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Javno komutirano telefonsko omreģje (PSTN) ï Priklju̧itvene zahteve kategorije II za dupleksne modeme za hitrosti 9600 b/s ali 4800 b/s, standardizirane za uporabo v PSTN

Public Switched Telephone Network (PSTN); Category II attachment requirements for 9 600 or 4 800 bits per second duplex modems standardised for use on the PSTN (Candidate NET 25)

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Foreword

This European Telecommunications Standard (ETS) has been produced by the Terminal Equipment (TE) Technical Committee of the European Telecommunications Standards Institute (ETSI). The text of this ETS may be utilized, wholly or in part, for the establishment of NET 25.

This ETS contains the technical requirements for approval to Category II of 9600 or 4800 bits per second duplex modems standardised for use on the Public Switched Telephone Network (PSTN). Testing and approval to Category II is applicable only at the request of the applicant. These requirements are based upon, and do not conflict with, CCITT Recommendation V.32 [3] (9600 bits per second duplex modem standardised for use on the General Switched Telephone Network, 1988).

Additionally, requirements are included relating to end-to-end interoperability over PSTN connections. Such requirements are in excess of the CCITT Recommendations.

Except where otherwise indicated a modem which complies with CCITT Recommendation V.32 [3] should always meet the requirements of this ETS which relate to parameters specified in that CCITT Recommendation.

Clause 4 of this ETS references the requirements common to both Category I and Category II modems, which are contained in Clause 4 of ETS 300 114 [2]. The definitions for Category I and Category II modems can be found in the foreword of ETS 300 114 [2].

Clause 5 of this ETS contains Category II requirements specific to 9600 or 4800 bits per second duplex modems. In the case of certain functions common to a number of different types of modem (e.g. Auto-answering sequence) reference is made to Clause 5 of ETS 300 114 [2], which contains the relevant requirements.

Every ETS prepared by ETSI is a voluntary standard. This ETS has been prepared as a candidate NET which may be transposed, in whole or in part, into a mandatory NET by the Technical Recommendations Application Committee (TRAC). It therefore contains text concerning type approval of the equipment to which it relates. This text should be considered only as a guidance and does not make this ETS mandatory.

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1 Scope

This ETS specifies the technical characteristics to be met by modems seeking Category II approval for duplex operation over the PSTN at 9600 or 4800 bits per second. The modulation scheme specified is that described in CCITT Recommendation V.32 [3].

The term "modem" in the context of this ETS includes all physical implementation practices for a voice band modem, which are galvanically connected to the PSTN.

This ETS specifies six modes of operation, each with five modes of use (see subclause 5.2).

This ETS also contains descriptions of the tests to be performed in order to confirm compliance with the functional requirements contained herein. A general description of the test conditions and test requirements is given in Annex A (normative).

2 Normative references

This ETS incorporates by dated and undated reference, provisions from other publications. These 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 amendments or revision. For undated references the latest edition of the publication referred to applies.

[1] ETS 300 001: "Attachments to the Public Switched Telephone Network (PSTN); General technical requirements for equipment connected to an analogue subscriber interface in the PSTN, (Candidate NET 4)".

[2] ETS 300 114 (1990): "Attachments to the Public Switched Telephone Network (PSTN); Basic attachment requirements for modems standardized for use on the PSTN".

[3] CCITT Recommendation V.32 (1988): "A family of 2-wire duplex modems operating at data signalling rates of up to 9600 bit/s for use on the general switched telephone network and on leased lines telephone-type circuits".

[4] CCITT Recommendation V.25 (1988): "Automatic answering equipment and/or parallel automatic calling equipment on the general switched telephone network including procedures for disabling of echo control devices for both manually and automatically established calls".

[5] CCITT Recommendation S.33 (1984): "Standardisation of an international text for the measurement of the margin of start-stop machines using International Alphabet No 5".

[6] CCITT Recommendation O.153 (1988): "Basic parameters for the measurement of error performance at bit rates below the primary rate".

3 Definitions and abbreviations

3.1 Definitions

For the purpose of this ETS the definitions in ETS 300 114 [2] apply, together with the following.

NOTE: In addition to the following definitions some other specific definitions are applicable (see subclauses 5.8.1 and 5.11.1 of this ETS).

Answer mode: when calls are established with automatic facilities, a standard answer mode shall be used by the modem at the answering station. This mode consists of conventional characteristics (e.g. use of high channel carrier frequency or particular scrambler generating polynomial) complementary to those used

in the standard call mode by the modem at the calling station, in order to ensure proper connection and inter-working.

