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Public Switched Telephone Network (PSTN);
Subscriber line protocol over the local loop for
display (and related) services;
Part 1: On hook data transmission

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Contents

Foreword

This draft European Telecommunication Standard (ETS) has been produced by the Signalling Protocols and Switching (SPS) Technical Committee of the European Telecommunications Standards Institute (ETSI), and is now submitted for the Public Enquiry phase of the ETSI standards approval procedure.

The attention of ETSI has been drawn to the Intellectual Property Rights (IPRs) listed below which are, or may be, or may become, Essential to this draft prETS and, in particular, on hook data transmission associated with ringing, network operator option: "transmission during ringing". The IPR owner has undertaken to grant irrevocable licences, on fair, reasonable and non-discriminatory terms and conditions under these IPRs pursuant to the ETSI interim IPR Policy. Further details pertaining to these IPRs can be obtained directly from the IPR owner.

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IPRs:

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1   Scope

This first part of ETS 300 659 specifies the subscriber line protocol for the support of PSTN display services at Terminal Equipment (TE) in "on hook" state. The subscriber line protocol is accomplished by using asynchronous voice-band modem. In addition, annex C is provided in order to allow the continuation of use in those networks that already implemented a Dual Tone Multi-Frequency (DTMF) based subscriber line protocol.

The requirements imposed on the modem-based subscriber line protocol deal with data encoding, data transmission requirements and the three layers of the interface at the network end of the interface: Presentation layer, Data Link layer and Physical layer.

The requirements imposed on the DTMF-based subscriber line protocol deal with the transfer of the DTMF coded display information. The procedures and the encoding arrangements are specified in annex C of this ETS.

TE can be connected by analogue access directly to the Local Exchange (LE) or through an Access Network (AN). In the latter case, data transmission can be applied from the LE or from elsewhere in the network hence a transmission path needs to exist from the LE to the TE before data transmission. It is the network operator's responsibility to ensure that the relevant protocol supports transmission path establishment. Transmission path establishment procedures are outside the scope of this ETS.

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]   ETS 300 001 (1992): "Attachments to Public Switched Telephone Network (PSTN); General technical requirements for equipment connected to an analogue subscriber interface in the PSTN".

[2]   DE/NA-10023: "Public Switched Telephone Network (PSTN); Calling Line Identification Presentation for Analogue Lines (CLIP-A) supplementary service; Service description".

[3]   ETR 206 (1995): "Public Switched Telephone Network (PSTN); Multifrequency signalling system to be used for push-button telephones [CEPT Recommendation T/CS 46-02 E (1985)]".

[4]   CCITT Recommendation Q.11 (1988): "Numbering plan for the international telephone service".

[5]   CCITT Recommendation T.50 (1992): "International Reference Alphabet (IRA) (Formerly International Alphabet No.5 or IA5) - Information technology - 7-bit coded character set for information interchange".

[6]   CCITT Recommendation V.23 (1988): "600/1200-baud modem standardized for use in the general switched telephone network".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this ETS, the following definitions apply:

calling line identity: See DE/NA-010023 [2].

graphic character: A character that has a visual representation normally hand-written, printed or displayed; in IRA characters 2/1 to 7/14 (see CCITT Recommendation T.50 [5]).

long silent period: Silent period between ringing patterns in ringing.

short silent period: Silent period between ringing pulses in a ringing pattern.

mark bit: Symbol "1" (see CCITT Recommendation V.23 [6]).

space bit: Symbol "0" (see CCITT Recommendation V.23 [6]).

ringing pulse: Pulse of ringing current used within ringing for call arrival indication. Ringing attributes (current values, duration of ringing pulses, number of ringing pulses in the pattern, cadence, etc.) are network specific.

Ringing Pulse Alerting Signal (RP-AS): Pulse of ringing current used to alert the TE that a data transmission will follow. Duration of RP-AS is specified in this ETS. RP-AS does not produce TE bell tinkle.

"on hook" state (or condition): TE quiescent or idle state (or condition), see ETS 300 001 [1].

"off hook" state (or condition): TE loop state (or condition), see ETS 300 001 [1].

3.2 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

AN	Access Network
AS	Alerting Signal
CLIP	Calling Line Identification Presentation
DT-AS	Dual Tone-Alerting Signal
DTMF	Dual Tone Multi-Frequency
FSK	Frequency-Shift Keying
IRA	International Reference Alphabet
LE	Local Exchange
PSTN	Public Switched Telephone Network
RP-AS	Ringing Pulse Alerting Signal
TAS	TE Alerting Signal
TE	Terminal Equipment
TE-ACK	TE Acknowledgement Signal

4 Data encoding

Graphic characters and the "space" character are coded according to national versions of the IRA as specified in CCITT Recommendation T.50 [5] (see annex E).

Control characters 0/0 to 1/15 and 7/15 are not used within this interface. Characters 8/0 to 15/15 are reserved for network operator use.

5 Protocol requirements

5.1 Presentation layer

The Presentation layer specifies the formats and sequence of information that LE transmits to the TE (Presentation layer message).

The Presentation layer message format is illustrated in figure 1.

TRANSMISSION DIRECTION

PARAMETER TYPE	PARAMETER LENGTH	PARAMETER DATA OCTET(S)		PARAMETER TYPE	PARAMETER LENGTH	PARAMETER DATA OCTET(S)

Bit 0   7 8   15 16

PARAMETER 1			PARAMETER N		
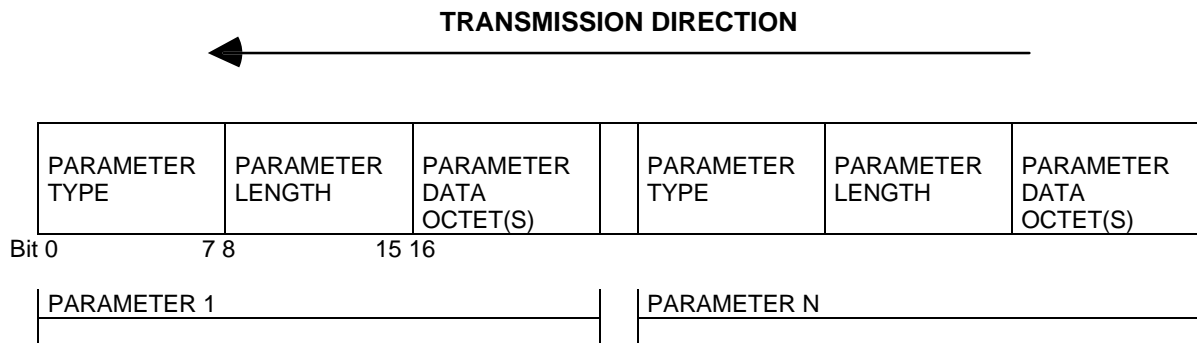
Figure 1: Presentation layer message format

Each parameter consists of a Parameter type, a Parameter length and Parameter octets(s).

Parameter type (1 octet): contains an assigned value used to identify the Parameter. Parameter type value is binary encoded.

Parameter length (1 octet): contains the number of Parameters octets that follow. Parameter length value is binary encoded.

