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Terminal Equipment (TE); Study and investigation into the feasibility for further harmonization of the requirements and associated tests of ETS 300 001 (Candidate NET 4) Part 2: Comprehensive study

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Foreword

This ETSI Technical Report (ETR) has been produced by the Terminal Equipment (TE) Technical Committee of the European Telecommunications Standards Institute (ETSI).

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

ETR 075 comprises three Parts:

ETR 075: "Terminal Equipment (TE); Study and investigation into the feasibility of further harmonization of the requirements and associated tests of ETS 300 001 (Candidate NET 4).

Part 1: Overview and conclusions [1],

Part 2: Comprehensive study,

Part 3: Special studies [2]".

ETR 075-1 [1] contains a summary of the overview and conclusions of this main Part of the ETR (ETR 075-2) and is provided for those readers who do not need the detail which is contained in this Part.

This Part contains the body of the ETR and gives a detailed analysis of the content of ETS 300 001 [3] together with findings and recommendations.

Part 3 (ETR 075-3 [2]) contains clauses which give the results of some detailed technical studies which formed part of the work of the Project Team (PT) which drafted the ETR (PT 17V).

To assist the reader to associate the comments in this ETR with the relevant requirements of the original ETS (ETS 300 001 [3]), some clauses are presented in a structure which retains the original numbering of ETS 300 001 [3].

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1 Scope

This ETR contains the detailed findings of the work drafted by PT 17V. The terms of reference for this PT were approved by the 11th ETSI Technical Assembly in 1991. They are provided in annex A to this Part of the ETR.

This Part of the ETR considers the requirements of Chapters 2, 3, 4, 5 and 6 of ETS 300 001 [3]. Guidelines for the work were provided by the PSTN FSG (see annex A).

2 References

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

[1] ETR 075-1: "Terminal Equipment (TE) - Study and investigation into the feasibility of further harmonisation of the requirements and associated tests of ETS 300 001 (Candidate NET 4) - Part 1: Overview and conclusions".

[2] ETR 075-3: "Terminal Equipment (TE) - Study and investigation into the feasibility of further harmonisation of the requirements and associated tests of ETS 300 001 (Candidate NET 4); Part 3: Special studies".

[3] 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)".

[4] EN 41003: "Particular electrical safety requirements for equipment to be connected to telecommunication networks".

[5] CCITT Recommendation G.121: "Loudness ratings (LRs) of national systems".

[6] ITU-T Recommendation Q.552: "Transmission characteristics at 2-wire analogue interfaces of digital exchanges".

[7] CCITT Recommendation G.117 (1988): "Transmission aspects of unbalance about earth (definitions and methods)".

[8] CCITT Recommendation O.9 (1988): "Measuring arrangements to assess the degree of unbalance about earth".

[9] CCITT Recommendation V.2 (1988): "Power levels for data transmission over telephone lines".

[10] CCITT Recommendation O.41 (1988): "Psophometer for use on telephone-type circuits".

[11] CEPT Recommendation T/CS 20-15: "Tones and announcements".

[12] CCITT Recommendation E.180 (1988): "Technical characteristics of tones for the telephone service".

[13] CEPT Recommendation T/S 34-08: "Automatic sender for push-button multifrequency signalling".

[14] CEPT Recommendation T/CS 46-02: "Multifrequency signalling system to be used for push-button telephones".

[15] CCITT Recommendation Q.23 (1988): "Technical feature of push-button telephone sets".

[16] CCITT Recommendation E.161 (1988): "Arrangement of figures, letters and symbols on telephones and other devices that can be used for gaining access to a telephone network".

[17] CEPT Recommendation T/S 46-04: "Alternative sender multifrequency signalling system to be used for push-button telephones".

[18] 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".

[19] CCITT Recommendation T.30 (1988): "Procedures for document facsimile transmission in the general switched telephone network".

[20] ETS 300 002: "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)".

[21] ETS 300 114: "Attachments to the Public Switched Telephone Network (PSTN); Basic attachment requirements for modems standardized for use on the PSTN (Candidate NET 20)".

[22] ETS 300 118: "Attachments to the Public Switched Telephone Network (PSTN); Category II attachment 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)".

[23] CCITT Recommendation P.56: "Objective measurement of active speech level".

[24] ETR 098 (1993): "Terminal Equipment (TE) - Review of studies and investigations concerning essential requirements in ETS 300 001 (NET 4)".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this Part of the ETR, the definitions given in ETS 300 001 [3] apply in addition to the following:

interface: A shared physical boundary between two functional units across which electrical signals originating from either of the units may pass to the other.

techno-regulatory: A description of any technical matter which of itself also has implications of a legal or regulatory kind.

