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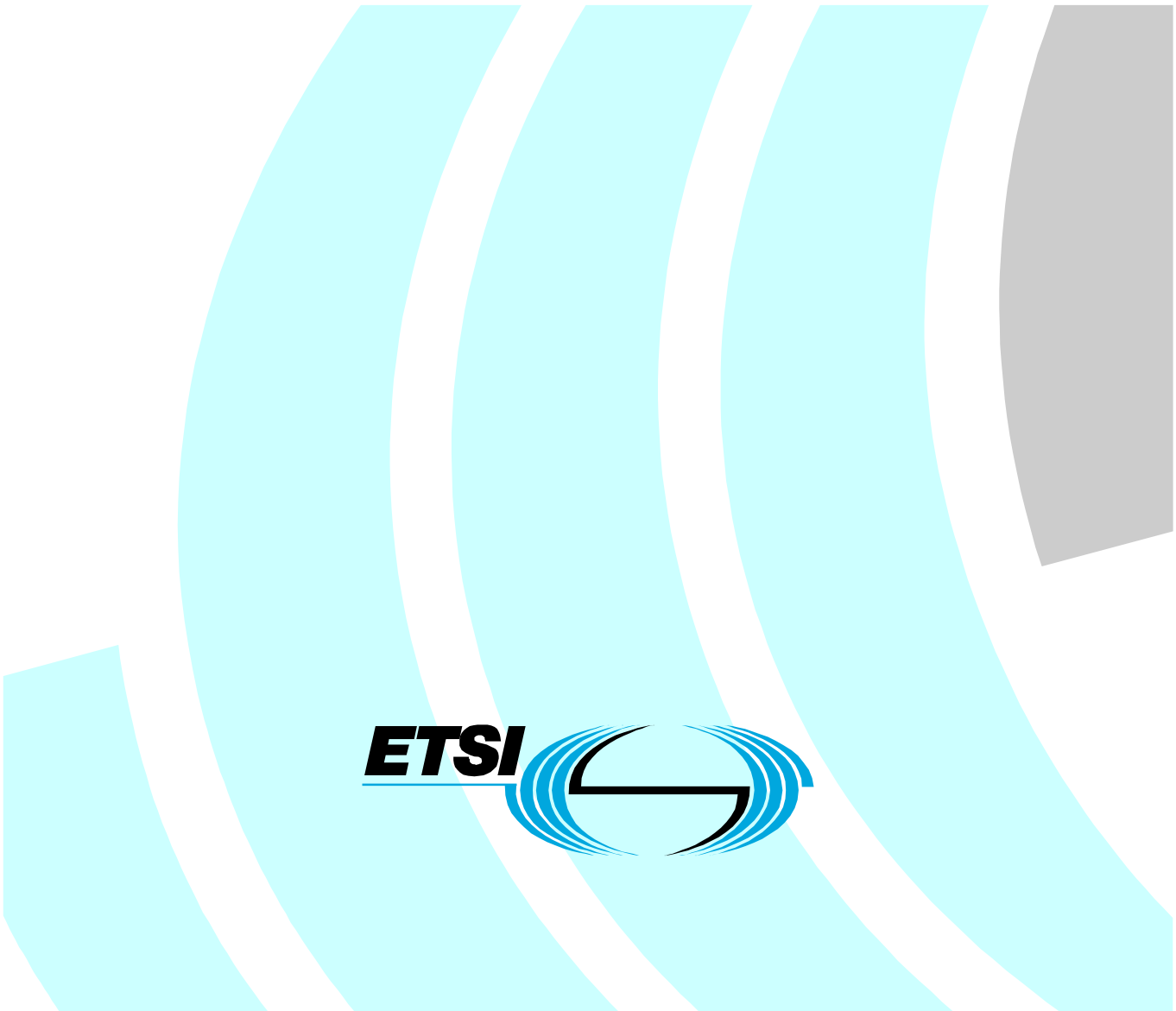
ETSI Standard

Access and Terminals (AT); Analogue access to the Public Switched Telephone Network (PSTN); Protocol over the local loop for display and related services; Terminal Equipment requirements; Part 1: On-hook data transmission



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Foreword

This ETSI Standard (ES) has been produced by ETSI Technical Committee Access and Terminals (AT), and is now submitted for the ETSI standards Membership Approval Procedure.