Parameter data octet(s): 1 or more (up to 253) octets. Parameter content value is binary or encoded in accordance with CCITT Recommendation T.50 [5].

5.2 Data Link layer

The Data Link layer is responsible for providing bit error detection capability and for prepending the Channel Seizure Signal and the Mark Signal to the Presentation layer message.

The Data Link layer message format is illustrated in figure 2.

TRANSMISSION DIRECTION

CHANNEL SEIZURE SIGNAL	MARK SIGNAL	MESSAGE TYPE	MESSAGE LENGTH	PRESENTATION LAYER MESSAGE	CHECKSUM
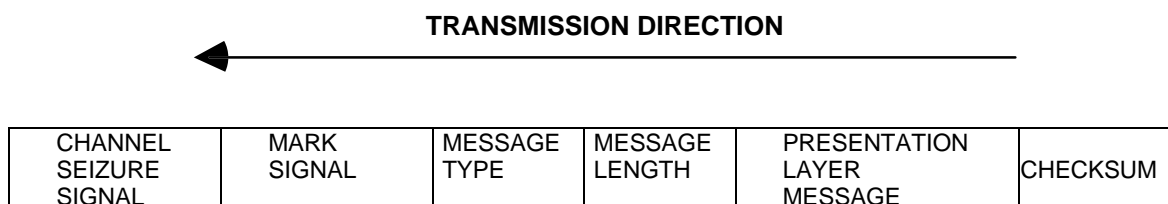
Figure 2: Data Link message format

Channel Seizure Signal: shall consist of a block of 300 continuous bits of alternating "0"s and "1"s. The first bit to be transmitted shall be a "0". The last bit to be transmitted shall be a "1". It shall start the data transmission only in "on hook" data transmission.

Mark Signal: shall consist of a block of 180 ± 25 mark bits. As a network operator option, Mark Signal may also consist of 80 ± 25 mark bits.

Message type (1 octet): contains an assigned value used to identify the message. Message type value is binary encoded.

Message length (1 octet): contains the number of octets of the Data Link layer message (not including the Message type, Message length and Checksum octets). This allows a presentation-layer message of between 3 and 255 octets. Parameter length value is binary encoded.

Checksum octet (1 octet): contains the two's complement of the modulo 256 sum of all the octets in the message starting from the Message type octet up to the end of the message (excluding the Checksum itself).

The protocol does not support error correction or message retransmission. No sequence number or acknowledgement shall be used for the data messages transmitted from the LE to the TE.

Any incorrect Data Link message shall be discarded by the TE.

Any unknown Data Link message shall be discarded by the TE.

5.3 Physical layer

Physical layer requirements refer to the network end of the local loop (interface point Z, see annex F).

Simplex asynchronous voiceband data transmission technique is used to transfer data to the TE. A frequency modulator is required in the LE and a demodulator in the TE. Modem shall meet 1 200 baud V.23 standard characteristics as specified in CCITT Recommendation V.23 [6].

The transmission levels are described in table 1.

Table 1: Transmission levels

Signal Level	-13,5 dBm ± 1,5 dB (point of application to the loop into a 600 Ω termination).
Signal Purity	Total power of all extraneous signal in the band 300-3 400 Hz shall be at least 30 dB lower than the power of signal fundamental frequency, measured at the point of application to the loop .

When sending a Data Link message the following requirements shall be met:

- each data octet (i.e. Message type, Message length, each Presentation layer message octet and Checksum) shall be enveloped by a start bit (space) and a stop bit (mark) in the format shown in figure 3;

1	H	G	F	E	D	C	B	A	0
Stop bit	2^7 (most significant)	2^6	2^5	2^4	2^3	2^2	2^1	2^0 (least significant)	Start bit

Figure 3

- the order of bits transmitted to line is: Start bit first, Stop bit last;

- the octets are transmitted according to the growing order of their number: octet 1 first, octet 2 second, etc.;

- the data signal shall be continuous.

Frequency-Shift Keying (FSK) modulation shall be applied only during transmission of data hence it shall be immediately stopped after the last bit of Data Link message has been transmitted.

In order to avoid corruption of the checksum by premature cessation of transmission, the stop bit following the checksum shall be followed by an additional one to ten Mark bits.

6 Data transmission requirements: signalling, timing and tolerance

Data transmission requirements refer to the network end of the local loop (interface point Z, see annex F).

Interface Z shall support data transmission to TE in the following modes:

- transmission is associated with ringing;
- transmission is not associated with ringing.

The data transmission mode is service-dependant.

6.1 Data transmission associated with ringing

Two methods associated with ringing are defined to transmit information to the TE:

- data transmission during ringing;
- data transmission prior to ringing.

It is a network operator option as to which method is used.

6.1.1 Data transmission during ringing

Data transmission shall occur during the first long silent period between two ringing patterns (see figure 4). A ringing pattern may consist of one or more ringing pulses separated by short silent periods. The first long silent period shall be of sufficient duration for the data to be transmitted. Ringing attributes (frequency, duration of ringing pulses, number of ringing pulses in the pattern, duration of silent periods) are network specific.

The initial application of ringing will provide an alert signal to the TE that data transmission is to be expected.

If the TE goes in "off hook" state before or during the data transmission, normal incoming call procedure shall occur and the data transmission shall be aborted.

Timing

FSK modulation transmission shall begin not less than 500 ms after the end of the first application of ringing current (First Ring Pattern). The second application of the current (Second Ring Pattern) shall start not less than 200 ms after FSK modulation transmission is stopped (see figure 4). The lower limits are required to enable TE to apply and remove appropriate impedance for data reception.
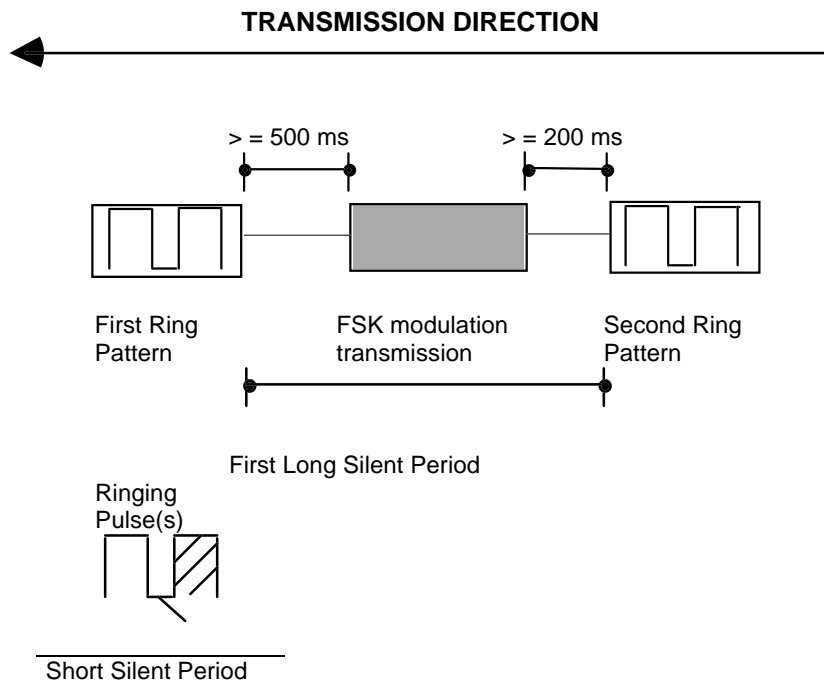
Figure 4: Data transmission during ringing

6.1.2   Data transmission prior to ringing

A TE Alerting Signal (TAS) will be used to signal to the TE that data transmission is to be expected.