If calls are established on the PSTN by operators, or for leased line operation, bilateral agreement on the use of call mode and answer mode shall be necessary.

Call mode: when calls are established with automatic facilities, a standard call mode shall be used by the modem at the calling station. This mode consists of conventional characteristics (e.g. use of low channel carrier frequency or particular scrambler generating polynomial) complementary to those used in the standard answer mode by the modem at the answering station, in order to ensure proper connection and inter-working.

If calls are established on the PSTN by operators, or for leased line operation, bilateral agreement on the use of call mode and answer mode shall be necessary.

Data Terminal Equipment (DTE): in the context of this ETS, the expression "DTE" is used to define the origin and destination of signals present at the digital interface of a modem. This expression does not require that a "commercial data terminal" be present to receive or generate such signals; a tester or any other suitable device may monitor or generate such signals.

Modem: a functional unit that modulates and demodulates signals in order to enable digital data to be transmitted over analogue transmission facilities.

Modem Conformance Tester (MCT): this is essentially a simulator designed to meet the requirements of a modem to the same recommendation as the modem under test. All individual sub-systems within it are both accessible (e.g. provide test points and permit functions to be enabled or disabled when required) and externally controllable (e.g. permit sequences such as the start up procedure to be selectively repeated). These within a conformance tester may be constructed as discrete items of equipment, so as to permit their assembly into varying configurations required to suit the tests (e.g. the asynchronous to synchronous converter may be simply applied to a synchronous CCITT Recommendation V.32 [3] conformance tester to achieve an asynchronous CCITT Recommendation V.32 [3] conformance tester).

As an interim measure, until the conformance tester is defined, its definition agreed to be appropriate by ETSI, and such a tester is available, a modem used for reference may be used in its place. In the absence of previous approval to Category II of the modem used for reference, in the relevant modes of use/operation, the testing authority shall ensure that the modem used for reference complies with the relevant ETS to the extent necessary for the performance of the test.

Modem used for reference: a modem used for some of the tests specified herein or in another modem specific ETS. A modem used for reference may, at the discretion of the applicant, be provided by the testing authority or by himself. It shall be designed:

- to meet the requirements of the same CCITT Recommendation(s) as the modem under test, to the extent necessary for performing the tests;

- to provide the functionalities for a modem used for reference that are specified in the relevant testing Clauses; and

- to provide an interface which is accessible and of a type suitable for use in the tests (e.g. CCITT Recommendation V.24).

Where the applicant has provided the modem used for reference and the test fails, the testing authority may not be in a position to determine the precise reason for failure.

Modes of operation: modes specified in this modem specific ETS, that have an influence upon line signals present at the PSTN interface.

Modes of use: modes specified in this modem specific ETS, that have an influence upon conditions present at a digital interface. For example, a "conventional" CCITT Recommendation V.24 interface or a PC bus interface in the case of an integral modem .

On-line state: the on-line state or condition is defined as an electrical condition into which, when connected to the network, a modem is placed such that it draws enough current to be capable of activating the exchange.

NOTE: Usually, a modem in on-line state is potentially capable of sending or receiving speechband information to, or from, the network.

Silence: signals which in the relevant frequency band have an in-band power level which is at least 30 dB below the level of the transmitted signal at the point of measurement. This term is used to describe periods where signals are not transmitted during the handshaking sequences.

3.2 Abbreviations

For the purpose of this ETS the following abbreviations apply.

AMM	Answer Mode Modem
CCITT	Comité Consultatif International Télégraphique et Téléphonique
CCT	Circuit
CEPT	Conférence Européenne des Administrations des Postes et des Télécommunications
CMM	Call Mode Modem
DCE	Data Circuit-Terminating Equipment
DTE	Data Terminal Equipment
ETS	European Telecommunication Standard
ETSI	European Telecommunications Standards Institute
GPA	General Polynomial Answer mode modem
GPC	General Polynomial Call mode modem
MCT	Modem Conformance Tester
MUT	Modem Under Test
NET	Norme Européene de Télécommunication
PSTN	Public Switched Telephone Network

4 General requirements

4.1 References to other ETSs

The modem shall comply with ETS 300 114 [2], Clause 4.

NOTE: ETS 300 114 in turn refers to ETS 300 001 [1] for the majority, if not all, of its requirements.

4.2 Information to be provided by the applicant

4.2.1 Information required for testing purposes

The applicant shall declare for which of the modes of operation/use identified in this ETS approval to Category II is sought.

