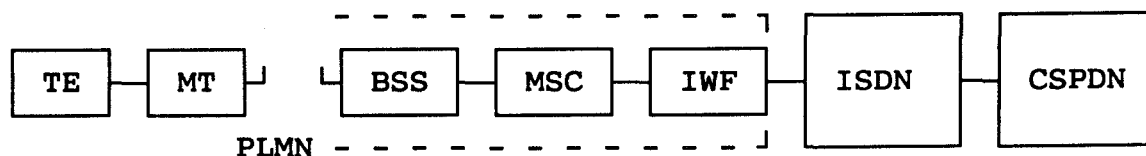**Figure 3 / GSM 03.44**: Network Interworking Scenarios

(5) Direct interworking PLMN to CSPDN
    with protocol conversion

```
 ┌────┐   ┌────┐    ┌─────┐   ┌─────┐   ┌─────┐   ┌───────┐
 │ TE │───│ MT │  │ BSS │───│ MSC │───│ IWF │───│ CSPDN │
 └────┘   └────┘    └─────┘   └─────┘   └─────┘   └───────┘
            PLMN
```
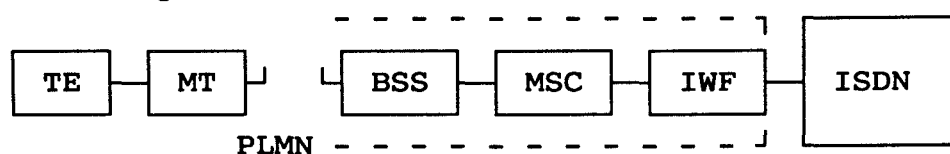
Note: This   is   a   national   option,   because   specific
        functionality in the IWF is needed (refer annex A).

(6) Interworking PLMN to CSPDN via ISDN
    with protocol conversion

```
 ┌────┐   ┌────┐    ┌─────┐   ┌─────┐   ┌─────┐   ┌──────┐   ┌───────┐
 │ TE │───│ MT │  │ BSS │───│ MSC │───│ IWF │───│ ISDN │───│ CSPDN │
 └────┘   └────┘    └─────┘   └─────┘   └─────┘   └──────┘   └───────┘
            PLMN
```

Note: This   is   a   national   option,   because   specific
        functionality in the IWF is needed (refer annex A).

(7) Direct interworking PLMN to ISDN
    with protocol conversion

```
 ┌────┐   ┌────┐    ┌─────┐   ┌─────┐   ┌─────┐   ┌──────┐
 │ TE │───│ MT │  │ BSS │───│ MSC │───│ IWF │───│ ISDN │
 └────┘   └────┘    └─────┘   └─────┘   └─────┘   └──────┘
            PLMN
```

Note: Presently this interworking case applies only to the
        Ttx service within an ISDN using T.70-CSPDN protocols.

Figure 3 / GSM 03.44 cont'd

For the interworking PLMN to the different networks the
following GSM recommendations apply:

PLMN to CSPDN: GSM 09.04
PLMN to PSPDN: GSM 09.06
PLMN to PSTN/ISDN: GSM 09.07

4.3. Roaming and Routing Considerations

Due to the fact that the provision of the teletex service within a GSM PLMN is classed as 'A', it may be provided within a VPLMN or not.

In addition to that also the teletex service within a corresponding fixed network in the foreign country may be offered or not.

To be able to support communication of a Ttx-TE when roaming within VPLMNs not providing a teletex service the support of the service must not require any specific facilities or resources (e.g. connection types).

Each GSM PLMN should therefore

(a) support a connection establishment, if teleservice "Teletex" is required, provided that the required bearer service is supported,

(b) route the call in a suitable way (direct or transit) - usually to the local PSPDN (refer also GSM 09.06),

(c) establish an appropriate connection (refer section 5).

The routing principles of GSM 03.70 apply.

Calls from a VPLMN are usually routed to a local PSPDN. For further details refer GSM 09.06.