Data transmission shall occur prior to normal first ring pattern, after the TAS.

The TAS shall be either:

a)   a Dual Tone Alerting Signal (DT-AS); or

b)   a Ringing Pulse Alerting Signal (RP-AS); or

c)   a line reversal followed by a DT-AS.

It will be a network operator option as to which method is used: the same method shall be used for data transmission not associated with ringing (see subclause 6.2).

In case c) at the beginning of the first ringing pattern, those polarity conditions which are pertinent during ringing will apply.

If the TE goes in "off hook" state before or during the data transmission, normal incoming call procedures shall occur and the data transmission shall be aborted.

Timing

a)   DT-AS

DT-AS shall precede FSK modulation transmission by not less than 45 ms; DT-AS shall precede FSK modulation transmission by not more than 500 ms. The application of ringing current shall start not less than 200 ms and not more than 500 ms after FSK modulation transmission is stopped (see figure 5 and table 2). The lower limits are required to enable TE to apply and remove appropriate impedance for data reception.

TRANSMISSION DIRECTION

Figure 5: Data transmission prior to ringing - case a) DT-AS

Table 2: Data transmission prior to ringing - timer values for case a)

45 ms $\leq$ T1 $\leq$ 500 ms (note)
200 ms $\leq$ T2 $\leq$ 500 ms
NOTE: Exceptionally, during maintenance and testing operation, T1 could be up to 5 seconds. Other situation where T1 may be greater than 500 ms are for further study.

b)   RP-AS

RP-AS shall precede FSK modulation transmission by not less than 500 ms; RP-AS shall precede data transmission by not more than 800 ms. The application of ringing current shall start not less than 200 ms and not more than 500 ms after FSK modulation transmission is stopped (see figure 6 and table 3). The lower limits are required to enable TE to apply and remove appropriate impedance for data reception.

TRANSMISSION DIRECTION
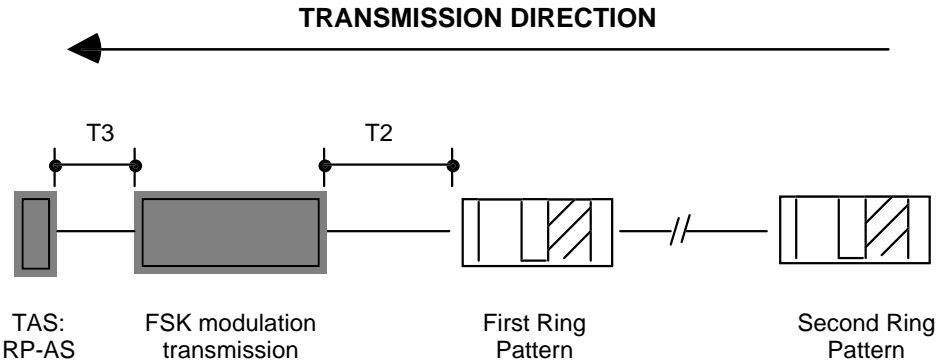
Figure 6: Data transmission prior to ringing - case b) RP-AS

Table 3: Data transmission prior to ringing - timer values for case b)

500 ms $\leq$ T3 $\leq$ 800 ms
200 ms $\leq$ T2 $\leq$ 500 ms

c)   Line reversal followed by DT-AS

A silent period of at least 100 ms shall immediately follow the line reversal; DT-AS shall precede FSK modulation transmission by not less than 45 ms; the total period between line reversal and the start of FSK modulation transmission shall not be greater then 700 ms. The application of ringing current shall start not less than 200 ms and not more than 500 ms after FSK modulation transmission is stopped (see figure 7 and table 4). The lower limits are required to enable TE to apply and remove appropriate impedance for data reception.
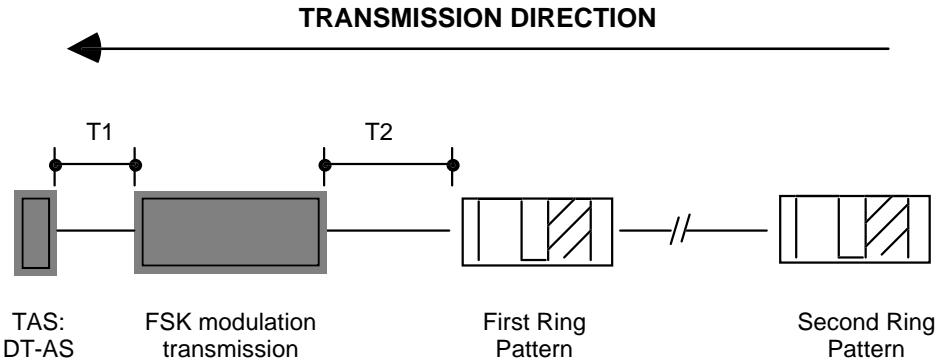
TRANSMISSION DIRECTION
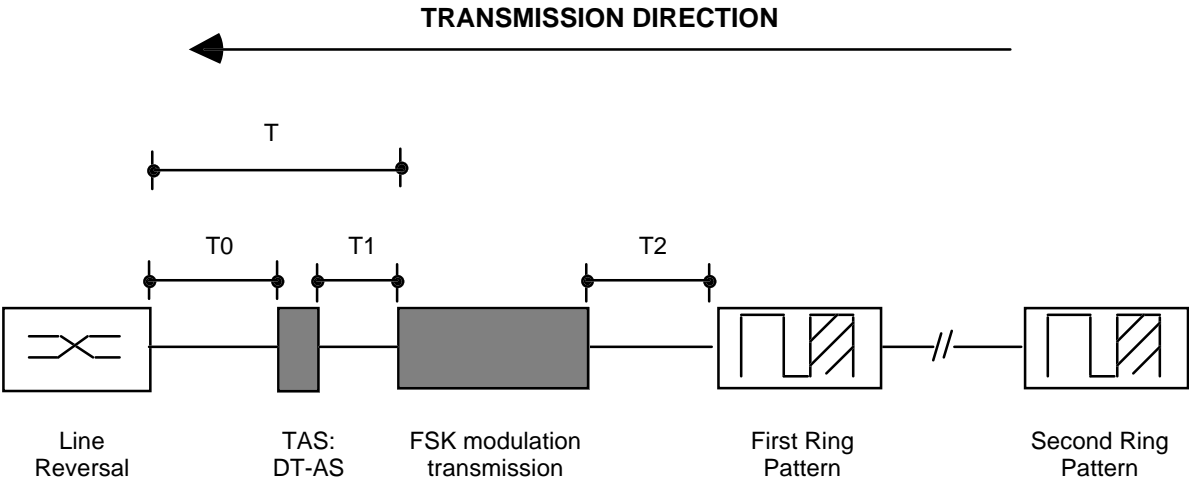
Figure 7: Data transmission prior to ringing - case c) line reversal + DT-AS

Table 4: Data transmission prior to ringing - timer values for case c)

T ≤ 700 ms (note)
T0 ≥ 100 ms
T1 ≥ 45 ms
200 ms ≤ T2 ≤ 500 ms
NOTE: Exceptionally, during maintenance and testing operation, T could be up to 5 seconds. Other situations where T1 may be greater than 500 ms are for further study.

