SLOVENSKI STANDARD
SIST-TP ETSI/ETR 206 E1:2005

01-januar-2005

Javno komutirano telefonsko omreģje (PSTN) ï Veļ frekvenļ ni signalizacijski sistem za uporabo v telefonih s tipkami [priporoļ ilo CEPT T/CS 46-02 E (1985)]

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

Ta slovenski standard je istoveten z: ETR 206 Edition 1

ICS:

33.040.35 Telefonska omrežja Telephone networks

SIST-TP ETSI/ETR 206 E1:2005 en

ETSI

ETSI TECHNICAL REPORT

ETR 206

September 1995

Source: ETSI TC-SPS

Reference: DTR/SPS-00001-7

ICS: 33.020

Key words: PSTN, DTMF

Public Switched Telephone Network (PSTN); Multifrequency signalling system to be used for push-button telephones

[CEPT Recommendation T/CS 46-02 E (1985)]

ETSI

European Telecommunications Standards Institute

ETSI Secretariat

Postal address: F-06921 Sophia Antipolis CEDEX - FRANCE
Office address: 650 Route des Lucioles - Sophia Antipolis - Valbonne - FRANCE
X.400: c=fr, a=atlas, p=etsi, s=secretariat - **Internet:** secretariat@etsi.fr

Tel.: +33 92 94 42 00 - Fax: +33 93 65 47 16

*

Foreword

This ETSI Technical Report (ETR) has been produced by the Signalling Protocols and Switching (SPS) Technical Committee of the European Telecommunications Standards Institute (ETSI).

ETRs are informative documents resulting from ETSI studies which are not appropriate for European Telecommunication Standard (ETS) or Interim European Telecommunication Standard (I-ETS) status. An ETR may be used to publish material which is either of an informative nature, relating to the use or the application of ETSs or I-ETSs, or which is immature and not yet suitable for formal adoption as an ETS or an I-ETS.

This work was initiated by the restructuring of CEPT (Conférence Européenne des administrations des Postes et des Télécommunications) and the creation of ETSI. As reported to the 16th Technical Assembly of ETSI, CEPT has proposed to transfer some Recommendations to ETSI which pertain to standardization.

Technical Committee SPS decided to convert these Recommendations into ETRs without any modification. The reader should note that undated references may no longer be relevant.

Endorsement notice

The text of CEPT Recommendation T/CS 46-02 E (1985) was approved by ETSI as an ETR without any modification.

NOTE: Due to the unavailability of the endorsed CEPT Recommendation, it is reproduced on the following pages of this ETR.

Recommendation T/CS 46-02 (Innsbruck 1981, revised at Nice 1985)

MULTIFREQUENCY SIGNALLING SYSTEM TO BE USED FOR PUSH-BUTTON TELEPHONES

Recommendation proposed by Working Group T/WG 11 "Switching and Signalling" (CS)

Text of the Recommendation adopted by the "Telecommunications" Commission:

"The European Conference of Postal and Telecommunications Administrations,

considering

— that access to the services of the telephone network will be provided by telephone sets equipped with 12 or 16 push-buttons as recommended in CCITT Recommendation Q.11 [1] for multifrequency signalling;

— that the use of these telephone sets and their signalling technique for a simple type of end-to-end data transmission in the international as well as in national networks requires standardisation of the technique to be used;

— that the existing CCITT Recommendations on the subject do not yet assure the required standardisation;

— that the Administrations are in favour of harmonising telecommunications equipment and systems which could lead to a reduction in development and manufacturing cost for those industries that provide equipment for several countries,

recommends

the use by the member Administrations of the multifrequency signalling system for push-button telephones (including those of private automatic branch exchanges), conforming with the specifications set out hereafter."

Blank page

BASIC MULTIFREQUENCY PUSH-BUTTON (MFPB) SIGNALLING SYSTEM

1. SIGNALLING SYSTEM PRINCIPLES AND CODING

1.1. General

This section deals with the general characteristics of the signalling system and conforms to CCITT Recommendation Q.23 [2].

1.2. Signal frequencies and codes

1.2.1. *Signal frequencies*

The signal frequencies shall be selected from two separate groups within the speech band (300-3,400 Hz), a low group and a high group, each group providing four signalling frequencies. These frequencies shall be:

— low group frequencies: 697, 770, 852 and 941 Hz;

— high group frequencies: 1,209, 1,336, 1,477 and 1,633 Hz.

1.2.2. *Signal format*

Each signal shall consist of two and only two of the signalling frequencies; one frequency from each of the low and high groups. Both frequencies shall be applied simultaneously in parallel across the line.

1.2.3. *Signal code*

The 16 discrete signals shall be allocated as shown in Table 1 (T/CS 46-02) below.