4.4. Mobile-to-mobile Communication

A communication from a mobile to another mobile is treated like a call from/to a fixed network subscriber, i.e. using the packet functions as per GSM 09.06.

4.5. Use of GSM Supplementary Services

Call forwarding supplementary services may be used to forward a mobile terminated call to a TDS (refer annex B).

5.   Use of Bearer Services

5.1. Connection Types, Bearer Capabilities, Protocol Models

The relationship between the teleservice "teletex" and the connection elements needed within a GSM PLMN is stated in table 1 / GSM 03.44 (refer table "Relationship between Teleservices and GSM PLMN Connection Types" in GSM 03.10).

Teleservice in GSM PLMN	Access at Mobile Station	Radio Interface Connection Element	Intermediate Rate RA1 to RA2 at the BSS-MSC-I/F	BSS-MSC Connection Element
Teletex	Data packet duplex, synchronous access, 2.4 kbit/s, 4.8 kbit/s, 9.6 kbit/s,	Cct mode, service data unit integrity, unrestricted, 3.6 kbit/s, 6 kbit/s or 12 kbit/s, HR or FR, transparent	8 kbit/s	Cct mode, service data unit integrity, 64 kb/s, unrestricted
		Cct mode, service data unit integrity, unrestricted, 6 kbit/s HR or 12 kbit/s FR, non-transparent	8 kbit/s HR, 16 kbit/s FR	

Table 1 / GSM 03.44:   Relationship between Teleservices and GSM PLMN Connection Elements

If an ISDN only is used as transit network to an AU, then it should provide a "unrestricted digital" connection element.

If used in conjunction with a PSTN, the ISDN should provide a "3.1 kHz audio restricted" connection element.

The protocol models and rate adaptation schemes used to support teletex between MS and IWF are shown in the figure "Information Transfer Protocol Models for GSM PLMN Connections" of GSM 03.10. Protocol model 2 in this figure shows the use of transparent mode and protocol model 4 the use of non-transparent mode.

Bearer Capabilities	Values	
Transfer Mode	circuit	packet
Information Transfer Capability	unrestricted digital information, 3.1 kHz Ex PLMN,	
Structure	service data unit integrity	
Duplex Mode	full duplex	
Signalling Access	X.32	
Modem Type	V.22bis, V.32	
Access Structure	synchronous	
User Rate	2.4, 4.8, 9.6 kbit/s	
Intermediate Rate	4, 8, 16 kbit/s	
Rate Adaptation	X.30, V.110, X.31 flag-stuffing *)	
Channel Requirements	half rate, full rate, dual / half rate preferred, dual / full rate preferred,	
Quality	transparent, non-transparent **)	
User Info L2 Protocol	X.25	

*)   X.31 flag-stuffing is only used for specialized IWFs (refer annex A)
**) For Ttx support non-transparent is the preferred option.

Table 2 / GSM 03.44: Bearer Capabilities used for Ttx Support

5.2. Terminal Adaptation Functions (TAF) for Teletex support

For teletex recommendation GSM 07.03 for transparent and non-transparent bearer capabilities using X.25 procedures applies.

When establishing a connection, the bearer capability element in the SETUP or in the CALL CONFIRM message should be coded with one element from each headline from table 2 / GSM 03.44.

5.3. Interworking Functions for Interworking to a PSPDN

The interworking scenarios (listed in section 4.2 / GSM 03.44) and thus the specific IWFs are possible solutions with respect to the global interworking configuration. The suitable implementation for a particular GSM PLMN is at the PLMN operator's discretion.

In accordance with GSM 09.01 interworking comprises the aspects of

- signalling interworking
- network interworking
- service interworking
- supplementary service interworking.

The following network interworking cases are considered:

- between a GSM PLMN and a PSTN
- between a GSM PLMN and a ISDN
- between a GSM PLMN and a PSPDN

The terminating network, however, is always a PSPDN. For other interworking cases refer annex A / GSM 03.44. Refer to GSM 09.06 for access scenarios.

