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Part 7: Locally generated information tones**

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Foreword

Part 7 of this Interim European Telecommunication Standard (I-ETS) was produced by the Terminal Equipment (TE) Technical Committee of the European Telecommunications Standards Institute (ETSI).

An ETSI standard may be given I-ETS status either because it is regarded as a provisional solution ahead of a more advanced standard, or because it is immature and requires a "trial period". The life of an I-ETS is limited to three years after which it can be converted into an ETS, have its life extended for a further two years, be replaced by a new version, or be withdrawn.

This is the seventh Part of an I-ETS which is currently comprises eight Parts:

- Part 1: General (I-ETS 300 245-1 [3]);
- Part 2: PCM A-law, handset terminals;
- Part 3: PCM A-law, loudspeaking and handsfree function;
- Part 4: Interface for additional equipment;
- Part 5: Wideband coding handset functions;
- Part 6: Wideband coding loudspeaking and handsfree telephony;
- Part 7: Locally generated information tones;**
- Part 8: Terminal application of 16 kbit/s speech coding algorithm.

The large number of services and facilities offered by the Integrated Services Digital Network (ISDN) requires that many items of information be provided to the human user in order to describe call progress, and to invite the user to react as appropriate. Related data, controlled by the network, are either displayed on the user's terminal or transmitted as tones or voice announcements through a B-channel.

The requirements concerning connection of the acoustic receiving transducer to the B-channel are detailed in I-ETS 300 245-1 [3], subclause 5.3.1.

The local generation of tones under control of messages received through the D-channel is another possibility.

This option allows the use of a man-machine procedure similar to the case of conventional analogue telephony terminals and/or replacement of network provided tones by a set of locally generated tones.

Proposed announcement date	
Date of adoption of this I-ETS:	10 November 1995
Date of latest announcement of this I-ETS (doa):	29 February 1996

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1 Scope

Part 7 of this I-ETS defines the use of a set of standardized tones which, as an option, may be generated by a digital telephony terminal as specified in I-ETS 300 245-1 [3], subclause 5.3.2.

This Part includes related information and requirements concerning the:

- definition and use of tones;
- control of tone generation;
- tone characteristics.

This I-ETS applies to terminals for connection to the ISDN basic access of the coincident S and T reference point.

2 Normative references

This Part of the I-ETS incorporates, by dated or 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 Part of this I-ETS only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

- [1] ETS 300 102-1 (1990): "Integrated Services Digital Network (ISDN); User-network interface layer 3, Specifications for basic call control".
- [2] ETS 300 085 (1990): "Integrated Services Digital Network (ISDN); 3,1 kHz telephony teleservice, Attachment requirements for handset terminals (Candidate NET 33)".
- [3] I-ETS 300 245-1: "Integrated Services Digital Network (ISDN); Technical characteristics of telephony terminals, Part 1: General".
- [4] ETS 300 153: "Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN basic access (Candidate NET 3, Part 1)".
- [5] ITU-T Recommendation P.57 (1993): "Artificial ears".
- [6] IEC Publication 651: "Sound level meters".

3 Definitions and use of tones

In order that a user always hears an identical tone in various European countries, when the call meets the same situation, a convenient set of harmonized tones should be used.

This facility is an option as specified in I-ETS 300 245-1 [3], subclause 5.3.2. The user should be provided with a means of implementing this option.

The set of tones should be kept to a minimum, while providing the user with a sufficient knowledge of the situation, in order that he can determine which specific behaviour or action is required.