The present document is part 1 of a multi-part deliverable covering the Protocol over the local loop for display and related services; Terminal Equipment requirements, as identified below:

Part 1: "On-hook data transmission";

Part 2: "Off-hook data transmission";

Part 3: "Protocol Implementation Conformance Statement (PICS) proforma specification On-Hook and Off-Hook";

Part 4: "Test Suite Structure and Test Purposes (TSS&TP); On-Hook and Off-Hook";

Part 5: "Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma specification for the user; On-Hook and Off-Hook".

The present document replaces EN 300 778-1 which is being withdrawn. There are no technical differences between the present document and the former EN 300 778-1.

1 Scope

The present document specifies the electrical characteristics and the functional characteristics for Terminal Equipment (TE) for connection to the network termination points of a Public Switched Telephone Network (PSTN) interface providing a Protocol over the local loop for display and related services based on the protocols defined in EN 300 659-1 [1] and EN 300 659-3 [3]. For those networks that have implemented a Dual Tone Multi Frequency (DTMF) based subscriber line protocol, network specific TE requirements apply (see annex A).

The present document applies to on-hook data transmission only.

The requirements are intended to ensure correct reception and detection of the received data. The method of displaying the received data is not defined.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

[1] ETSI EN 300 659-1: "Access and Terminals (AT); Analogue access to the Public Switched Telephone Network (PSTN); Subscriber line protocol over the local loop for display (and related) services; Part 1: On-hook data transmission".

[2] ETSI ES 201 235 (all parts): "Specification of Dual Tone Multi-Frequency (DTMF) Transmitters and Receivers".

[3] ETSI EN 300 659-3: "Access and Terminals (AT); Analogue access to the Public Switched Telephone Network (PSTN); Subscriber line protocol over the local loop for display (and related) services; Part 3: Data link message and parameter codings".

[4] ETSI TR 101 182: "Analogue Terminals and Access (ATA); Definitions, abbreviations and symbols".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in EN 300 659-1 [1] and EN 300 659-3 [3] and the following apply:

idle line signalling state: state into which the TE when connected to the network, is placed such that it is capable of receiving or sending speechband signalling without entering the loop state

idle state: Also known as the on-hook state, off-line state or the quiescent state, see TR 101 182 [4].

loop state: Also known as the on-line state or off-hook state, see TR 101 182 [4].

off-hook state: See loop state.

on-hook state: See **idle state**.

quiescent state: See **idle state**.

ringing state: idle state into which a ringing signal is applied

twist: level difference between different frequencies in a signal

3.2 Abbreviations

For the purposes of the present document, the abbreviations defined in EN 300 659-1 [1] and EN 300 659-3 [3] and the following apply:

NTP Network Termination Point

4 Physical layer requirements

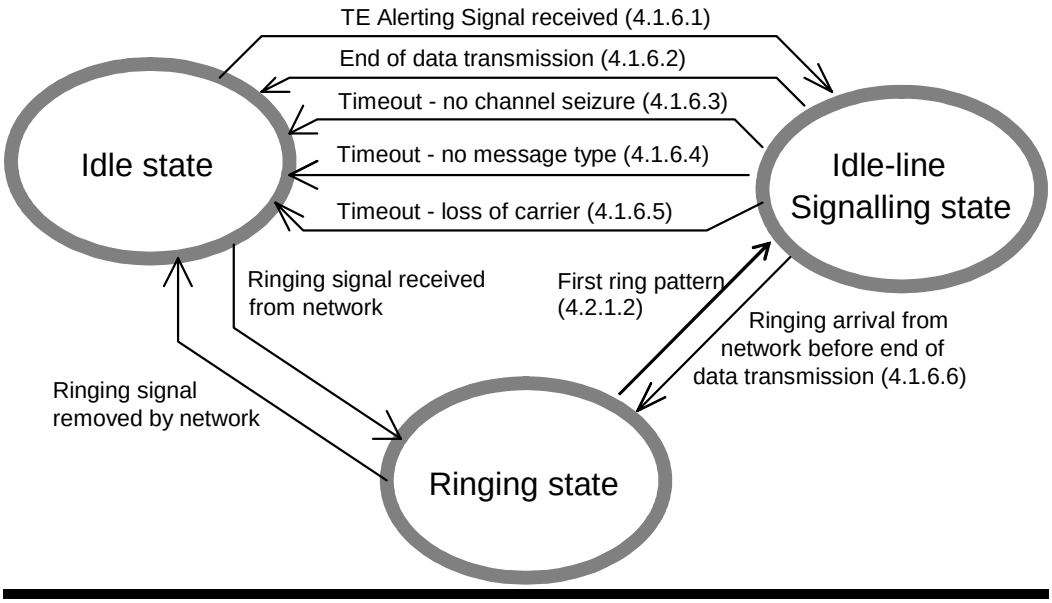

Figure 1: State diagram

4.1 General requirements

4.1.1 Idle state

There are no idle state requirements under the present document.

