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Attachments to the Public Switched Telephone Network (PSTN); Basic attachment requirements for modems standardized for use on the PSTN (Candidate NET 20)

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Basic attachment requirements for modems standardized for use  
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## Foreword

This European Telecommunication Standard (ETS) has been produced by the Terminal Equipment (TE) Technical Committee of the European Telecommunications Standards Institute (ETSI). The text of this draft ETS may be utilized, wholly or in part, for the establishment of NET 20.

This ETS is one of a series of ETSs which are applicable to modems. Details of the current series are given in Clause 2 of this Standard (Normative references, numbers [1] to [6] inclusive).

Approval as Category I is the minimum mandatory requirement for the connection of a modem to the Public Switched Telephone Network (PSTN), although there may be other additional requirements. Any modem is capable of Category I approval as long as it meets the PSTN access requirements of the country, or countries, for which approval is sought. It does not have to comply, for instance, with any of the CCITT V. series Recommendations, nor are there any approval requirements relating to its functioning or its performance as a modem. A modem approved as Category I may or may not be in compliance with certain CCITT Recommendations but, since this is not tested, no assurance of interworking is implied. All of the requirements for Category I modems are given in this ETS which in turn references draft prETS 300 001 [1].

NOTE: Clause 4 of this ETS, specifying the common requirements for modems to be attached to the PSTN, may reference significantly differing requirements, depending upon peculiarities of the national networks.

Approval as category II, which is applicable only when the supplier requests, is only available to modems providing certain combinations of functionality based upon the modem specific V. series of CCITT Recommendations. The object of Category II approval is to provide the user with the assurance that a modem can inter-work, under most network conditions, with other compatible Category II modems.

To obtain Category II approval a modem must, in addition to meeting requirements appropriate to Category I modems, meet the requirements given in one or more modem-specific ETS (final draft prETS 300 002 [6] and ETSs 300 115 to 300 118 ([2] to [5])). Certain requirements common to more than one specific ETS are included, for simplicity in Clause 4 and Annexes B, C and D, and are referred to (as required) in the modem-specific ETSs. The degree of compliance required by these ETSs with any V. series CCITT Recommendation has been intentionally limited to that which might reasonably be considered necessary in order to provide the intended assurance of inter-working between modems. In particular, there is no requirement that the digital interface of the modem conform to any particular physical realisation or functionality, and with certain identified exceptions, there are no requirements relating to the digital interface.

For instance, the following types are examples of features which do not affect modem to modem inter-working and do not prevent Category II approval of a modem as long as it meets the requirements of the appropriate modem-specific ETS:

- PC integral modems that present a bus interface;
- modems employing a proprietary auto-dialling protocol;
- "intelligent" modems that may send messages to a DTE;
- multi-mode modems that may connect to a variety of modem types.

Any modem that can be configured to meet the relevant requirements is approvable to Category II in that mode.

It is acceptable for a modem to be tested for Category II approval in only some of its potential operating modes. Where this is the case, it is necessary to, in other operating modes to be used on the PSTN, meet the requirements applicable to Category I modems. The "Instructions for Use" make it clear to the user those modes which the modem has been approved as meeting the requirements for Category II and those which meet requirements for Category I.

The requirements and the descriptions of the associated tests described in this ETS are specified to provide correct inter-working with the PSTN, minimise the risk of hazardous electrical conditions appearing on the PSTN, minimise the risk conditions occurring on the PSTN which might create hazards

for those using the modem and to ensure end-to-end interoperability between modems in compatible configurations.

NOTE: Compliance with a modem specific ETS provides to the user the added degree of assurance of interoperability over the PSTN. However, as the PSTN is primarily engineered to convey speech traffic, connections not permitting satisfactory data transmission can occur.

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## 1 Scope

This ETS specifies the technical characteristics to be met by modems seeking approval for connection to the PSTN. Clauses of this ETS also define the approval criteria for certain features which may be provided by some Category II modems, but the requirements in these parts are only mandatory when invoked by a modem specific ETS.