6.2   Data transmission not associated with ringing

A TAS will be used to signal to the TE that data transmission is to be expected.

Data transmission shall occur after the TAS.

The TAS shall be either:

a)   a DT-AS; or

b)   a RP-AS; or

c)   a line reversal followed by a DT-AS.

It is a network operator option as to which method is being used; nevertheless, it shall be the same method as used for data transmission associated with ringing (see subclause 6.1.2), in case a network operator uses a prior to ringing method for it.

If it is necessary (e.g. for applications such as telemetry) a network operator using option c) (line reversal followed by DT-AS) may apply option a) (DT-AS only) to some subscribers in order to avoid unacceptable bell tinkle.

If the TE goes in "off hook" state before or during the FSK modulation, the FSK modulation shall be aborted and normal outgoing call procedure shall occur.

Timing

a)   DT-AS

DT-AS shall precede FSK modulation transmission by not less than 45 ms; DT-AS shall precede FSK modulation transmission by not more than 500 ms. Appropriate idle condition will be applied on the local loop by not less than 200 ms and not more than 500 ms after FSK modulation transmission is stopped (see figure 8 and table 5). The lower limits are required to enable TE to apply and remove appropriate impedance for data reception.

TRANSMISSION DIRECTION

T1

T4

TAS: FSK modulation
DT-AS   transmission

(idle)
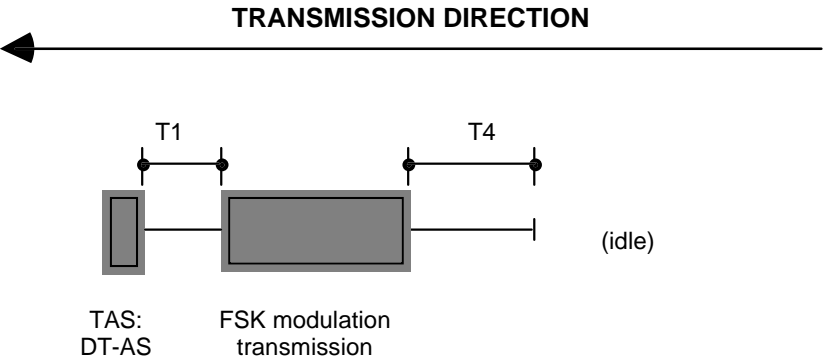
Figure 8: Data transmission not associated with ringing - case a) DT-AS

Table 5: Data transmission not associated with ringing - timer values for case a)

45 ms $\leq$ T1 $\leq$ 500 ms (note)
200 ms $\leq$ T4 $\leq$ 500 ms
NOTE: Exceptionally, during maintenance and testing operation, T1 could be up to 5 seconds. Other situations where T1 may be greater than 500 ms are for further study.

b)   RP-AS

RP-AS shall precede FSK modulation transmission by not less than 500 ms; RP-AS shall precede FSK modulation transmission by not more than 800 ms. Appropriate idle condition will be applied on the local loop by not less than 200 ms and not more than 500 ms after FSK modulation transmission is stopped (see figure 9 and table 6). The lower limits are required to enable TE to apply and remove appropriate impedance for data reception.

TRANSMISSION DIRECTION

T3

T4

TAS: FSK modulation
RP-AS   transmission

(idle)
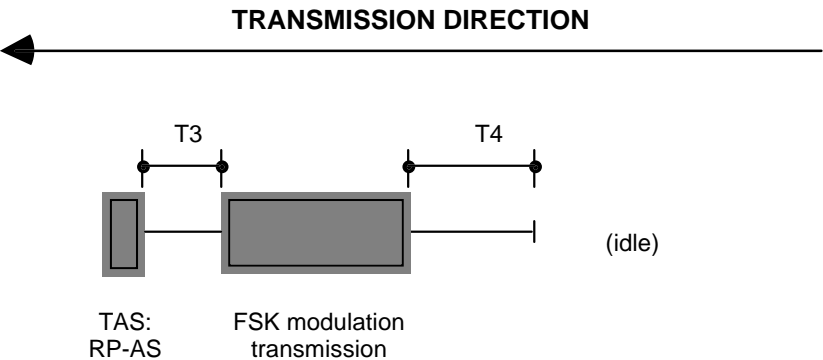
Figure 9: Data transmission not associated with ringing - case b) RP-AS

Table 6: Data transmission not associated with ringing - timer values for case b)

500 ms $\leq$ T3 $\leq$ 800 ms
200 ms $\leq$ T4 $\leq$ 500 ms

c)   Line reversal followed by DT-AS

A silent period of at least 100 ms shall follow the line reversal; DT-AS shall precede FSK modulation transmission by not less than 45 ms; the total period between line reversal and the start of FSK modulation transmission shall not be greater then 700 ms. Appropriate idle condition will be applied on the local loop by not less than 200 ms and not more than 500 ms after FSK modulation transmission is stopped (see figure 10 and table 7). The lower limits are required to enable TE to apply and remove appropriate impedance for data reception.

TRANSMISSION DIRECTION
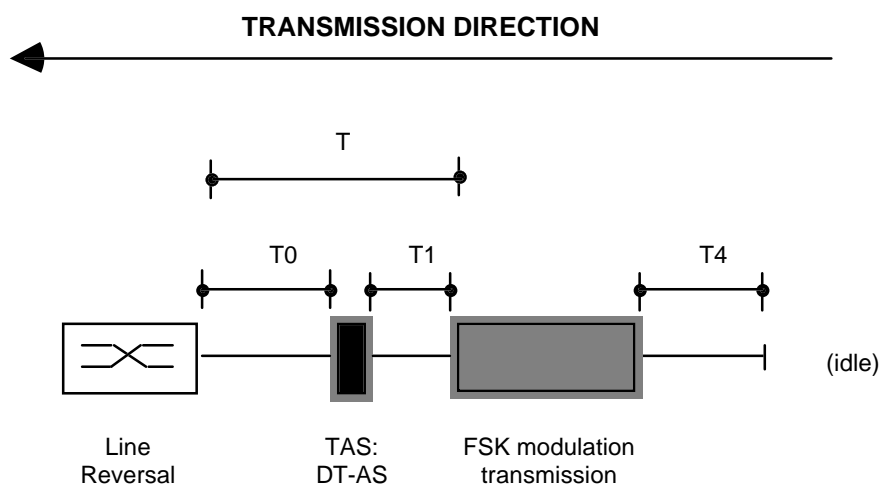
Figure 10: Data transmission not related with ringing - case c) line reversal + DT-AS

Table 7: Data transmission not related with ringing - timer values for case c)

T ≤ 700 ms (note)
T0 ≥ 100 ms
T1 ≥ 45 ms
200 ms ≤ T4 ≤ 500 ms
NOTE: Exceptionally, during maintenance and testing operation, T1 could be up to 5 seconds. Other situations where T1 may be greater than 500 ms are for further study.