3.2 Abbreviations

For the purposes of this Part of the ETR, the abbreviations given in ETS 300 001 [3] apply in addition to the following:

CEC	Commission of the European Community
PE	Public Enquiry
QoS	Quality of Service
TE	Terminal Equipment

4 Basis of study

This clause contains a synopsis of the information given in clause 4 of ETR 075-1 [1].

4.1 Background

Work on the drafting of ETS 300 001 [3] began under CEPT in late 1985. At that time few people could have been aware of the regulatory framework in which this ETS might be expected to operate. For the majority of those participating in the drafting of the original text, the document was believed to be an attempt to present, in a common format, the requirements and their associated tests, for the approval of Terminal Equipment (TE) wishing to connect to the Public Switched Telephone Network (PSTN). Ultimately, as the various national parameter values, etc. were inserted, the disparity in the various national approaches attempted to distort the framework of the core text. The CEPT (and later the ETSI Terminal Equipment) Technical Committee addressed this problem by making provision for national values and for more wide reaching differences in the form of national remarks.

As a result of this activity, ETS 300 001 [3] was submitted to ETSI TC-TE in the autumn of 1989 to begin its approval procedures. In October 1990, during the post-Public Enquiry (PE) review of ETS 300 001 [3] (again by TC-TE) it was agreed to constitute a workshop which would examine the future direction of PSTN activities, including possible uses of ETS 300 001 [3]. This workshop met at the ETSI Headquarters in Sophia Antipolis, France in March 1991.

In an effort to determine whether further harmonization of the technical content of ETS 300 001 [3] was feasibile, the Commission of the European Community (CEC) generated a mandate to study and investigate this topic. This mandate was the basis for the work presented in ETR 075, Parts 1 to 3.

4.2 Mandate BC-T-167

This mandate defined six activities, a précis of which follows:

a) a review of all PSTN affecting work within ETSI;

b) an examination of ETS 300 001 [3] to determine the possibilities for further harmonization;

c) a definition of harm to the network and thereby essential requirements;

d) an examination of the possibility to harmonize the testing methods;

e) to ensure that, after the above steps have been completed, subsequent changes to ETS 300 001 [3] continue to fit the proposed regulatory framework and to identify any other ETSI standards that might be needed;

f) to estimate the resources required and the profile of the experts required to carry out the above work.

The work contained in this ETR has arisen from the activity described in item b).

4.3 The Project Team and its work

4.3.1 Terms of reference

The various documents used to provide the terms of reference can be found in annexes A to D of this Part of the ETR.

The initial terms of reference of the Project Team were established by ETSI TC-TE and the PSTN Interim Steering Group (ISG). These were subsequently endorsed by the 11th ETSI TA. During November 1991, the ISG was augmented and became the PSTN Full Steering Group (FSG) and it was the FSG which directed the studies of the Project Team. The initial terms of reference also refer out to the tasks identified by the ETSI PSTN Workshop which was held on 14th to 15th March 1991 (see Annex A).

The Terms of reference were subsequently interpreted by the FSG and converted into a set of guidelines by the FSG (see annex A).

An outline of a report was established, normally containing at least one paragraph with a description for each clause, although not necessarily for each subclause, interpretation, comment, national inputs, harmonization feasibility and cost benefit. In addition, where warranted, some clauses also provided a description of the implications for testing.

As the work progressed, certain key parameters and methods of testing were identified where it was considered pertinent to study and report in-depth whilst keeping within the permitted resource constraints of the Project Team. Each of these reports examines in some detail the underlying principles of the parameter or testing method. These reports are contained in ETR 075-3 [2].

5 Analysis of ETS 300 001

This clause re-iterates the information contained in clause 5 of ETR 075-1 [1], but for the most part in a different style.

5.1 Structure and content of the document

ETS 300 001 [3] started its life under CEPT as a Recommendation and was simply a compendium of the national requirements for attachment to the PSTN. This early document was then taken, still under CEPT, as an input to a later document (known as enhanced NET 4) and simply attempted to set out, in a common format, the national requirements for all the contributing Administrations. Having established this format for the earlier Chapters, this task was passed to a Project Team (PT 2), where the framework of common text for the later Chapters was drafted. This initial attempt to encourage a common format by providing a "common text and values" foundered and gave birth to the national tables.