For the purposes of this Part of this I-ETS, the following definitions apply. The set of standardized tones and their meaning in the ISDN terminal application is described as follows:

dial tone: Indicates that the terminal or the network is ready to receive call information and invites the user to start dialling.

special dial-tone: An alternative to the dial tone that reminds the user that special conditions apply to his/her terminal (a local or network provided facility/supplementary service has been activated).

ringing tone: Indicates that the outgoing call is presented to, and acknowledged by, at least one compatible terminal at the called party's premises (however, this terminal may already be engaged in another call).

busy tone: Informs the caller that the called party is busy.

congestion tone: Informs the caller that a temporary network congestion, error, etc., rejects his call attempt.

call waiting tone: An indication advising the called party, already engaged in another telephony call, that his terminal has received a new incoming call.

special information tone: Informs the caller that an auditory or visual announcement clarifying the call progress will normally follow. This may indicate call diversion, number not valid, etc, ...

invalid attempt indication: An indication that the call attempt has been rejected by the network for some special reason. e.g. error, fault, unallowed number. It informs the user that his call attempt has not been successful and should not normally be tried again. Additional information on the nature of the failure may be provided. The special information tone is used for this purpose. Where the special information tone is not available the congestion tone shall be provided.

call reject indication: An indication that the call attempt (or established call) has met a situation where it should be cleared. Busy tone or congestion tone are used for this purpose.

NOTE: When the digital telephony terminal is connected to an ISDN providing detailed data about call rejection (through a "cause" information element), the call reject indication may be used with a more restrictive meaning indicating that the call attempt was valid and may be tried again, taking into account additional information which may be displayed on the terminal. The "causes" associated with this restrictive meaning are listed in annex A (normative).

4 Tone classification and minimum requirements

The tones, with their conditions for delivery, may be classified as follows:

Type 1: tones which could not be received from the network since a B-channel is not yet or no longer available;

Type 2: tones generated in place of network-provided tones;

Category A: tones which may be useful to keep the same man-machine procedure, e.g. in the case of conventional analogue terminals;

Category B: tones which are considered as basic requirements for the telephony service;

Category C: additional tones.

Table 1 gives the type and category of every local tone relating to its condition for delivery.

Table 1: Type and category of local tones relating to conditions for delivery

Tones	Case/condition	Type	Category	NOTE
Dial tone	en-bloc sending	1	A	
	overlap sending	2	B	
Special dial tone	special facility activated	1 or 2	C B	2
Ringling tone	called terminal alerting	2	B	
Busy tone	Network Determined User Busy (NDUB)	2	B	
	User Determined User Busy (UDUB)	2	B	
	call rejected by the network/time out (no answer from the called terminal)	2	B	
	call rejected by the called user (with or without user-to-user signalling message)	2	B	
	call rejected by the called terminal (free but without B-channel available)	2	B	
Congestion tone	call rejected by the network (temporary congestion or failure)	2	B or C	1
	call attempt rejected by the calling terminal (e.g. not ready, no B-channel available)	1	C	
	call cleared by distant user (previously established by any user)	1	A	2
Call waiting tone	additional call set-up received	1 or 2	C	3
Special information tone	call cleared by the network (invalid attempt)	1	B or C	4
NOTE 1: If this tone is not available, it shall be replaced by the busy tone (B).				
NOTE 2: If the terminal can set-up a new call, dialling tone may be used as an alternative.				
NOTE 3: As an alternative, the terminal may generate a low level audible alerting signal.				
NOTE 4: A locally generated special information tone should only be used where there is no B-channel tone and message available.				

Any terminal providing the local tone generation option specified in this I-ETS shall generate, as a minimum, tones belonging to type/category 2/B.

Provision of tones 1/A, 1/C and 2/C is subject to additional options.

Conformance shall be checked subjectively.

5 Control of tone generation

Tone generation shall be controlled by the terminal, taking into account human user actions and D-channel messages.

5.1 Dial tones (normal or special)

5.1.1 En-bloc sending

If en-bloc sending is used, the dial tone shall start when the user lifts the handset (or performs an equivalent action, e.g. in the case of a loudspeaking terminal). Dial tone shall be switched off when one of the following conditions occurs:

- a) handset replaced (or equivalent);
- b) entry of the first address digit or, where automatic dialling is used, action on a related key.

NOTE: When the user dials (manually or automatically) without lifting the handset, and initiates the call set-up by any action, the application of the dial tone is not required.