6.3   TAS physical characteristics

6.3.1   DT-AS

The physical characteristics of the DT-AS are described in table 8.

Table 8: DT-AS

Nominal Frequencies	2 130 Hz and 2 750 Hz ± 0,5%
Signal Level	-15 dBm/tone ± 2 dB (point of application to the loop into a 600 Ω termination)
Maximum difference in the power between tones	2 dB
Signal Purity	Total power of all extraneous signal in the band 300-3 400 Hz (shall be at least 30 dB lower than the power of signal fundamental frequency measured at the point of application to the loop)
Duration	100 ms ± 10 ms

6.3.2 RP-AS

The duration of RP-AS is described in table 9.

Table 9: RP-AS

Duration	200 ms ≤ RP-AS ≤ 300 ms

7 Data Link message and parameter codings

7.1 Data Link message and general parameter requirements

A Data Link message (for simplicity: a message) is generally related to a given service, but the same message can be used in support of different applications (each of them can require different parameters).

At the LE, for each standard message type (or for each service if the same message type is used in support of different applications) a list of parameters is necessarily defined. Each list consists of two categories of parameters, mandatory or optional according to the service description.

Furthermore, each message can contain other parameters for network operator use only.

The mandatory/optional characteristics of a parameter within a message are service dependent as depicted in annex A. The TE does not need to know which parameters are mandatory/optional and the TE may decide how to handle the parameters (e.g. to display information or not).

Any unknown message or any unknown parameter within a known message shall be discarded by the TE.

Any unknown value of parameter data inside any known parameter shall be discarded by the TE.

Parameter data shall refer to only one type of information.

The meaning and the format of a given parameter are always identical.

The same parameter may be used within different messages (or different services).

If two parameters have the same meaning, they are required to have the same value.

Parameters may be sent in any order within a message.

If mutually exclusive parameters are found in a message, the TE shall use the first and ignore the other.

If two parameters within a message are identical (same type coding value) the second parameter is discarded by the TE.

A range within the Message type coding is reserved for network operator use.

A range within the Parameter type coding is reserved for network operator use.

A range within the values of a parameter can be reserved for network operator use.

The parameter "Extension for network operator use" (see subclause 7.4.16) shall be included in the message when a reserved value for network operator is used in Message type, Parameter type, Parameter data value in order to qualify without ambiguity for the TE the private extension of the standard used by the network operator.

In case of the presence of more than one reserved value for network operator (e.g. if the message contains two network operator parameters) the message shall contain only one "Extension" parameter.

If the TE recognizes all the "Extension for network operator" parameter data octets (i.e. the Country code, the Network Operator code and the Version), it shall process the private values of Message type, Parameter type and Parameter data in accordance with the network operator specifications.

If the TE does not recognize all of the "Extension for network operator" parameter data octets, the TE shall discard:

-        the complete network operator message, if a reserved value is used in the type of Message;

-        the network operator parameter, if a reserved value is used in the type of Parameter;

-        the network operator parameter data, if a reserved value is used in the parameter data octets.

7.2   Data Link message types

Table 10 summarizes the messages that protocol shall support.

Table 10: Data Link messages

Message name	Reference (subclause)
Call Setup	7.2.1
Message Waiting Indicator	7.2.2
Advice of Charge	7.2.3

Table 11 summarizes the Message type coding.

Table 11: Message type coding

Type (binary) HGFE DCBA	Type (hexadecimal)	Message name
0000 0100	04H	reserved
1000 0000	80H	Call Setup
1000 0010	82H	Message Waiting Indicator
1000 0100	84H	reserved
1000 0101	85H	reserved
1000 0110	86H	Advice of Charge
1111 0001 to 1111 1111	F1H to FFH	reserved for network operator use

7.2.1 Call Setup message

This message is used to send information related with an incoming call. It supports Calling Line Identification Presentation (CLIP). It may also support CLIP related applications (e.g. CLIP on Call Waiting, CLIP on Ring-back-when-free-call, Calling Name Delivery).

The Call set-up message may contain the following parameters.

Table 12: Call set-up message parameters

Parameter name	Reference (subclause)
Date and Time	7.4.1
Calling Line Identity or	7.4.2
Reason for absence of Calling Line Identity	7.4.4
Called Line Identity	7.4.3
Calling Party Name	7.4.5
Reason for absence of Calling Party Name	7.4.6
Complementary Calling Line Identity	7.4.8
Call type	7.4.9
First Called Line Identity (in case of forwarded call)	7.4.10
Network Message System Status	7.4.11
Type of Forwarded call(in case of forwarded call)	7.4.12
Type of Calling User	7.4.13
Redirecting Number (in case of forwarded call)	7.4.14
Extension for network operator use	7.4.16
Network operator parameter	-

See annex A for the parameter status (mandatory/optional at the LE) according to service requirements.

7.2.2 Message Waiting Indicator message

This message is used to indicate the presence of waiting messages in the network message system.

The Message Waiting Indicator message may contain the following parameters:

Table 13: Message Waiting Indicator message parameters

Parameter name	Reference (subclause)
Date and Time	7.4.1
Calling Line Identity or	7.4.2
Reason for absence of Calling Line Identity	7.4.4
Calling Party Name	7.4.5
Reason for absence of Calling Party Name	7.4.6
Visual Indicator	7.4.7
Network Message System Status	7.4.11
Extension for network operator use	7.4.16
Network operator parameter	-

7.2.3 Advice of Charge message

This message could be used to send information related to the charge of a call.

For further study.

7.3 Parameter types

Table 14 summarizes the Parameter types that are supported.

Table 14: Parameter types

Type (binary) HGFE DCBA	Type (hexadecimal)	Length (note)	Parameter name
0000 0001	01H	8	Date and Time
0000 0010	02H	max. 20	Calling Line Identity
0000 0011	03H	max. 20	Called Line Identity
0000 0100	04H	1	Reason for Absence of Calling Line Identity
0000 0111	07H	max. 20	Calling Party Name
0000 1000	08H	1	Reason for absence of Calling Party Name
0000 1011	0BH	1	Visual Indicator
0001 0000	10H	max. 20	Complementary Calling Line Identity
0001 0001	11H	1	Call type
0001 0010	12H	max. 20	First called Line Identity (in case of forwarded call)
0001 0011	13H	1	Network Message System Status
0001 0101	15H	1	Type of Forwarded call (in case of forwarded call)
0001 0110	16H	1	Type of Calling user
0001 1010	1AH	max. 20	Redirecting Number (in case of forwarded call)
0010 0000	20H	x	Charge
1110 0000	E0H	10	Extension for network operator use
1110 0001 to 1111 1111	E1H to FFH	-	Reserved for network operator use
NOTE: Parameter type and Parameter length are defined in detail in subclause 7.4.			

7.4 Parameter coding

7.4.1 Date and time parameter

The purpose of the Date and time parameter is to provide the date and the time to the user. It indicates the point in time when the message has been generated by the LE.