It soon became clear that the format imposed by common text plus national values was still too rigid to encompass the totality of each Administration's requirements. This resulted in national remarks and national contributions, generated by specific Administrations to modify the common text by addition or deletion (description as applicable) so as to produce the current form of the ETS.

The common part has had virtually no technical changes since its agreement by ETSI STC-TE4 in late 1989; Administrations have continued to work on their national contributions and have submitted various changes and additions since that time. Following adoption of the document as acceptable to go for voting in late 1991, the voting period (essentially the first half of 1992) was also allocated as a further (and final) period during which Administrations could further add to or modify national parts, and many of these changes were not received until the Project Team analysis of the ETS as sent for voting was substantially complete.

ETSI decided at the outset of the Project Team work that the set of national variations due at the end of the voting period would not be considered. Following on from this decision, it should be noted that this ETR deals with the analysis of ETS 300 001 [3] as it was sent for voting, and considers the contents which are, in part, current to the common text as fixed in 1990 and, in part, current to 1991 for the National parts.

5.2 National parts and their role

Approximately two-thirds of the content of ETS 300 001 [3] consists of national remarks, alternative requirements and tests, and special national requirements and tests additional to the common text. Chapter 10 contains a number of national requirements or tests of "unclassified" content many of which could have been incorporated more usefully into the body of the ETS.

The main reason for the generation of national remarks has been the fact that a common set of words was unable to express the wide range of differing national standards that existed across Europe. Their role in the ETS, therefore, has been to to describe the *status quo* applicable to each Administration and to make these national differences visible.

5.3 Administration specific issues

The study of the common text and of related national parts revealed a significant number of instances of apparent confusion arising from (presumably) Administrations' differing interpretation of the common text or from ambiguities within the common text itself. These factors have been, as far as possible, identified in the analysis.

5.4 The techno-regulatory environment

The regulatory environment in which ETS 300 001 [3] is still far from clear, and this uncertainty together with the current differences in national regulations has made a significant contribution to the complexity of the ETS. There is no harmonized regulatory definition of the boundary of the network, no common approach to second and third party liabilty at the boundary of the network, no common regulation of installation practices and no common approach to privacy issues within a local installation.

The national differences in the regulatory environment have been key factors determining the differing content of the various national inputs. Until there is harmonization of the legal application of the ETS, there can only be incomplete harmonization of its content. A number of issues relating to this problem arose during its' Public Enquiry in 1990 and still await resolution.

5.5 Testing

Much has been said about testing and its role in further harmonizing the content of ETS 300 001 [3]. There can be no doubt that the lack of harmonization in this area has significantly impeded the uniform presentation of the content of the ETS as a whole.

In many cases, the form of the test determines the requirement and its values and thus national differences in test methods have led to national requirements that differ from the common text. Differences in interpretation of the common text tests have also given rise to differences in the type of tests and the values of the requirements declared.

Where possible, these factors have been analysed for relevance and technical content, and a special study on testing is presented in ETR 075-3 [2].

6 Study of the feasibility of harmonization

This Part of ETR 075 contains a comprehensive analysis of the requirements. It consists of a number of reports, each generated independently, but following a common format. Each report deals with the technical content of each Chapter to be considered, i.e. 2, 3, 4, 5, 6, 7 & 9 of ETS 300 001 [3] (the content of Chapter 10 being considered in the main during consideration of its associated Chapter i.e. subclause 10.3 is considered with Chapter 3). The format of these reports is as follows for each clause (but, occasionally, collectively for a number of like clauses (normally subclauses of the original ETS)) and the ETR provides an interpretation, comment(s), national inputs, harmonization feasibility, cost benefit and, in many cases, separate comment on testing. The format was devised with the intention of imposing a consistent structure on the reports, and to ensure that particular problems were highlighted.

The interpretation is a paraphrasing of the requirement in order to accentuate the meaning of the clause/subclause. It was felt that since in some cases the requirement values differed by several magnitudes that a common understanding of the requirement was unlikely. This has been shown to be justified by the response by one Administration during early exposure of the contents of this report who remarked "some interpretations of the PT are completely different from the ones that ********** has , for that Chapter or clause". Leaving aside the complaint about the introduction of terms not previously defined in ETS 300 001 [3], it is clear that harmonization of the requirements on the basis of misunderstanding is not actually harmonization at all. It is clear that a common understanding of the requirements is an essential precursor for harmonization to be meaningful.