Low group frequencies \ High group frequencies	Hz	1209	1336	1477	1633
	697	1	2	3	A
	770	4	5	6	B
	852	7	8	9	C
	941	*	0	#	D

Table 1 (T/CS 46-02).

Table 1 (T/CS 46-02) gives the full allocation of signal codes.

The system may be utilized with only 10 discrete signals, in which case the signals designated *, #, A, B, C and D will not be used; or with 12 discrete signals, in which case the signals A, B, C and D will not be used.

Note: The presentation in Table 1 (T/CS 46-02) corresponds to the actual lay-out of the push-buttons on the terminal equipment. The arrangements and designations of buttons are further specified in Recommendation T/CS 34-01 [3].

2. PUSH-BUTTON SENDER

2.1. Area of application and general

This Section deals with the multifrequency sender which is used in push-button telephones.

The sender has basically been specified for signalling to the exchange. However, regard has also been taken of the possible use of push-button telephones for end-to-end data transmission when manual operation applies.

The requirements stated in this section apply to an unregulated generator, i.e. a generator in which the output levels are not controlled by the line current.

2.2. Operational conditions

The sender is expected to operate under varying environmental conditions.

(a) A general purpose sender should operate in temperature controlled locations and partly temperature controlled locations, i.e. in normal living and working areas as well as entrances, staircases of buildings, factories and industrial plants, etc. The relevant climate conditions are described in Recommendation T/TR 02-06 [4]. The sender must meet the requirements within these conditions.

(b) A wide temperature range sender should operate in open air as well as sites with heat trap, i.e. telephone booths and similar installations. The relevant climatic conditions are described in Recommendation T/TR 02-06, Figure 3 [4]. The wide temperature range sender must meet the requirements within these conditions.

2.3. Signal output requirements

2.3.1. *Frequency tolerance*

The output frequencies shall be maintained within ± 1.5% of their nominal values. This tolerance shall also include the effect of different line impedances offered to the sender.

2.3.2. *Sending level*

The sending levels with a load resistance of 600 ohms shall be for:

option 1
— the high frequency group: − 9 dBm ± 2 dB
— the low frequency group: − 11 dBm ± 2 dB;

option 2
— the high frequency group: − 6 dBm ± 2 dB
— the low frequency group: − 8 dBm ± 2 dB;

with a restriction that the level of the higher frequency component of the compound signal shall be 2 ± 1 dB above the level of the lower frequency component.

2.3.3. *Unwanted frequency components*

2.3.3.1. When a signal is output:

(a) the total power level of all unwanted frequency components shall be at least 20 dB below the level of the low group frequency component of the signal;

(b) the level of any individual unwanted frequency component shall not exceed the following limits:
— in the frequency band 300-4,300 Hz: − 33 dBm;
— in the frequency band 4,300-28,000 Hz: − 37 dBm at 4,300 Hz, then falling at 12 bB/octave until 28 kHz;
— in the frequency band 28-70 kHz: − 70 dBm;
— in the frequency band 70-200 kHz: − 80 dBm;
— in the frequency band above 200 kHz: − 70 dBm.

2.3.3.2. When no signal is output, the level of any single frequency emitted from the sender to line shall not exceed − 80 dBm.

2.3.4. *Risetime*

The level of each of the two frequency components of the multifrequency signal shall be be within 1 dB of the final value within 7 ms from the time that any button is operated.

2.3.5. *Signal timing*

When a button is depressed, the signal is output to line. It continues until the button is released.

If the signal output is automatically timed, the duration of the signal shall be 70 ± 5 ms excluding risetime. In this case, the interdigital pause shall have a minimum value of 65 ms.

Note 1. Frequency tolerance

The tolerance specified in CCITT Recommendation Q.23 [2] is 1.8%. However, it was considered that 1.5% could be achieved in practice without any difficulty for the operating conditions specified in Section 2.2.

Note 2. Sending level

The lower sending levels are based on the application of CCITT Recommendation Q.15 [5] to the use of push-button telephones for end-to-end data transmission. Assumptions were made for average power losses and activity factors.

The pre-emphasis of 2 dB is a compromise between different national requirements. A tolerance of 1 dB was specified because it can be assumed that the drift in the power levels of the two single frequency components will be correlated.

Note 3. Unwanted frequency components

In § 2.3.3.1. the requirement (a) is related to the performance of the multifrequency signalling system itself. The requirement (b) is to avoid interference to this and other inband signalling systems and other channels in multiplex systems.

The specification in § 2.3.3.2. assures that none of the frequencies is audible during the conversation condition.