The application and removal of dial tone when en-bloc sending is used shall be checked subjectively.

5.1.2 Overlap sending

If overlap sending is used, the dial tone shall be applied after receipt of the "SETUP ACK" message as defined in ETS 300 102-1 [1].

Dial tone shall be switched off when one of the following conditions occurs:

- a) handset replaced (or equivalent);
- b) entry of the first address digit or, where automatic dialling is used, action on a related key;
- c) receipt of a "DISCONNECT", "RELEASE" or "RELEASE COMPLETE" message, as defined in ETS 300 102-1 [1].

The application and removal of dial tone when overlap sending is used shall be checked subjectively.

5.2 Ringing tone

Ringing tone shall be applied after the receipt of an "ALERTING" message, as defined in ETS 300 102-1 [1], which contains the appropriate call reference value. It shall be switched off when one of the following conditions occurs:

- a) receipt of a "CONNECT MESSAGE", as defined in ETS 300 102-1 [1];
- b) receipt of a "DISCONNECT", "RELEASE" or "RELEASE COMPLETE" message, as defined in ETS 300 102-1 [1];
- c) handset is replaced (or equivalent).

The generation and removal of ringing tone shall be checked subjectively.

5.3 Call reject and invalid attempt

5.3.1 Receipt of network messages

According to the "cause" information element, the appropriate tone of table A.1 in annex A shall be selected and generated after receipt of a "DISCONNECT", "RELEASE" or "RELEASE COMPLETE" message, as defined in ETS 300 102-1 [1], which contains the appropriate call reference value.

5.3.2 Call cleared by remote user

At the end of an established call, cleared by the remote user, the telephony terminal may generate:

- a) congestion tone, when the local user does not immediately go on-hook;
- b) dial tone, when the terminal is permitted to initiate a new call.

5.3.3 No B-channel available

A terminal which is able to monitor the availability of the B-channels may, if both channels are already engaged by other terminals, generate congestion tone when the user initiates a new call attempt.

5.3.4 Termination of tone

Any tone present shall be switched off when the user replaces the handset (or equivalent).

The generation and removal of the tones shall be checked subjectively.

5.4 Call waiting tone

Call waiting tone shall be applied after the receipt of an incoming compatible call when the telephony terminal is already engaged in a call. The tone shall be superimposed on (added to) the receive path.

Call waiting tone shall be switched-off when the user answers or rejects the second call, or when the network clears the waiting call.

The generation of the tone and duration of the cadence shall be checked subjectively at the terminal under test when D-channel messages are sent to the terminal indicating that a second call is waiting.

The removal of the tone shall be checked subjectively when the appropriate action is performed or an appropriate D-channel message is received.

6 Tone characteristics

When a digital telephony terminal supports the local tone generation option, the characteristics of the delivered tones shall meet the requirements described in the subclauses 6.1 to 6.4.

However, until a date to be determined, it may generate, in addition, as an option, a set of tones conforming to one of the sets of national requirements specified in ETS 300 085 [2], annex B. It shall be possible to switch from one set to the other set of tones by a simple operation accessible to an unskilled customer.

6.1 Sound pressure level

When measured by an artificial ear the sound pressure level shall be $-5 \text{ dBPa} \pm 4 \text{ dBPa}$ (each sine wave) for a handset terminal when the Receive Loudness Rating (RLR) is at the nominal value. The level may be altered by the operation of a user-controlled volume control.

Compliance shall be checked by the tests described in annex B, subclause B.2.1.1 for continuous tones and in annex B, subclause B.2.2.1 for pulsed tones.

NOTE 1: The level for loudspeaking and handsfree terminals is for further study.

NOTE 2: The level where low acoustic impedance receivers are used is for further study.

6.2 Distortion

For handset terminals, the third harmonic distortion measured shall be lower than 5 %.

Compliance shall be checked for continuous tones as described in annex B, subclauses B.2.1.3 and B.2.2.3 for pulsed tones.