The intention of the comment is to highlight such things as the difference in requirement values, to indicate potential barriers to harmonization and, where harmonization appeared to be feasible, how this might be achieved.

The national inputs is a discussion about the various national remarks.

6.1 Chapter 1

Chapter 1, as it deals with a number of general subjects common to the rest of the ETS, has not been considered.

6.2 Chapter 2

Chapter 2 of ETS 300 001 [3] deals with the various access requirements that can be determined by a DC measurement and includes requirements relating to polarity dependence, insulation requirements, voltage drop limits, transients and DC overload.

2 DC characteristics

2.1 Polarity

Interpretation

This is simply a statement requiring TE operation and performance to be absolutely independent of line polarity. It states that the requirements of the ETS need to be met regardless of the applied polarity and that any series connected terminals should not require terminals to be polarity conscious in order for a particular feature to function.

Comment

With the exception of Malta, no remark having been received, the other nineteen countries are unanimous in stating this to be a mandatory requirement.

The objective of this requirement is to prevent terminals from having features built into them that are sensitive to the received polarity from the exchange. Network operators generally cannot maintain the polarity of a connection in the long term and in some public telephone systems the polarity of the line changes at various stages of call establishment and clearing. With free market conditions, where users are able to buy terminals and take them home and wiring may not normally be supplied by the network operator, it is wholly impractical for polarity-dependency to exist.

National inputs

There are only three remarks to this requirement (**D, IRL, N**).

The German remark relates to the "W-wire", which appears to carry the ringing current.

The Irish remark, having said that it is mandatory not to be polarity sensitive, goes on to permit polarity sensitive equipment which protects itself against polarity inversions.

Finally, Norway for the specific case of an exchange based call barring function makes a reference to the DC mask in subclause 2.3(N)1. This apparently should be to sublause 2.3(N)2.

On this occasion only one variant appears in the testing (**D**). The statement of how the requirement is to be tested seems to be comprehensive enough to ensure that the tests based on these descriptions would be performed in a similar fashion and produce repeatable results.

Additionally in Chapter 10, Portugal and Spain have a transient requirement following polarity reversal.

Harmonisation feasibility

The only country that seems to have a problem is Germany. It is possible that after some investigation even this point could be clarified.

Cost benefit

There would appear to be no costs or benefit since this subclause has already achieved significant levels of harmonization.

2.2 Insulation resistance

Interpretation

Under the main heading of this subclause of ETS 300 001 [1] appears a requirement that the TEUT shall not be modified in any way. It is assumed that this statement is meant to imply that the TE should be tested in the form in which it is to be sold.

The remainder of this subclause is split into a further two parts dealing with requirements in the quiescent condition and in the loop condition.

For the quiescent condition there are three requirements for TE which cover insulation resistance measured between the two line wires for connection to the network, the same two wires when shorted together and any signal earth, and the same two wires shorted together and any part which the user can touch other than the earth or signal earth terminals.

For the loop condition there are two requirements. The first concerns insulation resistance between the two line wires for connection to the network when shorted together and any signal earth; the second concerns the same two wires shorted together and any part which the user can touch other than the earth or signal earth terminals.

Comment

There is a general problem with this subclause in that the requirements are couched in terms of the two line terminals to be connected to the PSTN, and it is not always clear what should happen to any other wires which might be derived from these such as in the existing German installations.

The requirement for a minimum insulation resistance between the terminals for connection to the PSTN controls the amount of current a terminal may draw in the quiescent state. It seems reasonable that terminals should generally be designed with this parameter minimised in value. Removal of the requirement would have significant implications because:

1) automatic network testing methods rely upon a controlled and known minimum quiescent condition terminal current;

2) a number of terminals connected to the same line could collectively draw sufficient line current to signal the loop condition.

There are, however, cases in which TE is required to draw more current than that resulting from its insulation resistance alone, such as in applications requiring line powering of a pay-phone or small data terminal in a remote part.

The requirement concerning insulation resistance between the network connection leads and the signalling earth lead is required in order to safeguard:

a) automatic testing of the telephone line by the Network Operator (a significant earth leakage might viewed as a potential cable fault);

b) a false loop condition from being detected by the exchange in certain installations.

The requirement setting out insulation resistance values between network leads and user touchable parts is confusing. In this context, it would appear that that such a requirement should exist only for reasons of safety. This is supported by National Remarks (**F & GB**), comment at Public Enquiry (again **F & GB**) and the fact that, in total, six countries consider the requirement to be "not mandatory".