5.4. High Layer Compatibility Information Element

Mobile subscribers using the teletex service shall code the high layer compatibility information element as described below. Depending on the network implementation this indication may be used by the network for teletex specific requirements.

Depending on the signalling capabilities of the fixed network the high layer compatibility information element may not be included in the call setup message to the MS in case of a mobile terminated call. Therefore a Ttx-MS shall not reject an incoming call due to the absence of this element.

High layer characteristics Identification	Teletex (basic teletex)
	Document application profile for formatted mixed mode *)
	Document application profile for processable mode *)

*) for future use

Table 3 / GSM 03.44:   High layer compatibility information element for teletex
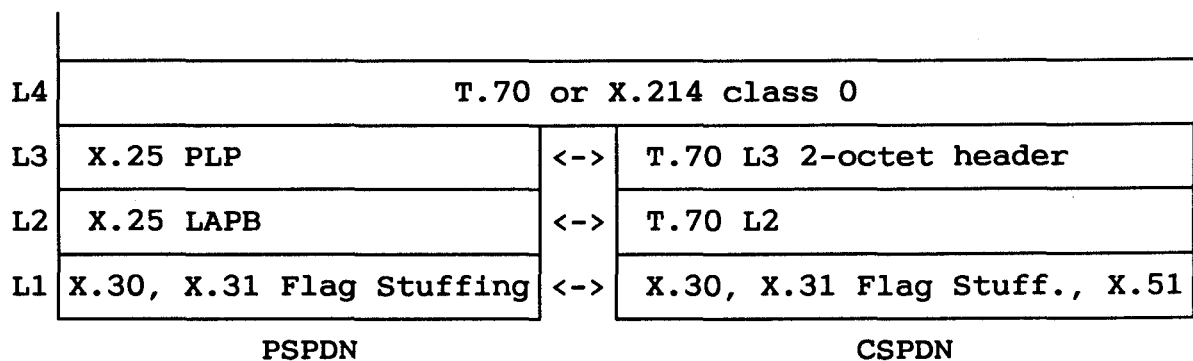
ANNEX A

Teletex specific Interworking Functions

This annex deals with interworking functions with a Teletex-specific functionality.

Two different cases are illustrated:

(a) interworking with a CSPDN either directly or via an ISDN to communicate with Ttx terminals through the CSPDN - especially when the Ttx service is offered in such a network in the given country (figure A.2 / GSM 03.44 and figure A.3 / GSM 03.44, respectively)

(b) interworking with an ISDN to communicate with Ttx terminals directly connected to the ISDN using T.70-CSPDN protocols (figure A.4 / GSM 03.44)

Both cases need a special protocol conversion from PSPDN to CSPDN protocols (figure A.1 / GSM 03.44).

L4	T.70 or X.214 class 0		
L3	X.25 PLP	<->	T.70 L3 2-octet header
L2	X.25 LAPB	<->	T.70 L2
L1	X.30, X.31 Flag Stuffing	<->	X.30, X.31 Flag Stuff., X.51
	PSPDN		CSPDN

Protocol stacks and conversion for information transfer phase (data phase);