Idle state requirements are given in relevant access standards.

4.1.2 Polarity

Requirement: All requirements in the present document shall be met independently of the polarity of the DC voltage applied to the line terminals of the TE.

Test: Compliance is under study.

4.1.3 AC termination

Requirement: The TE shall present one of the following AC conditions during the idle line signalling state:

a) an impedance not less than 8 kΩ, but with a phase angle not exceeding + 5° over the frequency range 200 Hz to 4 000 Hz;

b) a return loss over the frequency range 1 000 Hz to 2 500 Hz of not less than 10 dB with respect to a network comprising a resistor of 820 Ω in series with a parallel combination of a 360 Ω resistor and a 180 nF capacitor.

Test: Compliance shall be by supplier's declaration.

4.1.4 DC termination

Requirement: During the idle-line signalling state the TE shall present either of the following DC conditions to the network:

a) the current drawn by the TE shall not exceed 0,5 mA at 50 V;

b) the current drawn by the TE shall not exceed the current drawn by a 5 MΩ resistor when connected to 100 V.

Test: Compliance is under study.

4.1.5 Data signals

Data transmission to the TE is by means of the Frequency Shift Keying (FSK) method as specified in EN 300 659-1 [1].

4.1.5.1 Frequencies

Requirement: The TE shall be capable of correctly receiving FSK signalling tones at the following frequencies:

- Mark = logical "1" frequency: 1 300 Hz ± 1,5 %.
- Space = logical "0" frequency: 2 100 Hz ± 1,5 %.

Test: Compliance is under study.

4.1.5.2 Rate

Requirement: The TE shall be capable of correctly receiving FSK signalling tones at the rate of 1 200 bit/s ± 1 %.

Test: Compliance is under study.

4.1.5.3 Levels

Requirement: The TE shall be capable of correctly receiving FSK signalling tones with levels within the range -8 dBV to -36 dBV, and with a twist between the mark and space tones not exceeding 6 dB.

Test: Compliance is under study.

4.1.5.4 Unwanted signals

Requirement: The TE shall correctly receive FSK signalling tones of correct frequency and level in the presence of unwanted voice band (300 Hz to 3 400 Hz) signals with a total power not exceeding a level 25 dB below the total power level of the FSK signalling during channel seizure.

Test: Compliance is under study.