For special dial tone, only the fundamental frequency component of dial tone (425 Hz) shall be measured.

NOTE 1: The distortion for loudspeakers and headset terminals is for further study.

NOTE 2: The generation and removal of tones should not cause disturbing clicks.

6.3 Frequency and cadence

The frequency and cadence of the tones specified in this I-ETS shall be as specified in annex C

The tolerances for the frequencies shall be ± 25 Hz. The tolerances for the cadences shall be ± 10 %.

The frequency of each tone shall be checked as described in annex B, subclause B.2.1.2 for continuous tones or annex B, subclause B.2.2.2 for pulsed tones.

The pulse and pause timings shall be checked as described in annex B, subclause B.2.2.4.

For special dial tone, only the fundamental frequency component of dial tone (425 Hz) shall be measured. The difference between dial tone and special dial tone shall be checked subjectively.

6.4 Switching delay (informative)

The delay between the controlling event and the tone generation should be kept below 200 ms.

Annex A (normative): Selection of tones according to cause values

Table A.1 indicates which tone shall be generated according to the situation as described by the "cause" information element included in the D-channel message "DISCONNECT", "RELEASE" or "RELEASE COMPLETE", as defined in ETS 300 102-1 [1].

Table A.1

Cause value		Situation reference ETS 300 102-1 [1]	Tones			NOTES
class	cause number		Busy	Congestion	Special information	
000	1	Unallocated number			M	1
	2	No route to specified transit network			M	1
	3	No route to destination			M	1
	6	Channel unacceptable				N/A
	7	Call delivered in an established channel				N/A
	16	Normal call clearing		O		2
	17	User Busy (UDUB)	M			3
	18	No user responding (no terminal)			M	1
	19	No answer from user (user alerted)	M			3
	21	Call rejected by called user	M			3
	22	Number changed			M	1
	26	Non-selected user clearing				N/A
001	27	Destination out of order			M	1
	28	Invalid number format			M	1
	29	Facility rejected				N/A
	30	Response to status enquiry				N/A
	31	Normal, unspecified		O		2
	34	No circuit/channel available (NDUB)	M			3
	38	Network out of order (long period)			M	1
	41	Temporary failure of network		P		4
010	42	Switching equipment congestion			M	1
	43	Access information discarded			M	1
	44	Requested channel not available				N/A
	47	Resource unavailable, unspecified			M	1
011	58	BC not presently available			M	1
	all other	Service or option unavailable				N/A
100	all	Service or option not implemented				N/A
101	all	Invalid message (including "SUSPEND" and "RESUME")			M	1
110	all	Protocol error			M	1
111	127	Interworking, unspecified			M	1
NOTE 1: Where locally generated tones are used, the special information tone shall be mandatory (M). If a locally generated message cannot be given then the special information tone should be generated for a maximum of 10 seconds. An audible prompt inviting the user to read the displayed information is also a permitted option.						
NOTE 2: Provision of the congestion tone is an option (O). An other option is to deliver the dial tone as soon as the terminal is available to set up a new call.						
NOTE 3: Provision of the busy tone shall be a mandatory (M) requirement.						
NOTE 4: Congestion tone is preferred (P) but busy tone is an acceptable alternative.						
N/A: Provision of a tone in this situation is not applicable.						
Warning: The conditions for application of busy tone, congestion tone or special information tone given above differ from current practice in some networks, which could cause confusion when they are introduced. Care should be taken to inform the end users.						

Annex B (normative): Test specifications

B.1 General conditions for testing

B.1.1 Environment for tests

The environmental conditions for the testing laboratory and the power supply limitations can be found in ETS 300 153 [4].

B.1.2 Test equipment interface

The interface of the test equipment connected to the terminal under test shall be capable of providing the signalling and supervision necessary for the terminal to be working in all test modes. The connection of the test equipment to the terminal under test at the coincident S and T reference point shall be in accordance with ETS 300 153 [4].

B.1.3 Test equipment requirements

Artificial ear: The default artificial ear is the ITU-T Recommendation P.57 [5] type 1 artificial ear.