National inputs

For the quiescent condition

<u>For the general requirement:</u>

For two countries (**NL & GB**), the national remarks describe the method by which users should determine how many terminals they are permitted to attach to the line.

One country (**B**), requires the voltage to be increased from 200 V to 500 V for the user accessible parts.

Two countries (**D & S**), find it necessary to add extra clarification to the requirements.

Finally, four countries (**A, DK, F & CH**) provide requirements which apply to specific types of terminal.

<u>Specifically for the insulation resistance between the terminals:</u>

Remarks from two other countries' (**SF & E**) except specific terminals and permit them to draw more current than the insulation resistance limits would have allowed.

<u>For the insulation between shorted terminals and earth:</u>

Great Britain **(GB)** requires the test to be done between the individual wires unshorted rather than shorted.

<u>For the insulation between shorted terminals and user accessible parts:</u>

The remark from Spain **(E)** refers to the Spanish comment above. Referring to this requirement, **F & GB** state this to be a safety requirement and, therefore, to be outside the scope of this ETS.

Additionally, in Chapter 10, Spain has a requirement for insulation resistance between lines on multi-line TEs and Finland **(SF)** has a requirement for leakage current.

For the loop condition

Two countries (**E, GB**) comment on the general requirement. **GB** states that, in their opinion, insulation resistance between user accessible parts and other wires is a safety matter while Spain **(E)** attempts to clarify the requirement although it is not obvious what their comment adds other than to require the use of the Spanish test.

Additionally, in Chapter 10, Spain has a requirement for insulation resistance between lines on multi-line TEs.

Harmonisation feasibility

1) Based on the assumption that the requirements for electrical separation to exist between the Network connections of a terminal and user accessible parts are a safety matter, reference to safety standards provides a harmonized value.

2) It is not clear whether the requirements of subclause 2.2 are derived from the needs of a single terminal or a complete installation. Until the question of which technical interface under consideration is being described and how many terminals may be connected is resolved it makes no sense to try to harmonize the requirements in this subclause.

2.3 DC current and loop resistance

Interpretation

The requirements of this subclause are intended to specify the range of resistance values of a TE when placed in the loop condition. The table of requirements also specifies a current range.

For modern equipment, it is often not possible to describe the requirement in terms of a single resistance, and many countries resort to specifying a mask into which the voltage/current characteristics of the TE needs to fall.

Some masks specify an overvoltage feeding limit to ensure correct interworking with the PSTN on short lines. Others include a lower limit in order to cover parallel terminal operation.

It is possible to specify both types of requirement in the form of a mask and so this form of specification can be taken as a move towards harmonization.

Comment

This requirement is essential in order to ensure correct inter-operability with the network by TE in other than quiescent or ringing conditions. The requirement has to take account of installations with multiple TE, perhaps of differing types.

National inputs

The country inputs are provided in a number of different formats (no format is pre-supposed).

- five countries submit text only **(A, B, D, GR, E**);
- ten countries submit graphs in the v, i dimensions (**CY, DK, F, I, NL, N, S, CH, GB, IRL**);
- three countries have tabled values (**L, IS, SF**);
- one country submits a graph of current and resistance (**P**).

These inputs can be broadly grouped into six technical categories:

1) maximum loop resistance

The masks for some countries (**A, CY, DK, SF, D, GR, IS, L, NL, N, E, CH**) require a TE to exhibit a maximum loop resistance within a range (typically 400 ohms - 500 ohms) for line currents greater than 20 mA and up to the maximum line current that can be obtained from the national feeding bridge.

2) higher voltages permitted

Some of the country masks (**B, F, I, P, S, GB**)**,** for current values [mA] greater than (**B**[25]**, F**[26]**, I**[25]**, P**[31]**, S**[14]**, GB**[42]) mA, it is permitted for the voltage to rise and this voltage is then only limited by the feeding conditions of the line. Other country masks require the terminal to limit the current to less than 60 mA (**F**[60]).

For Ireland it is not clear where the current limiting of 100 mA is performed (network or TE).

3) current limitation requested, performed within the network

Some other country masks (**A, SF, D, GR, IS, I, L, S**) require the line current to be limited to less than 60 mA but this function seems to be performed in the PSTN interface by means of current limiting or by switching resistors into the feed (this point needs to be checked) (**A, SF, GR, D, L**) or using a feeding bridge with sufficient resistance to limit this current in case of short line (**SF, S, IS, I**).