4.1.6 Timing requirements

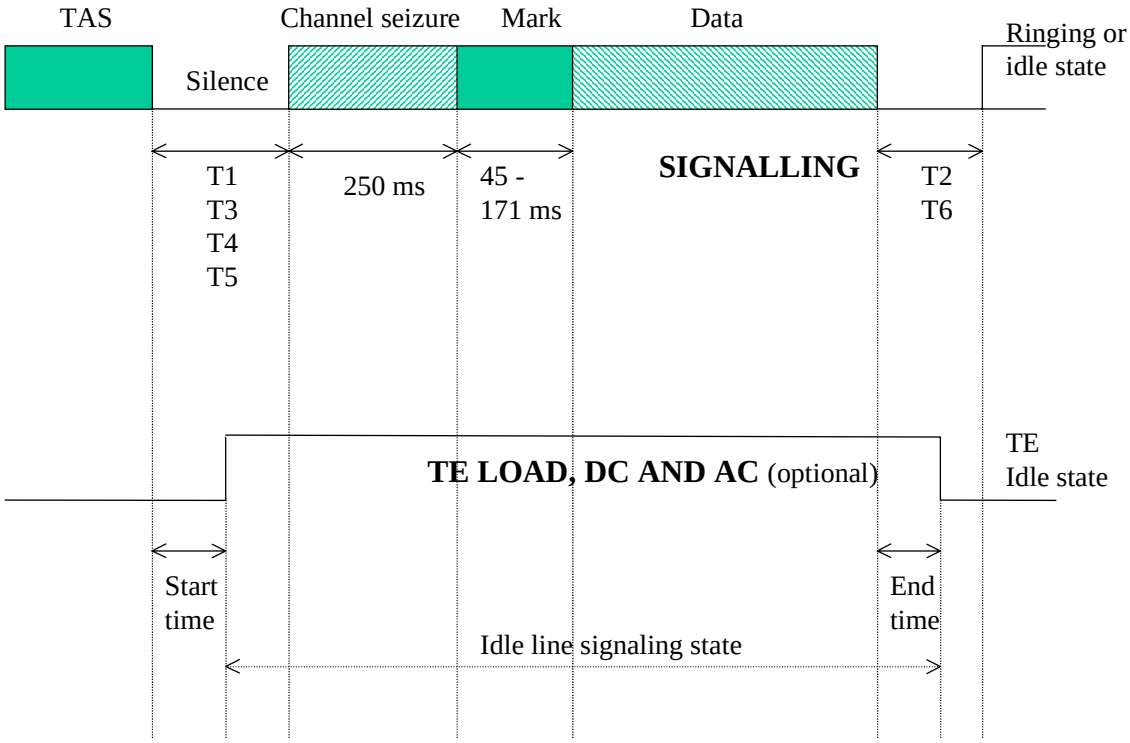

Figure 2: Timing illustration

The values of timing parameters T0, T1, T2, T3, T4, T5 and T6 are defined in EN 300 659-1 [1].

4.1.6.1 Start time

Requirement: The TE shall enter the idle-line signalling state and be ready to receive FSK data transmission within one or more of the following time periods measured from the end of the TAS or the first ring pattern (see figure 2):

a) 45 ms when a TAS of type DT-AS or LR + DT-AS is used;

b) 500 ms when a TAS of type RP-AS or alerting signal of type "first ring pattern" is used.

Test: Compliance shall be by supplier's declaration.

4.1.6.2 End time

Requirement: The TE shall leave the idle-line signalling state and revert to the idle state within 150 ms from when the FSK data transmission has been completely signalled (see figure 2).

Test: Compliance shall be by supplier's declaration.

4.1.6.3 Timeout - Channel seizure not received

Requirement: If Channel seizure signal is not received the TE shall revert to the idle state within 2,15 s from the end of the TAS.

Test: Compliance is under study.

4.1.6.4 Timeout - message type byte not received

Requirement: If a message type byte is not received the TE shall revert to the idle state within 2,15 s from the end of the channel seizure signal.

Test: Compliance shall be by supplier's declaration.

4.1.6.5 Timeout - loss of carrier

Requirement: Where the TE is subjected to a reduction of the FSK signal level to below -50 dBV following normal reception of a channel seizure, the TE shall revert to the idle state within 150 ms.

Test: Compliance is under study.

4.1.6.6 Ringing arrival in the idle line signalling state

Requirement: The TE shall leave the idle-line signalling state within 150 ms of receiving a ring burst when in idle line signalling state.

Test: Compliance is under study.

4.2 Alerting method specific requirements

The TE shall enter an idle-line signalling state in response to a TE Alerting Signal (TAS) or first ring pattern applied to the TE via the NTP, and shall leave the idle-line signalling state when the data transmission is completed (see figure 1). The TE should respond to one or more of the different ways of alerting mentioned in clauses 4.2.1.1, 4.2.1.2 and 4.2.2.

The values of timing parameters T0, T1, T2, T3, T4, T5 and T6 are defined in EN 300 659-1 [1]. Other timing parameters are defined in clause 4.2.4, table 3 of the present document.

4.2.1 Data transmission associated with ringing

4.2.1.1 Prior to ringing

4.2.1.1.1 Dual Tone Alerting Signal (DT-AS)

Requirement: The TE shall correctly detect a DT-AS type of TAS, shall enter idle-line signalling state within T_D from the end of the TAS, and shall return to idle state within T_{res} from the end of the data transmission. The characteristics of DT-AS are specified in table 1.

Test: Compliance is under study.

NOTE: The TE may receive different DT-AS from the network to identify other services not specified in the present document.