When measuring low acoustic impedance receivers the ITU-T Recommendation P.57 [5] type 3.2 artificial ear shall be used. The low leakage option shall be adopted. Sound pressure measurements shall be referred to the Ear Reference Point (ERP) by the correction characteristic specified in ITU-T Recommendation P.57 [5].

Sound level meter: The sound level measurement equipment shall conform to IEC Publication 651 [6], type 1. The 'I' detector characteristic shall be used.

B.2 Tone measurements

The handset shall be mounted in the Loudness Rating Guard-ring Position (LRGP) and the ear piece shall be sealed to the knife-edge of an artificial ear.

Using a suitable ISDN simulator, the terminal under test shall be placed in a condition so that each of the defined tones provided by the terminal are generated by appropriate D-channel messages and user actions.

B.2.1 Measurement of continuous tones

The terminal shall be set in a state where the relevant tone is being generated.

B.2.1.1 Sound pressure level

The sound pressure level (p) shall be measured by connecting a suitable measuring set to the artificial ear.

B.2.1.2 Frequency

The frequency (f) of the tone from the artificial ear shall be measured using a suitable measuring equipment.

B.2.1.3 Distortion

The r.m.s. values of the sound pressure p at the fundamental frequency and the third harmonic of the fundamental frequency of the tone in the artificial ear shall be measured selectively. The third harmonic distortion, D , expressed as a percentage shall then be calculated as follows:

$$D = \frac{p_3}{\sqrt{p_1^2 + p_3^2}} \times 100 \%$$

where p_1 and p_3 are the r.m.s. sound pressure levels for the fundamental and third harmonic frequencies respectively.

B.2.2 Measurement of pulsed tones

The terminal shall be set in a state where the relevant tone is being generated.

B.2.2.1 Level

The maximum r.m.s. level of the tone shall be measured.

B.2.2.2 Frequency

The frequency of the tone in the artificial ear shall be measured using suitable measuring equipment.

B.2.2.3 Distortion

The r.m.s. values of the sound pressure p at the fundamental frequency and the third harmonic of the fundamental frequency of the on period of the tone in the artificial ear shall be measured selectively. The third harmonic distortion, D , expressed as a percentage shall then be calculated as follows:

$$D = \frac{p_3}{\sqrt{p_1^2 + p_3^2}} \times 100 \%$$

where p_1 and p_3 are the r.m.s. sound pressure levels for the fundamental and third harmonic frequencies respectively.

B.2.2.4 Timing measurements

The start of the tone is defined as the instant when the instantaneous amplitude first rises above 50 % of its peak value.

The end of the tone is defined as when the instantaneous amplitude last falls to 50 % of its peak value.

Annex C (normative): Tone characteristics

C.1 General

The tone characteristics specified in this Part of the I-ETS are presented in the graphical format shown in figure C.1.

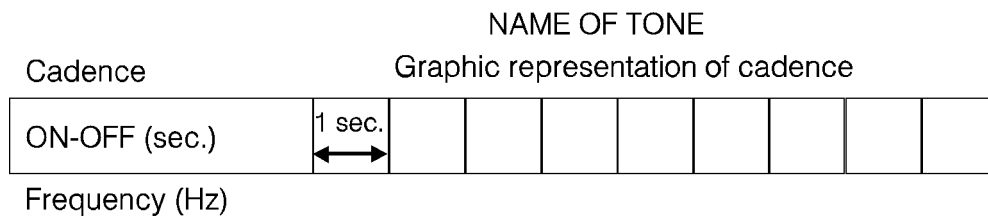


Figure C.1: Presentation form

C.2 Dial tone

If a special dial tone is required, the basis should be the same continuous 425 Hz tone as specified above. It should be clear that, in this state, the telephony terminal can be used for dialling as usual.