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

NOTE: This implies that certain types of modems, e.g. acoustically coupled and cordless modems, are outside the scope of this ETS.

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 for Clause 4 is given in Annex A and for Clause 5 in Annex B.

Annex C describes the testing facilities which a testing laboratory may need to provide.

Annex D indicates additional equipment, or software, that applicants may need to provide in order that testing to Category II can be achieved.

## 2 Normative references

This ETS incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and 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.

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- [1] Draft prETS 300 001 (1990): "Attachments to Public Switched Telephone Network (PSTN); General technical requirements for equipment connected to an analogue subscriber interface in the PSTN (T/TE 04-16) [Candidate NET 4]".  
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- [2] ETS 300 115 (1990): "Attachments to the Public Switched Telephone Network (PSTN); Category II attachment requirements for 300 bits per second duplex modems standardized for use on the PSTN [Candidate NET 21]".
- [3] ETS 300 116 (1990): "Attachments to the Public Switched Telephone Network (PSTN); Category II attachment requirements for 1200 bits per second duplex modems standardized for use on the PSTN [Candidate NET 22]".
- [4] ETS 300 117 (1990): "Attachments to the Public Switched Telephone Network (PSTN); Category II attachment requirements for 2400 bits per second duplex modems standardized for use on the PSTN [Candidate NET 23]".
- [5] ETS 300 118 (1990): "Attachments to the Public Switched Telephone Network (PSTN); Category II requirements for 1200 bits per second half-duplex and 1200/75 bits per second asymmetrical duplex modems standardized for use on the PSTN [Candidate NET 24]".
- [6] Final draft prETS 300 002 (1991): "Public Switched Telephone Network (PSTN); Approval requirements for 9600 or 4800 bits per second duplex modems standardized for use on the PSTN (T/TE 04-09) [Candidate NET 25].
- [7] CCITT Recommendation V.24 (1984): "List of definitions for interchange circuits between Data Terminal Equipment and Data Circuit-Terminating Equipment".
- [8] CCITT Recommendation V.14 (1988): "Transmission of start-stop characters over synchronous bearer channels".

- [9] CCITT Recommendation V.25 (1984): "Automatic answering equipment and/or parallel automatic calling equipment on the general switched telephone network including procedures for the disabling of echo control devices for both manually and automatically established calls".
- [10] CCITT Recommendation V.21 (1984): "300 bits per second duplex modem standardized for use in the General Switched Telephone Network".
- [11] CCITT Recommendation V.54 (1984): "Loop test devices for modems".
- [12] CCITT Recommendation V.4 (1984): "General structure of signals of international Alphabet No. 5 Code for data transmission over Public Telephone Networks".
- [13] CCITT Recommendation S.33 (1984): "Standardization of an international text for the measurement of the margin of start-stop machines using International Alphabet No. 5".
- [14] CCITT Recommendation V.52 (1984): "Characteristics of distortion and error-rate measuring apparatus for data transmission".
- [15] CCITT Recommendation V.22 (1984): "1200 bits per second duplex modem standardized for use in the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits".
- [16] CCITT Recommendation V.22bis (1988): "2400 bits per second duplex modem using the frequency division technique standardized for use on the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits".
- [17] CCITT Recommendation V.23 (1984): "600/1200- Baud modem standardized for use in the General Switched Telephone Network".
- [18] CCITT Recommendation V.32 (1984): "A family of 12-wire, duplex modems operating at data+signalling rates up to 9600 bits/s for use on the general switched telephone network and on leased telephone type circuits".

### 3 Definitions and abbreviations

#### 3.1 Definitions

For the purpose of this and other related ETSS, the following definitions apply:

**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.

**Built-in modem:** a functionally separate internal modem which is mechanically combined with a terminal.

**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, a 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 suitable device may monitor or generate such signals.

**Integrated modem:** an internal modem which is functionally and physically merged with the terminal.

**Internal modem:** a modem which is physically incorporated in a terminal equipment and which takes its electrical power supply from the terminal.