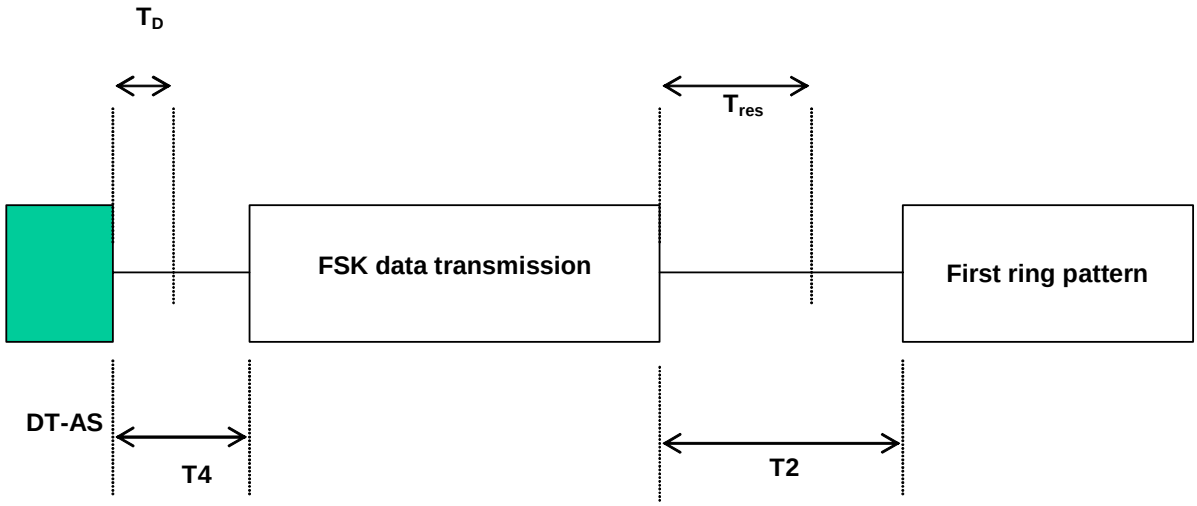

Figure 3: DT-AS alerting signal

4.2.1.1.2 Ringing Pulse Alerting Signal (RP-AS)

Requirement: The TE shall correctly detect a RP-AS type of TAS, shall enter idle-line signalling state within T_R from the end of the TAS, and shall return to idle state within T_{res} from the end of the data transmission. The characteristics of RP-AS are specified in table 2.

Test: Compliance is under study.

NOTE: The RP-AS may cause unwanted bell tinkle, depending on the type of terminal.

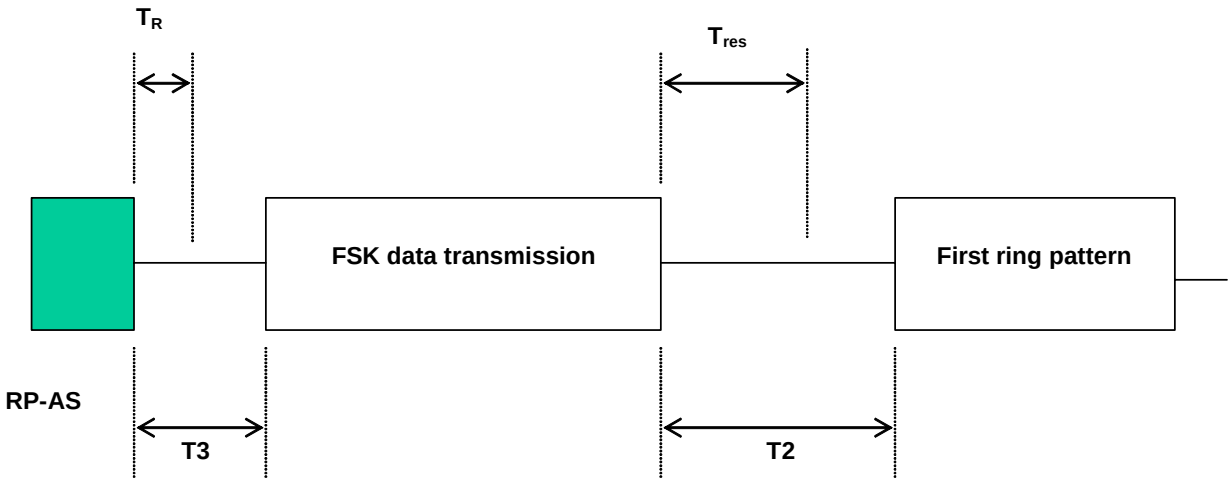

Figure 4: RP-AS alerting signal

4.2.1.1.3 LR + DT-AS

Requirement: The TE shall correctly detect a LR + DT-AS type of TAS, shall enter idle-line signalling state within T_D from the end of the TAS, and shall return to idle state within T_{res} from the end of the data transmission. The characteristics of DT-AS are specified in table 1.

Test: Compliance is under study.

NOTE: The polarity of the line may be reversed any time after the FSK data transmission.