A special modification of the dial tone for reminding the user that particular conditions apply can be achieved in different ways:

- addition of a second tone with a frequency of 350 Hz (continuous or intermittent);
- short periodical interruptions of the dial tone (where the dial tone period is long enough and interruption short enough, typically 1 second on and 0,1 second off, so this tone can not be confused with congestion tone);

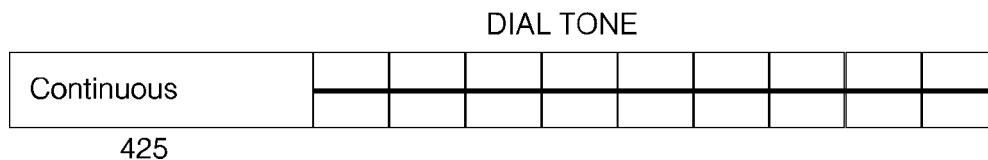


Figure C.2: Dial tone

C.3 Ringing tone

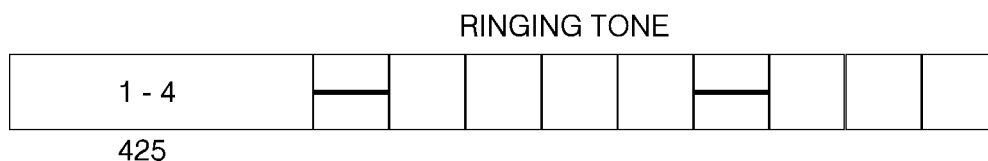


Figure C.3: Ringing tone

C.4 Busy tone

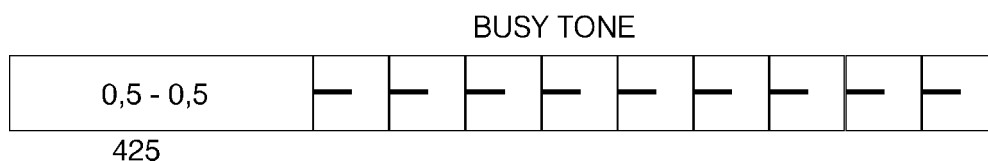


Figure C.4: Busy tone

C.5 Congestion tone

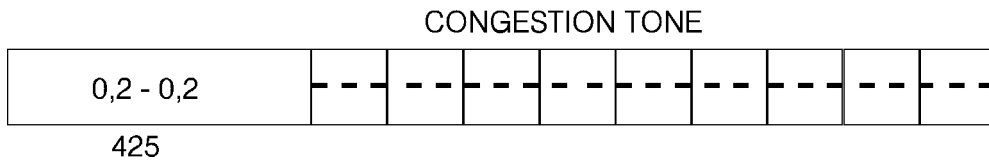


Figure C.5: Congestion tone

C.6 Special information tone

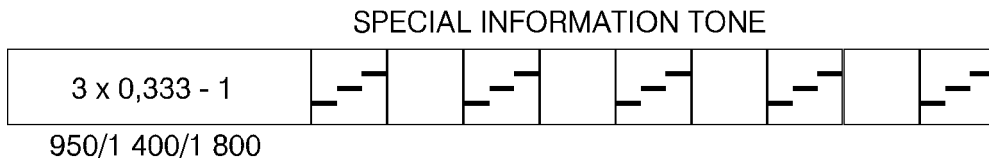


Figure C.6: Special information tone

C.7 Call waiting tone

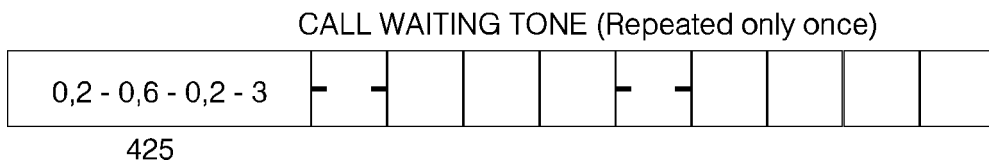


Figure C.7: Call waiting tone

History

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April 1993	Public Enquiry	PE 41:	1993-04-26 to 1993-09-17
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