Table 15

Octet number	Contents
1	0000 0001 (01H): Date and Time parameter type
2	0000 1000 (08H): Parameter length (8)
3	Month's most significant octet
4	Month's least significant octet
5	Day's most significant octet
6	Day's least significant octet
7	Hour's most significant octet
8	Hour's least significant octet
9	Minute's most significant octet
10	Minute's least significant octet

Days shall range from 01 to 31. Months shall range from 01 (January) to 12 (December). Hours shall range from 00 (midnight) to 23. Minutes shall range from 00 to 59.

Each parameter octet shall be coded according to CCITT Recommendation T.50 [5].

7.4.2 Calling Line Identity parameter

The purpose of the Calling Line Identity parameter is to identify the origin of a call.

Table 16

Octet number	Contents
1	0000 0010 (02H): CLI parameter type
2	000X XXXX: Parameter length (max. 20)
3	Digit 1
...	...
n+2	Digit n

Digits shall be coded according to CCITT Recommendation T.50 [5]. The digits may be interspersed with characters "space" (2/0), "-" (2/13), "(" (2/8), or ")" (2/9).

7.4.3 Called Line Identity parameter

The purpose of the Called Line Identity parameter is to identify the called party of a call.

Table 17

Octet number	Contents
1	0000 0011 (03H): Called Directory Number parameter type
2	000X XXXX: Parameter length (max. 20)
3	Digit 1
...	...
n+2	Digit n

Digits shall be coded according to CCITT Recommendation T.50 [5]. The digits may be interspersed with characters "space" (2/0), "-" (2/13), "(" (2/8), or ")" (2/9).

7.4.4 Reason for Absence of Calling Line Identity parameter

The purpose of the Reason for Absence of Calling Line Identity parameter is to describe the reason for absence of Calling Line Identity. The parameters "Calling Line Identity" and "Reason for Absence of Calling Line Identity" are mutually exclusive within a message.

Table 18

Octet number	Contents
1	0000 0100 (04H): Reason for absence of CLI parameter type
2	0000 0001 (01H): Parameter length (1)
3	0100 1111 ("O"): Unavailable 0101 0000 ("P"): Private (CLIR involved) 1000 0000 to reserved for network operator use 1111 1111

Characters shall be coded according to CCITT Recommendation T.50 [5].

7.4.5 Calling Party Name parameter

The purpose of the Calling Party Name parameter is to identify the name of the party at the origin of a call.

Table 19

Octet number	Contents
1	0000 0111 (07H): Name parameter type
2	000X XXXX: Parameter length (max. 20)
3	Character 1
...	...
n+2	Character n

Characters shall be coded according to CCITT Recommendation T.50 [5].

7.4.6 Reason for Absence of Calling Party Name parameter

The purpose of the Reason for Absence of Party Name parameter is to describe the reason for absence of the Calling Party Name.

Table 20

Octet number	Contents
1	0000 1000 (08H): Reason for absence of Name parameter type
2	0000 0001 (01H): Parameter length (1)
3	0100 1111 ("O"): Unavailable 0101 0000 ("P"): Private (Name delivery has been blocked) 1000 0000 to reserved for network operator use 1111 1111

Characters shall be coded according to CCITT Recommendation T.50 [5].

7.4.7 Visual Indicator parameter

The purpose of the Visual Indicator parameter is to switch on/off a TE visual indicator (presence of waiting messages).

Table 21

Octet number	Contents
1	0000 1011 (0BH): Visual Indicator parameter type
2	0000 0001 (01H): Parameter length (1)
3	0000 0000 (00H): Deactivation (indicator off) 1111 1111 (FFH): Activation (indicator on) 1000 0000 (80H) to reserved for network operator use 1111 1110 (EFH)

7.4.8 Additional Calling Line Identity parameter

Table 22

Octet number	Contents
1	0001 0000 (10H): Complementary CLI parameter type
2	000X XXXX: Parameter length (max. 20)
3	Digit 1
...	...
n+2	Digit n

Digits shall be coded according to CCITT Recommendation T.50 [5]. The digits may be interspersed with characters "space" (2/0), "-" (2/13), "(" (2/8), or ")" (2/9).

7.4.9 Call Type parameter

Table 23

Octet number	Contents
1	0001 0001 (11H): Call Type parameter type
2	0000 0001 (01H): Parameter length (1)
3	0000 0001 (01H): Voice Call 0000 0010 (02H): CLI Ring Back when free call 0000 0011 (03H): Calling Name Delivery 1000 0001 (81H): Message Waiting Call 1000 0010 (82H) to reserved for network operator use 1111 1111 (FFH)

7.4.10 First Called Line Identity parameter (in case of forwarded call)

In case of forwarded call the purpose of First Called Line Identity parameter is to identify the first called party.

Table 24

Octet number	Contents
1	0001 0010 (12H): First Called Line Directory Number parameter type
2	000X XXXX: Parameter length (max. 20)
3	Digit 1
...	...
n+2	Digit n

Digits shall be coded according to CCITT Recommendation T.50 [5]. The digits may be interspersed with characters "space" (2/0), "-" (2/13), "(" (2/8), or ")" (2/9).

7.4.11   Network Message System Status parameter

The purpose of Network Message System Status is to specify the number of waiting messages in the network message system.

Table 25

Octet number	Contents
1	0001 0011 (13H): Network Message System Status parameter type
2	0000 0001 (01H): Parameter length (1)
3	0000 0000 (00H): No messages 0000 0001 (01H): 1 message or unspecified number of message waiting 0000 0010 (02H) to Number of message waiting in message system 1111 1111 (FFH)

The number of message shall be coded binary.

7.4.12   Type of Forwarded Call parameter (in case of forwarded call)

Table 26

Octet number	Contents
1	0001 0101 (15H): Forwarded Call Type parameter type
2	0000 0001 (01H): Parameter length (1)
3	0000 0000 (00H): Unavailable or unknown forwarded call type 0000 0001 (01H): Forwarded call on busy 0000 0010 (02H): Forwarded call on no reply 0000 0011 (03H): Unconditional forwarded call 0000 0100 (04H): Deflected call (after alerting) 0000 0101 (05H): Deflected call (immediate) 0000 0110 (06H): Forwarded call on inability to reach mobile subscriber 1000 0000 (E0H) to reserved for network operator use 1111 1111 (FFH)
NOTE:	Octet 3 coding is compatible to ISUP as specified in ETS 300 356.

7.4.13   Type of Calling User parameter

Table 27

Octet number	Contents
1	0001 0110 (16H): Type of Calling User parameter type
2	0000 0001 (01H): Parameter length (1)
3	0000 0000 (00H): Origination unknown or unavailable 0000 0011 (03H): VPN (Virtual Private Network) 0000 0100 (04H): Mobile phone 0000 0101 (05H): Mobile phone + VPN 0000 1010 (0AH): Ordinary calling subscriber 0000 1011 (0BH): Calling subscriber with priority 0000 1100 (0CH): Data Call 0000 1101 (0DH): Test call 0000 1111 (0FH): Payphone
NOTE:	Octet 3 coding is compatible to ISUP as specified in ETS 300 356.