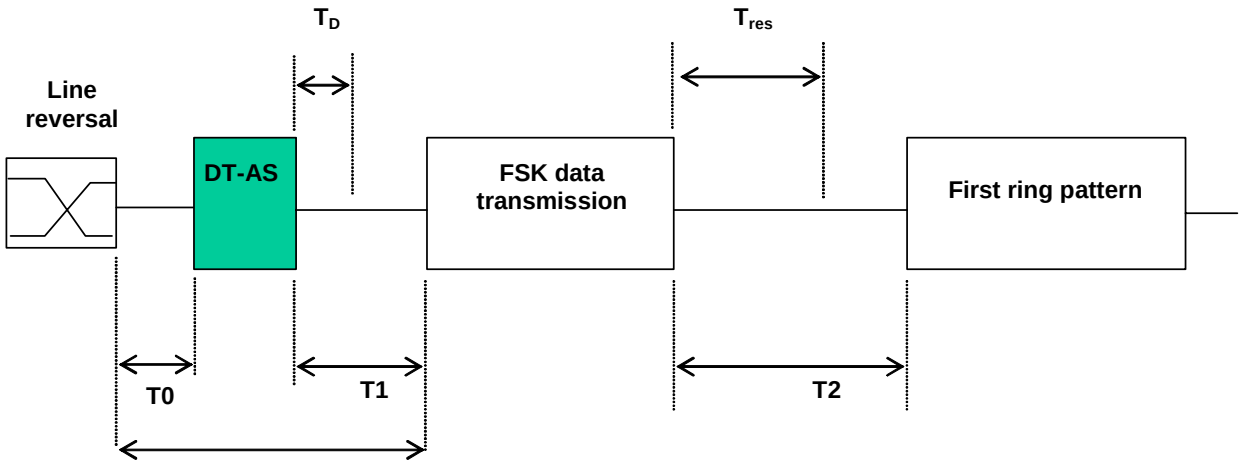

Figure 5: LR + DT-AS alerting signal

4.2.1.2 Data transmission during ringing

Requirement: The TE shall correctly detect a first ring pattern with a duration of 350 ms to 1 200 ms the signal having the same characteristics as the normal ringing signal.

NOTE: Although the structure of the first ring pattern is network specific it is assumed to have the following common characteristics:

- Each ringing pulse has a duration of not less than 350 ms.
- Any short silent period between ring pulses has a duration not more than 450 ms.

Test: Compliance is under study.

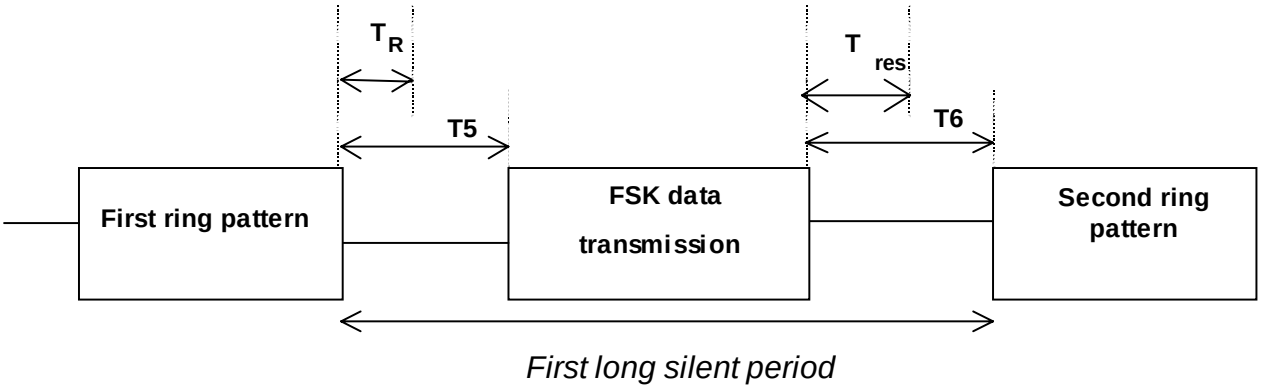

Figure 6: Data transmission during ringing

4.2.2 Data transmission not associated with ringing

Requirement: The TE shall meet the requirements for the appropriate TAS recognition defined in clause 4.2.1.1. Ringing will not follow the return to idle state.

Test: Compliance shall be checked by the appropriate test of clause 4.2.1.1.

4.2.3 TE alerting signals

4.2.3.1 Dual Tone Alerting Signal (DT-AS)

Requirement: The TE shall detect the DT-AS (see table 1) in the presence of unwanted voice band (300 Hz to 3 400 Hz) signals with a total power not exceeding 25 dB below the level of the received DT-AS tones.