Different types of internal modems are defined: built-in, plug-in and integrated modems.

**Intracharacter signalling rate:** the intracharacter signalling rate of a message is the signalling rate of the start element and data elements within each character of this message.

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

**Modem used for reference:** a modem used for some of the tests specified herein or in a 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 [7]).

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 a modem specific ETS, that have an influence upon line signals present at the PSTN interface.

**Modes of use:** modes specified in a modem specific ETS, that have an influence upon conditions present at a digital interface e.g. a "conventional" CCITT Recommendation V.24 [7] interface or a PC bus interface in the case of an integrated modem.

**On-line state:** 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 the on-line condition is potentially capable of sending or receiving speech-band information to or from the network.

**Plug-in modem:** a physically and functionally separate internal modem which is interchangeable from a terminal.

**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 hand-shaking sequences.

### 3.2 Abbreviations

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 Telecommunications Standard
ETSI	European Telecommunications Standards Institute
MCT	Modem Conformance Tester
PSTN	Public Switched Telephone Network

## 4 Common requirements

### 4.1 General notes

This Clause specifies the requirements to be met by all modems seeking Category I or Category II approval for use on the PSTN.

### 4.2 PSTN access requirements

The requirements of Draft prETS 300 001 [1] apply.

### 4.3 Information to be provided by the applicant

#### 4.3.1 Information required for testing purposes

The applicant shall provide to the testing authority, at least the information indicated below:

- equipment nature (stand-alone, rack-mounted, integrated in a terminal);
- approval domain (Category I and/or Category II);
- countries for which approval is sought.

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An example of proforma chart to collect these information is provided in Annex E.

#### 4.3.1.1 List of modes

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The applicant shall specify those modes of the equipment relevant to operation on the PSTN and for which of them approval is sought:

- list of carrier modes;
- automatic answering;
- automatic calling;
- provision of line loop 3 during a connection;
- special features.

NOTE: Operation in modes not approved for use on a specific PSTN is prohibited in the country concerned.

#### 4.3.1.2 Other items

The applicant shall provide the following information:

- additional technical information (transmitted level, minimum received level...);
- power supply;
- environmental characteristics.

### 4.3.2 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) the modes for which only Category I approval has been given;
- c) any information specifically indicated in this ETS for inclusion in the "Instructions for use"; and
- d) 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 Requirements common to some Category II modems

### 5.1 General notes

This Clause contains requirements which are common to some of the following modem specific ETSs and could be invoked by:

- ETS 300 115 [2];
  - ETS 300 116 [3];
  - ETS 300 117 [4];
  - ETS 300 118 [5];
  - final draft prETS 300 002 [6].
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On the whole, these requirements are based upon, and do not conflict with, CCITT Recommendations, nevertheless some exceptions have been introduced in subclause 5.5 (for asynchronous to synchronous conversion based upon CCITT Recommendation V.14 [8]) and in subclause 5.6 (for modem performance tests).

**NOTE:** In the following, references are made to interchange circuits between the modem and the DTE, as defined in CCITT Recommendation V.24 [7]. DTEs using certain customized modems should not generally provide an interface with such interchange circuits. For these cases the references to CCITT Recommendation V.24 [7] type interchange circuits indicate equivalent operation of a DTE and of a modem where this exists.

### 5.2 Call establishment sequence based upon CCITT Recommendation V.25 [9]

#### 5.2.1 For modems initiating calls

The requirements of this subclause shall only be mandatory when invoked by a requirement in the relevant specific ETS.

The provision of a calling tone as described in CCITT Recommendation V.25 [9] is optional. Where this facility has been provided the calling tone shall be 1300 Hz with the exception of CCITT Recommendation V.21 [10] modems where it shall be either 980 Hz or 1300 Hz. Multi-mode modems providing this facility shall use 1300 Hz.

After completion of the dialling phase, when the calling modem or its associated automatic call establishment equipment is presented with valid answer tone in the range 2078 Hz to 2122 Hz indicating that the remote modem has connected to line, the modem shall not give an indication to the DTE that it is