Note 4. Risetime

While a button is moving from the undepressed to the depressed position, the direct current and alternating current characteristics of the telephone set are changed, which will cause transients. The transients and the characteristics of the two-frequency signal limit the accuracy with which the risetime can be measured. Further, the time at which the button is operated may be difficult to identify. A firmer requirement than 7 ms could therefore hardly be verified in practice.

The amplitude of the transients depends upon the characteristics of the sender, the local line and the exchange feeding bridge. Although a limitation of the transients is necessary, it has not yet been possible to specify maximum values.

Two factors must be taken into account when specifiying the amplitude and duration of transients:

(a) for signalling to the exchange the influence of transients on the receiver performance must be limited;

(b) for the purpose of data transmission, Administrations must ensure that in practice (i.e.: when the telephone, sender, local line and feeding bridge are associated) the amplitude and duration of transients at the output of the exchange feeding bridge does not significantly increase the level of the mean power transmitted to the national network.

Note 5. Signal timing

Provision is made here for the timing of signals from the sender to be achieved in either of two ways. Either the signal duration is controlled solely by the length of time the keypad button is depressed, or the sender itself may exert control on the signal duration in the manner specified.

2.4. Electrical characteristics

2.4.1. *Impedance*

The return loss of the sender against a pure resistance of 600 ohms shall be at least 14 dB in the frequency band 300-3,400 Hz.

2.4.2. *Speech suppression*

When a button is depressed the sending efficiency of the telephone set (from microphone to line) shall be decreased by at least 60 dB.

2.4.3. *Impedance unbalance to earth*

The impedance unbalance to earth measured in accordance with the principle of measurement in Recommendation Q.45 [6] shall be not worse than or equal to:

— in the frequency band 40- 300 Hz: 40 dB;
— in the frequency band 300- 600 Hz: 50 dB;
— in the frequency band 600-3,400 Hz: 55 dB.

During the measurement the telephone set shall be placed on a metallic surface which is connected to earth potential.

2.4.4. *Direct current condition*

The sender shall be powered by the line current feed. The sender shall function correctly with either normal or reversed current feed.

2.4.5. *Overvoltage protection*

The sender shall be adequately protected, in accordance with national requirements, against overvoltage, e.g. lightning, with buttons either operated or non-operated.

2.4.6. *Dial tone*

The sender shall operate correctly in the presence of dial tone.

Note 1. Impedance

The return loss is specified against a pure resistance of 600 ohms as this is in accordance with international practice and maintains a constant reference impedance throughout the specification. However, it is recognised that higher impedances are more appropriate for a number of national networks.

Note 2. Direct current conditions

The current feeding systems used by Administrations can differ significantly to the extent that it is not possible to specify requirements other than those stated in § 2.4.4. However, in order to facilitate the realisation of a common design of sender to meet the requirements of different direct current feeding systems to be used with push-button telephones, the following information is provided.

i) Minimum and maximum conditions of the feeding systems in different countries are given in Table 2 (T/CS 46-02) below. The column *minimum current* relates to the current needed to hold the connection.

ii) The minimum and maximum conditions for each system can be represented by straight lines in a U/I diagram, Figure 1 (T/CS 46-02):
maximum condition $U = U_{max} - I \cdot R_{min}$
minimum condition $U = U_{min} - I \cdot R_{max}$

Country	Battery voltage (V)		Total resistance of feeding bridge and line		Minimum current (mA)
	min.	max.	min.	max.	
Belgium	44	52	400	1,600	20
Denmark	44	56	450	2,480	15.3
Finland 1	44	53	700	2,500	15
Finland 2	56	66	900	2,700	18
France 1	45	53	300	1,820	12
France 2	90	106	1,400	2,800	12
FR Germany	57	64	1,260	3,240[1]	17
Italy	44	52	720	3,010	12[2]
Netherlands	42	56	640	2,140	16
Norway	44	52	500	2,000	17
Spain 1	44	52	300	2,340	10
Spain 2	44	56	500	1,856	15
Sweden 1	31	45	1,000	2,200	11
Sweden 2	42	56	1,600	3,400	9.5
Switzerland 1	44	54	700	1,700	21
Switzerland 2	56	66	1,000	2,000	22.5
United Kingdom	45	52	360	1,450	25

Table 2 (T/CS 46-02).

[1] This includes the resistance of the telephone.
[2] This value also ensures the proper functioning of the meter at the subscriber's premises.