Test: Compliance is under study.

Table 1: DT-AS signal characteristics

Nominal frequencies	2 130 Hz and 2 750 Hz, with an accuracy of ±0,5 %
Signal level	-9 dBV/tone to -40 dBV/tone
Twist	6 dB max
Duration	100 ms ± 10 ms
NOTE: In some networks the signal level may exceptionally increase to -4 dBV/tone.	

4.2.3.2 Ringing Pulse Alerting Signal (RP-AS) requirement

Requirement: The TE shall detect a Ringing Pulse Alerting Signal (RP-AS) as specified in table 2.

NOTE: The ringing frequency of 25 Hz or 50 Hz is network dependent.

Test: Compliance is under study.

Table 2: RP-AS signal characteristics

Frequency	25 Hz or 50 Hz	As for normal ringing signal
Amplitude	30 Vrms to 90 Vrms	As for normal ringing signal
Duration	200 ms to 300 ms	

4.2.4 Timer requirements

Table 3: On-hook Timers

Timer	Value	Description
T_D	0 ms to 45 ms	The time to enter the idle line signalling state when DT-AS or LR + DT-AS is used
T_R	0 ms to 500 ms	The time to enter the idle line signalling state when RP-AS or alerting by ring pattern is used (see note)
T_{res}	0 ms to 150 ms	The time to return to the idle state after data transmission
NOTE: A system allowing up to 450 ms between ring pulses in a pattern will "leave" only 50 ms until the data transmission starts.		

5 Datalink layer - data reception

The FSK data is transmitted to the TE in the form of a datalink packet consisting of several data fields of variable length. The structure of the datalink packet is specified in EN 300 659-1 [1].

5.1 Channel seizure

Requirement: The TE shall detect datalink packets with the following channel seizure field of length and fulfilling the data signals requirements:

- 300 alternating bits of mark-space (logical "1" and "0"), starting with a space.

Test: Compliance is under study.

5.2 Mark signal

Requirement: The TE shall detect datalink packets with the following Mark signal field length and fulfilling the data signals requirements:

a) 180 ± 25 mark (logical "1") bits; or

b) 80 ± 25 mark (logical "1") bits.

Test: Compliance is under study.

5.3 Message type

Requirement: The TE shall detect a datalink packet containing one of the data link message types shown in table 1 of EN 300 659-3 [3].

Test: Compliance is under study.

5.4 Message length

Requirement: The TE shall detect datalink packets with presentation layer messages of length 3 to 255 bytes.

Test: Compliance is under study.

NOTE: Although the maximum length of message earlier identified is 75 bytes, some of the present applications extend to 255 bytes. Existing TE intended for a maximum of 75 bytes message length can still be used for services not requiring longer messages.

5.5 Checksum

Requirement:

- The TE shall detect datalink packets with a valid checksum.
- The TE shall identify an incorrect checksum or a non-existent checksum.

Test: Compliance is under study.

NOTE: The checksum is validated by the TE, by calculating the modulo -256 sum of all the fields from the message type field to the checksum field inclusive and ignoring any carry from the most significant bit. A resultant sum of zero indicates a correct checksum.

6 Presentation layer - message interpretation

Requirement: The TE shall correctly interpret messages containing the mandatory parameter type(s) of the service the TE supports, and shall, if applicable, correctly interpret any optional parameters in the same message belonging to the same service.

Test: Compliance is under study.

7 Safety

Safety requirements are outside the scope of the present document. Safety requirements are published by CENELEC.

8 Electro Magnetic Compatibility (EMC)

EMC requirements are outside the scope of the present document.

Annex A (normative): DTMF based subscriber line protocol

A.1 Introduction

This annex specifies the characteristics for TE for connection to the Network Termination Point (NTP) of a PSTN interface providing display information, based on the DTMF subscriber line protocol as defined in EN 300 659-1 [1].

The basic TE attachment requirements are given in relevant access standards and the expected performance of TE is imposed in the network operator's interface publications.

The requirements are intended to ensure correct physical conditions on the line at the NTP and correct reception and detection of the DTMF codes. In addition, some requirements are included and indicated as optional; these requirements are intended to give guidance about matters which are of interest for practical and operational needs of the served subscriber/user.

The method of displaying the received information is not defined in this annex.