7.4.14   Redirecting Number parameter (in case of forwarded call)

In case of chained forwarded call, the purpose of Redirecting Number parameter is to identify the last redirecting party.

Table 28

Octet number	Contents
1	0001 1010 (1AH): Redirecting Number parameter type
2	000X XXXX: Parameter length (max. 20)
3	Digit 1
...	...
n+2	Digit n

Digits shall be coded according to CCITT Recommendation T.50 [5]. The digits may be interspersed with characters "space" (2/0), "-" (2/13), "(" (2/8), or ")" (2/9).

7.4.15   Charge parameter

For further study.

7.4.16   Extension for network operator use parameter

This parameter is used to qualify without ambiguity for the TE the private extension of the standard used by the network operator.

Table 29

Octet number	Contents
1	1110 000 (E0H): Extension for network operator use parameter type
2	0000 1010 (0AH): Parameter length (10)
3	First digit of Country code
4	Second digit of Country code or space (20H) if no second digit
5	Third digit of Country code or space (20H) if no third digit
6 to 9	Network Operator code
10 to 12	Version (operator coding)

Parameter octets shall be coded according to CCITT Recommendation T.50 [5]. Unused octets of Network Operator code and Version code shall be coded as "space" (2/0).

The Country code shall be coded in accordance with CCITT Recommendation Q.11 [4].

The Network Operator code is defined by an agreement between the different network operators of each country.

The Version is defined by the network operator.

Annex A (normative):   PSTN CLIP service parameter list

This annex describes how the protocol shall support the PSTN CLIP service as specified in DE/NA-010023 [2].

The LE shall use the Call Setup message in data transmission associated with ringing. The message shall contain the parameters as specified in table A.1.

Table A.1

Parameter name	Status
Date and Time	Optional
Calling Line Identity or Reason for absence of Calling Line Identity	Mandatory
Called Line Identity	Optional
Calling Party Name	Optional
Reason for absence of Calling Party Name	Optional
Complementary Calling Line Identity	Optional
Call type	Optional
First called Line Identity (in case of forwarded call)	Optional
Network Message System Status	Optional
Type of Forwarded call (in case of forwarded call)	Optional
Type of Calling User	Optional
Redirecting Number (in case of forwarded call)	Optional
Extension for network operator use	Optional (note)
Network operator parameter	*Optional*
NOTE: Mandatory when a reserved value for network operator is used in Message type, Parameter type, Parameter data value.	

Annex B (normative): TE connected to the LE via a pair gain system - considerations for the Z' interface

The following points need to be observed in case of TE connected to the LE via some types of pair gain systems:

1) where DT-AS is used, the LE may be required to provide a line reversal, to cause the pair gain system to switch through the speech path, even though the TE may not require a line reversal;

2) in implementing the timings in the LE for interface Z in annex F, allowance may need to be made for signalling delays introduced by some pair gain systems, as follows:

   a) T0 (in subclause 6.1.2 case c) and subclause 6.2 case c)) may need to be 500 ms to guarantee a minimum 100 ms interval between line reversal and TAS at interface Z'.

   b) For T2 (in subclause 6.1.2 cases a) to c)) as specified for interface Z, the interval between the end of FSK signalling and normal ringing being applied at interface Z' could be as high as 800 ms.

   c) For T4 (in subclause 6.2 cases a) to c)) as specified for interface Z, the interval between the end of FSK signalling and the line at interface Z' being returned to idle state could be as high as 800 ms.

Annex C (normative): DTMF based subscriber line protocol

C.1 Introduction

This annex specifies the DTMF based subscriber line protocol for the support of PSTN display services at the TE. For the transfer of display information over analogue subscriber lines, use is made of the 16 code DTMF signalling system in accordance with ETR 206 [3]. Except for these special display procedures, the normal signalling procedures and physical properties for analogue subscriber lines apply (see the network specific annexes of ETS 300 001 [1]).

C.2 Line seizure phase

In case of an incoming call for a subscriber, the exchange shall seize the corresponding subscriber line for the terminating call. The line seizure shall be indicated to the subscriber line by means of a polarity reversal.

> NOTE: The return to the idle polarity will take place after the number information transfer phase and is outside the scope of the DTMF based subscriber line protocol.

C.3 Number information transfer phase

The sending of display information depends on the subscription option between user and network operator. In order to indicate the start of the transmission of display information, the exchange shall start sending the series of DTMF codes within a predefined time range after line seizure. The DTMF codes are separated by a transmission interval between successive codes. The time between polarity reversal and completion of display information sending is dependent on the number of DTMF codes to be sent. If the call is answered during transmission of the display information, the call is regarded by the exchange as being answered and the exchange shall then through-connect the call.

Different stages of implementation are anticipated. The following two examples show the possible series of DTMF codes that are sent by the network.

EXAMPLE 1: **Transfer of Calling Line Identity**

$<D><S_1>...<S_n><C>$
_---------------- digit transmission sequence
$<C>$ DTMF code "C" (end code)
$<D>$ DTMF code "D" (start code)
$<S_1>...<S_n>$ Digits (0 - 9)

EXAMPLE 2: **Transfer of Calling Line Identity and subsequent identities**

$<A><S_1>...<S_n><D><S_1>...<S_n><D><S_1>...<S_n><C>$
_---------------- digit transmission sequence
$<A>$ DTMF code "A" (start code calling party number)
$<C>$ DTMF code "C" (end code)
$<D>$ DTMF code "D" (start code call diversion number)
$<S_1>...<S_n>$ Digits (0 - 9)

In addition, the DTMF code "B" may be sent by the network as start code for the transfer of information values, through which special events can be indicated to the user.

The overdecadic DTMF digits "A", "B", "C" and "D" shall not be presented.

C.4 Alerting phase

After transmission of the display information, indicated by DTMF code "C", the first ringing pulse shall be provided to the subscriber line and further the normal basic call signalling procedures shall apply.

Annex D (informative): Parameter list per service

D.1 CLIP on Ring-back-when-free-call service

This clause describes how the protocol could support a CLIP related application, CLIP on Ring-back-when-free-call.

The LE uses the Call Setup message in data transmission associated with ringing. The message contains the parameters as specified in table D.1.

Table D.1

Parameter name	Status
Date and Time	Optional
Called Line Identity Number	Mandatory
Call type	Optional
Extension for network operator use	Optional (note)
Network operator parameter	*Optional*
NOTE: Mandatory when a reserved value for network operator is used in Message type, Parameter type, Parameter data value.	

D.2 Message Waiting Indicator service

This clause describes how the protocol could support a Message Waiting Indicator service.

The LE uses the Message Waiting Indicator message in data transmission not associated with ringing. The message contains the parameters as specified in table D.2.

Table D.2

Parameter name	Status
Date and Time	Optional
Calling Line Identity	
or	Optional
Reason for absence of Calling Line Identity	
Calling Party Name	Optional
Reason for absence of Calling Party Name	Optional
Visual Indicator	Mandatory
Network message system status	Optional
Extension for network operator use	Optional (note)
Network operator parameter	*Optional*
NOTE: Mandatory when a reserved value for network operator is used in Message type, Parameter type, Parameter data value.	