Figure A.1 / GSM 03.44: PSPDN-CSPDN protocol conversion
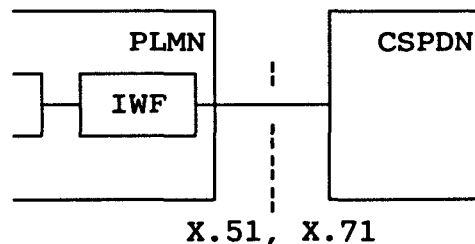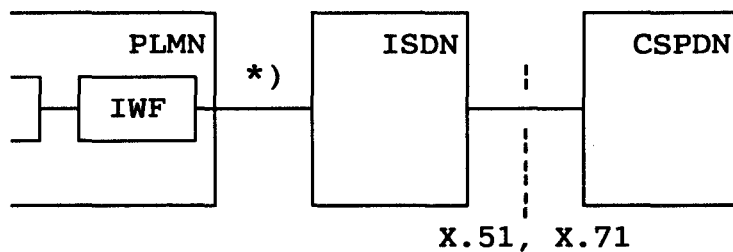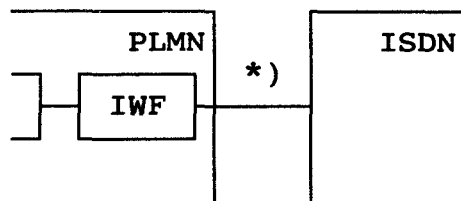

X.51, X.71

Figure A.2 / GSM 03.44: Interworking with teletex in a CSPDN

*)   e.g. X.30 rate adaptation or X.31 flag stuffing (preferable
      X.30, otherwise the IWF to the CSPDN from the ISDN has to
      have flag stuffing function, too)

Figure A.3 / GSM 03.44:   Interworking with teletex in a CSPDN
                               via ISDN

*)   X.31 flag stuffing

Figure A.4 / GSM 03.44: Interworking with teletex in an ISDN

ANNEX B

Teletex Document Store

1.   Introduction

A teletex document store (TDS) is an optional functional unit, the provision of which is necessary, if the PLMN operator wishes that mobile terminated calls should not fail due to temporary absence of a Ttx-MS. A particular TDS can be in charge of one or more PLMNs. Each PLMN is the HPLMN of the Ttx-MSs, that TDS is acting for.

The provision and location of a TDS is at the PLMN operator's discretion (e.g. within the HPLMN or within a fixed network).

It is not intended to receive documents instead of the Ttx terminal in general, but only occasionally, if the MS does not accept a call. This may include e.g. temporary user initiated unconditional call forwarding.

Whether use of unconditional call forwarding is required in general, when the Ttx-MS is roaming in a another GSM PLMN, depends e.g. on the signalling capabilities of the concerned networks.

Some requirements can be identified from the user point of view either being a subscriber to a PLMN or to a fixed network.

These requirements are that a TDS must

(a)   be able to receive and store documents for a Ttx terminal (subscriber) it is in charge *for,*

(b)   act instead of the terminal as being the terminal itself (negotiation of options), especially there must not be any unacceptable impact on the remote fixed network based Ttx terminal which forces the user of that terminal to change his/her communication habits,

(c)   to be responsible *for* the delivery of the documents to the terminal it is in charge for.

A minimum set of functions is necessary to fulfill the requirements. To perform those functions, however, a TDS can be e.g. a separate stand-alone system or part of a Message Handling System MHS (based on X.400- and/or T.300-series of CCITT recommendations).

Once a document has been received and is stored in the document store the way to access and/or retrieve the document is not in the scope of this recommendation. However, it should be noted that usually a Ttx terminal can only make use of the teletex protocols. During the process of receiving documents from another Ttx terminal located in a PLMN or in a fixed network the TDS has to behave like a Ttx terminal anyway (see also requirements above).

2. Minimum Set of Functions

The following function must be allocated to a TDS:

- Ttx document reception

- Ttx document storage capability (document store)

- either automatic forwarding Ttx documents to the Ttx-TE (subscriber) or document retrieval by the authorized Ttx-TE

- operation and maintenance facilities

3. Receiving Teletex Documents into the Document Store

The Ttx document reception function of the TDS may be accessed e.g. using call forwarding facilities of the connected network. These facilities, if used, are activated by the network, whenever there is a match with the associated conditions, e.g. the addressed Ttx-TE in the PLMN does not answer the mobile terminated call. The address of the TDS must therefore be known to the network as forwarded-to address.

4. Getting Teletex Documents from the Document Store

The way of having access to the received documents and the detailed procedures are outside of the scope of this recommendation.