A.2 Definitions

DTMF: Dual Tone Multi-Frequency signalling system, according to ES 201 235 [2]

idle polarity: polarity of the feeding voltage between the a- and b-wire of the line in idle state; the idle polarity may be a-wire positive or a-wire negative with respect to b-wire

Network Termination Point (NTP): physical point at the boundary of the PSTN intended to accept the connection of a TE

Display Information Transfer (DIT) phase: phase in the protocol procedure during which the display information is transferred with DTMF codes according to ES 201 235 [2], with the DTMF transmitter in the PSTN exchange and the DTMF receiver in the TE

Display Information Transfer (DIT) state: physical and electrical condition of a TE during the DIT phase of the DTMF based protocol

DIT-only TE: Terminal Equipment with the function of only receiving and displaying the provided display information, e.g. intended to be connected in parallel with TE (with or without such function).

NOTE: For this type of TE, only the quiescent condition and the DIT state condition are applicable.

A.3 Requirements

A.3.1 General

A.3.1.1 Requirements in all conditions except the DIT state

In all conditions of the TE except the DIT state, the requirements are given in relevant access standards and the expected performance of TE is imposed in the network operator's interface publications.

A.3.1.2 Requirements in the DIT state

In the DIT state, the requirements are given in relevant access standards and the expected performance of TE is imposed in the network operator's interface publications.

A.3.1.3 Additional requirements in all conditions

The requirements shall be met independent of the polarity of the line feeding voltage (according to the basic TE attachment requirements, but the polarity reversals in quiescent condition and in DIT state shall be detected and interpreted as defined in clauses A.3.2.1 and A.3.4.1 respectively.

A.3.1.4 Optional requirements related to parallel connectivity capability

The parallel connectivity capability of TEs, as determined by parameters in quiescent condition and during ringing, is also applicable for TEs with DIT function, in which for the DIT state the following applies:

a) for the parameters "DC resistance" and "AC impedance" the values in the DIT state are defined in clauses A.3.2.2 and A.3.2.3 respectively; these values are such that up to 5 TEs with DIT function can be connected in parallel;

b) the values in the DIT state of the parameters "DC resistance to earth" and "impedance for ringing signals" shall be equal to or greater than the values in the quiescent condition.

For DIT-only TE, it is of special importance that this type of TE will have, both in quiescent condition and in DIT state, such parameter values, that this type of TE does not influence in a noticeable way the parallel connectivity capability at the NTP.

A.3.2 Establishing the DIT state

A.3.2.1 Transition to the DIT state

Starting from the quiescent condition of the TE and feeding voltage with idle polarity, the DIT state shall be established within 200 ms after the reversal of the feeding voltage polarity and the reversed voltage has reached a level of higher than 30 V dc.

A.3.2.2 DC resistance in the DIT state

In the DIT state the DC resistance between the line terminals shall not be less than 90 kΩ.

NOTE: In some networks it is required that the DC resistance between the line terminals is between 90 kΩ and 110 kΩ.

A.3.2.3 AC impedance in the DIT state

In the DIT state the AC impedance in the frequency range of 300 Hz to 3 400 Hz shall be greater than 1 800 Ω and preferably lower than 2 400 Ω.

A.3.3 DTMF code reception in the DIT state

For the DTMF based subscriber line protocol of the DIT service, use is made of the DTMF signalling system according to ES 201 235 [2] with the transmitter function in the exchange and the receiver function in the TE. Receipt of all 16 DTMF code signals shall be supported. The requirements in ES 201 235 [2], parts 1 and 3, clause 3.3 shall be met.

A.3.4 End of the DIT state

A.3.4.1 Leaving the DIT state

When the display information transfer is completed, the TE shall leave the DIT state and return to the quiescent condition with the ringing function, if provided, enabled, unless the TE has already left the DIT state while being forced to the loop condition (i.e. by answering the call).

A.3.4.2 Criteria for leaving the DIT state

The transfer of number information is to be regarded as completed when one of the following criteria is met:

a) the DTMF code <C> (end code) is received;

b) ringing signal is received;

c) the feeding voltage polarity is reverted back to the idle polarity;

d) no DTMF code is received within 1 s after the reversal of the feeding voltage polarity and the reversed voltage has reached a level of higher than 30 V DC;

e) after receipt of a DTMF code the DTMF pause condition is present for more than 1 s.

At least the criteria d) and e) shall be supported by the TE. These two criteria will guarantee in both normal and abnormal display information transfer procedures, that the DIT state is left before or as soon as possible after the line comes into loop condition because the call is answered by one or another TE connected at the NTP.

History

Document history		
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