The area between these lines represents all possible feeding conditions for the sender. The part of this area with currents smaller than the minimum current should not be entered by the U/I curve of the sender. For the systems in Table 2 (T/CS 46-02), the lowest points of this forbidden area have been calculated, and are shown in Table 3 (T/CS 46-02).

iii) A curve through the lowest points as shown in Figure 1 (T/CS 46-02) represents the lower boundary of the forbidden area B, for a sender which is suitable for all systems in Table 2 (T/CS 46-02). The other boundaries for area B are a vertical line starting in the point with the highest minimum current (25 mA) and lines representing the extremes in minimum feeding conditions (S_1 and S_2).

iv) For the systems mentioned in Table 2 (T/CS 46-02); the upper limits are determined by the extremes in maximum feeding conditions.

v) Area C represents conditions which will not occur during normal operation.

vi) For a sender suitable for all systems in Table 2 (T/CS 46-02), the meaning of the areas is as follows.
— For all conditions represented by the part of the U/I curve in area A, all requirements should be fulfilled.

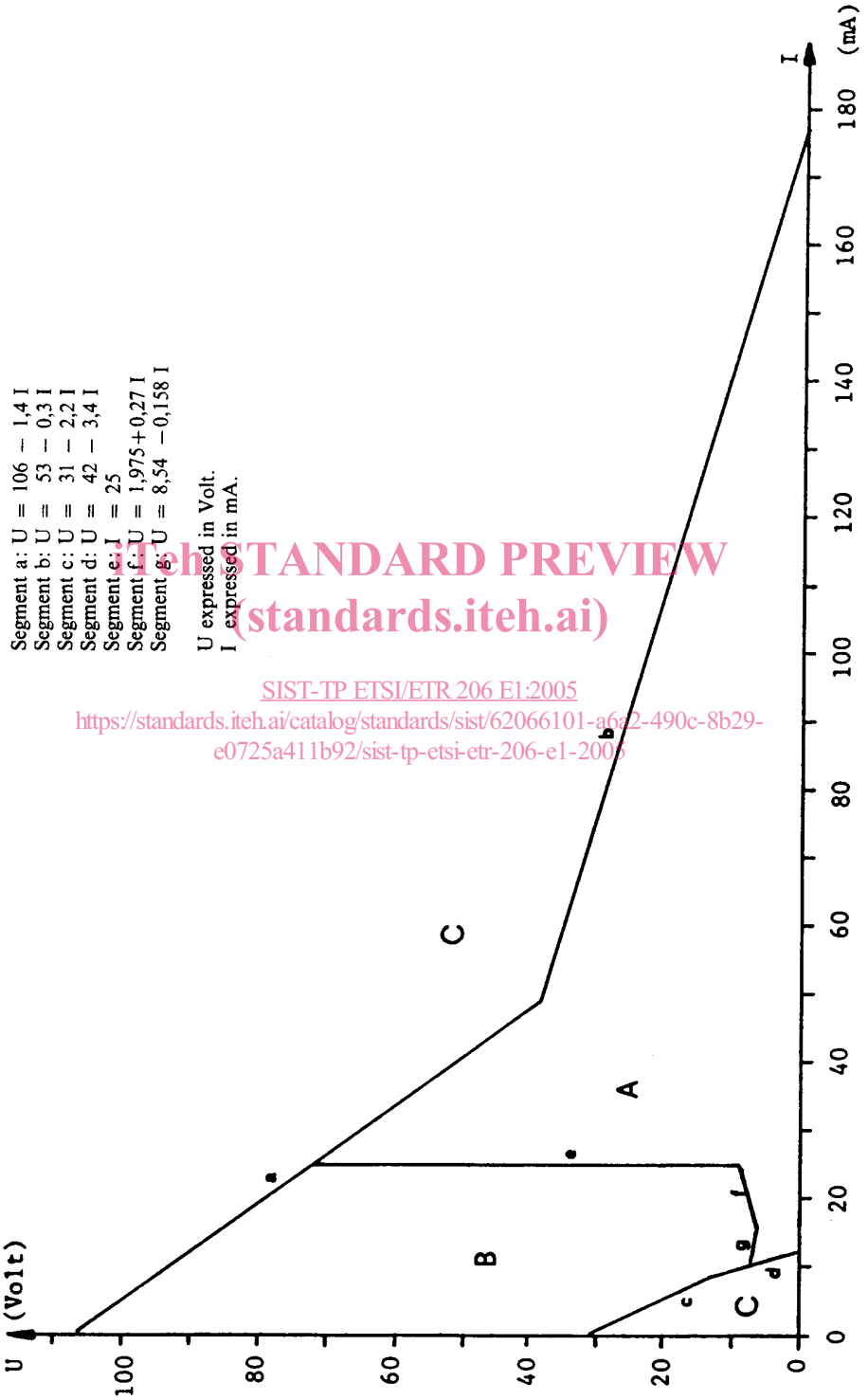

Figure 1 (T/CS 46-02).