The same information can be transmitted to the TE using the Call Setup message in data transmission associated with ringing. In this context, the message contains the following parameters:

- "Call Type" (parameter type: 11H) coded as "Message waiting call" (81H);

- "Network Message System Status".

D.3 Advice of Charge service

For further study.

Annex E (informative):   International reference alphabet - Basic code table

Table E.1: 7-bit basic code table

b7					0	0	0	0	1	1	1	1
b6					0	0	1	1	0	0	1	1
b5					0	1	0	1	0	1	0	1
b4	b3	b2	b1		0	1	2	3	4	5	6	7
0	0	0	0	0			SP	0	②	P	②	p
0	0	0	1	1			!	1	A	Q	a	q
0	0	1	0	2			"	2	B	R	b	r
0	0	1	1	3			#/£	3	C	S	c	s
0	1	0	0	4			¤/$	4	D	T	d	t
0	1	0	1	5			%	5	E	U	e	u
0	1	1	0	6			&	6	F	V	f	v
0	1	1	1	7			'	7	G	W	g	w
1	0	0	0	8			(	8	H	X	h	x
1	0	0	1	9			)	9	I	Y	i	y
1	0	1	0	10			*	:	J	Z	j	z
1	0	1	1	11			+	;	K	②	k	②
1	1	0	0	12			,	<	L	②	l	②
1	1	0	1	13			-	=	M	②	m	②
1	1	1	0	14			.	>	N	②	n	②
1	1	1	1	15			/	?	O	_	o	DEL

Annex F (informative):   Reference configurations
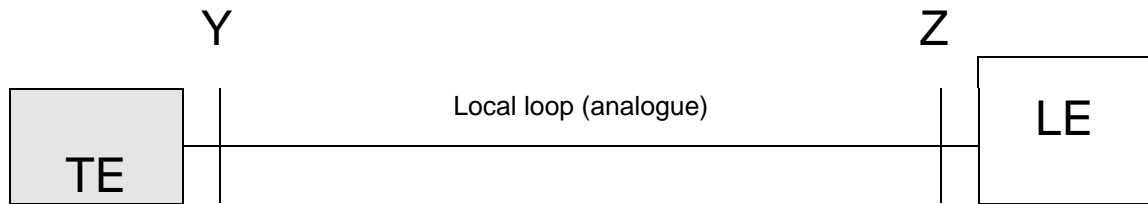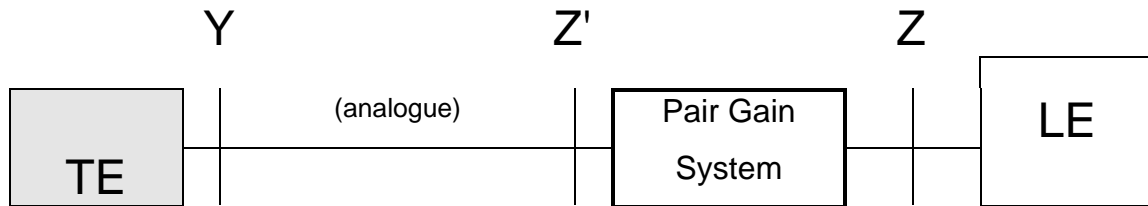
Y   Z

```
┌────────┐ │                                              │ ┌────────┐
│        │ │        Local loop (analogue)                 │ │        │
│   TE   │ │                                              │ │   LE   │
│        │ │                                              │ │        │
└────────┘ │                                              │ └────────┘
```

Figure F.1: TE directly connected to the LE

Y   Z'   Z

```
┌────────┐ │                     ┌──────────┐           │ ┌────────┐
│        │ │     (analogue)      │ Pair Gain │           │ │        │
│   TE   │ │                     │  System   │           │ │   LE   │
│        │ │                     └──────────┘           │ │        │
└────────┘ │                                              │ └────────┘
```

Pair Gain System: A multiplex or concentrating transmission system which presents normal analogue PSTN line interfaces at each end, i.e. at both Z and Z'.

Figure F.2: TE connected to the LE via a Pair Gain System

Y   Z

```
┌────────┐ │                 │ ┌────────┐          ┌────────┐
│        │ │ Local loop      │ │        │ Digital  │        │
│        │ │ (analogue)      │ │   AN   │ interface│   LE   │
│   TE   │ │                 │ │        │ (e.g. V5)│        │
└────────┘ │                 │ └────────┘          └────────┘
```
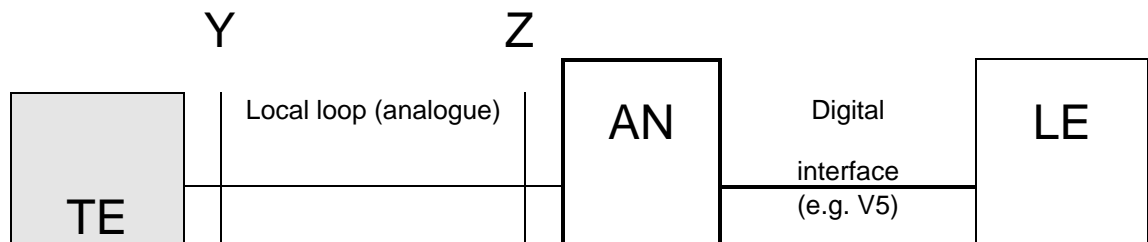
Figure F.3: TE connected to the LE via an AN

Annex G (informative):   Qualification parameters (for further study)

G.1   Parameter type

Table G.1

Type (binary) HGFE DCBA	Type (hexadecimal)	Length	Parameter name
0001 0111	17H	1	Qualification of Calling Line Identity
0001 1000	18H	1	Qualification of First Called Line Identity (in case of forwarded call)
0001 1001	19H	1	Qualification of Additional Calling Line Identity
0001 1011	1BH	1	Qualification of Redirecting Number

G.2   Parameter coding

Table G.2

Octet number	Contents
1	0001 0111 (17H): Qualification of Calling Line Identity 0001 1000 (18H): Qualification of First Called Line Identity (in case of forwarded call) 0001 1001 (19H): Qualification of Additional Calling Line Identity 0001 1011 (1BH): Qualification of Redirecting Number
2	0000 0001 (01H): Parameter length (1)
3: bits 3 to 1	000: Access code is included in DN (PNP or UPT) 001: Subscriber number (E.164) 010: Nature of address unknown 011: National significant number (E.164) 100: International number (E.164) 101: Prefix + National (significant) Number (E.164) 110: International prefix + International Number (E.164) 111: spare
3: bits 5 to 4	00: Numbering plan unknown or unavailable 01: E.164 numbering plan 10: Private numbering plan 11: UPT numbering plan
3: bits 7 to 6	00: user provided, not verified 01: user provided, verified and passed 10: user provided, verified and failed 11: network provided
3: bit 8	0: number complete 1: number incomplete

Annex H (informative):   Bibliography

-                ETS 300 356: "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 2 for the international interface".

-                Bellcore GR-30-Core (1994): "LATA Switching Systems Generic Requirements (LSSGR): Voiceband Data Transmission Interface".

History

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