Compliance is considered to have been accomplished by provision of the relevant information.

NOTE: This could be accomplished by completion of forms such as those provided in Annex B (informative).

4.2.2 Instructions for use

Instructions for use shall be made available with the apparatus. The instructions for use shall include:

a) the apparatus or types of apparatus to which the instructions apply;

b) any information specifically indicated in this ETS for inclusion in the "Instructions for use"; and

c) any national restrictions on the use of the apparatus.

Any additional information that has been included shall be disregarded unless it is the subject of another ETS.

Compliance shall be checked by inspection.

5 Functional requirements specific to Category II modems

5.1 General requirements

To comply with the requirements of this ETS, it shall be necessary that the modem provide:

- duplex mode of operation by means of the modulation scheme specified in CCITT Recommendation V.32 [3];
- channel separation by echo cancellation techniques;
- quadrature amplitude modulation;
- signalling rates of 4800 bit/s and/or 9600 bit/s;
- use of the rate sequence during call establishment to decide the data rate and method of coding;
- means by which the channels may be selected either manually and/or automatically, where a modem is capable of transmitting in either of the two channels;
- means to respond to a request for a retrain;
- means to respond to a request for an instigation of a digital loop 2.

NOTE 1: The general requirements described above are a subset of CCITT Recommendation V.32 [3]. In the requirements which follow any deviations from the strict interpretation of CCITT Recommendation V.32 [3] have been identified.

NOTE 2: In the following, references are made to interchange circuits between the modem and the DTE, as defined in CCITT Recommendation V.24. However, not all modems provide an interface with such circuits. For these cases the references to CCITT Recommendation V.24 type interchange circuits indicate equivalent operation of a DTE and of a modem where this exists.

5.2 Modes of operation/use

The following modes of operation are identified:

- 9600 bit/s Trellis coded, call;
- 9600 bit/s Trellis coded, answer;
- 9600 bit/s non-redundant coding, call;
- 9600 bit/s non-redundant coding, answer;
- 4800 bit/s non-redundant coding, call;
- 4800 bit/s non-redundant coding, answer.

It shall be possible to configure the modem to operate at either 4800 bit/s or 9600 bit/s. Optionally the modem may operate at both 4800 bit/s and 9600 bit/s. Where the modem operates at 9600 bit/s using trellis coding then non-redundant coding at 9600 bit/s shall also be provided.

For each mode of operation identified for approval to Category II, the modem shall provide at least one of the following modes of use:

a) asynchronous with 8 bits per character;

b) asynchronous with 9 bits per character;

c) asynchronous with 10 bits per character;

d) asynchronous with 11 bits per character;

e) synchronous.

In the asynchronous (start-stop) modes of use, the modem shall accept a data stream from the DTE at a nominal rate of 9600 bits per second and/or 4800 bits per second. The asynchronous data to be transmitted shall be converted into a synchronous data stream in accordance with subclause 5.9 suitable for transmission.

Demodulated data shall be decoded in accordance with subclause 5.5, then descrambled in accordance with subclause 5.6, it shall then be passed for reconversion into an asynchronous data stream in accordance with subclause 5.9.

In the synchronous modes of use, the modem shall accept synchronous data from the DTE. The data shall then be scrambled in accordance with subclause 5.6 and passed to the modulator for encoding in accordance with subclause 5.5.

Demodulated data shall be decoded in accordance with subclause 5.5, then descrambled in accordance with subclause 5.6.

The modem shall respond to a request to execute a retrain. Optionally, the modem may also provide facilities to instigate a retrain during data transmission if the modem detects a loss of equalization.

NOTE: This facility can also be used to effect a change of rate from 9600 bit/s to 4800 bit/s or vice versa, without disconnection from the PSTN.

It shall be the applicant's responsibility to specify for which of the above mentioned modes of operation/use approval for Category II is sought.

5.3 Line signals

5.3.1 Transmitted carrier frequency

The carrier frequency transmitted shall be 1800 Hz ± 1 Hz.

Compliance shall be checked by the method described in Annex A, Clause A.2.

5.3.2 Receiver carrier tolerance

The receiver shall be able to operate correctly with a received carrier frequency in the range of 1800 Hz ± 7 Hz.

Compliance shall be checked by the method described in Annex A, Clause A.3.

5.3.3 Transmitted spectrum

The national network specific spectral power limits are specified in ETS 300 114 [2], Clause 4.