4) maximum current not specified

The remainder of the country masks **(B, CY, DK, GR, NL, N, P, E, CH, GB)** do not specify the maximum line current. It would appear that this is defined only by the lowest feeding resistance and the highest voltage (EMF) for each PSTN interface. Under this arrangement the current could reach a maximum value in [mA] of (**B**[120], **CY**[109], **DK**[112], **GR**[80 or 157]?, **NL**[82,5], **N**[119,6], **P**[183,3], **E**[186,6], **CH**[95], **GB**[125]).

5) low voltages in the seize/hold area

For most countries the voltage across the line terminals is severely constrained for low values of current, typically 10 V for less than 20 mA (seize/hold area). Within this area, the masks fall into two broad categories those that require a particularly low voltage (typically less than 7,5 V at less than 2 mA) (**CY, DK, IS, I, L, N, P, S, CH**) and those that permit a somewhat higher voltage (typically more than 7,5 V at 2 mA) (**A, B, SF, F, D, GR, IRL, NL, E, GB**).

In addition, in Chapter 10, five countries (**A, F, N, P, E**) have a requirement for the terminal to operate correctly in the face of network transients.

6) parallel terminal powering

The masks for the following ten countries (**A, CY, DK, F, D, N, S, CH, GB**) specify a lower limit (**parallel/transfer area**) which could facilitate the simultaneous use of two or more telephones in parallel. Other countries do not consider this facility.

Harmonisation feasibility

A considerable amount of effort has been expended on graphical and mathematical analysis in an attempt to derive a single harmonized voltage/current mask, but the main result has been to expose the complexity of the problem.

Harmonization is not practicable at present without a re-definition of the current European requirements.

It is possible to specify an access mask which falls below all of the present voltage limits, but in practice, such an approach ignores some national network requirements, may restrict technology, and causes large numbers of the existing terminal population to be non-compliant.

A comprehensive analysis of the requirements of Chapter 2, subclause 2.3 was made (see ETR 075-3 [2]), which identifies a conflict between the requirement of France for a 60 mA maximum loop current and the requirements of other countries for a maximum loop resistance in the terminal. It is not possible to build apparatus which will simultaneously satisfy both sets of requirements, and this analysis suggests some approaches which may be helpful.

Testing methods

It is difficult to define a simple test method for the V/I characteristics that covers all conditions that may occur in practice due to differing types of exchanges and differing terminal designs. Further study of appropriate testing methods awaits further refinement of this requirement.

Cost benefit

The cost of any harmonization process that required modification of existing PSTN interfaces would be extremely large. Similarly, any harmonization process that rendered present terminals non-compliant would require special arrangements which might be expensive (replacement of TE *en masse* is considered inappropriate).

2.4 Transient response of loop current

Interpretation

This subclause sets out to define the minimum period in which a TE needs to achieve stable conditions within the defined states.

2.4.1 Quiescent to loop state

Interpretation

This subclause requires TE loop current attain a stable value within a specified tolerance and within a certain period after assuming the loop condition.

Comment

During the initial period of call establishment, many modern public telephone exchanges use a battery feed with higher source impedance than the battery that will ultimately provide the normal feed during the transmission of a signalling phase. Also, when a terminal enters the loop condition in response to an incoming call indication, it can be faced with either ringing current superimposed on dc, in which case the exchange will normally recognise the answer signal fairly quickly or ringing current without dc and dc only during the periods of no ringing current, in which case the exchange equipment may not respond until the dc is re-applied.

It is also known that some types of exchange determine the length of local cable by measuring the current shortly after seizure and adjust the transmission parameters using this information. If such adjustments are to be meaningful, it is necessary for the line current to have stabilised before the adjustments are made. Therefore, it may be necessary to ensure that the line current stabilises fairly quickly. Whether it needs to be within 1 mA or whether 5% to 10% would suffice would require further investigation.

National inputs

Firstly, the basis on which many of the national requirements have been defined is limited to the TE changing from quiescent to loop condition. As far as the telephone exchange equipment is concerned, this change can only be recognised as the line current or some other derivative of this, passing a set threshold. It seems technically inappropriate to relate this action to the mechanical operations within the terminal. It seems likely that the basis on which the national requirements have been stated is not derived from a common understanding and these requirements therefore need to be reconsidered.

Secondly, seven countries (**B, SF, GR, IS, IRL, S & GB**) do not find such a requirement to be mandatory and do not, as an alternative, even express voluntary requirements. Eleven countries (**CY, DK, F, D, I, L, NL, N, P, E & CH**) have requirements which vary in complexity; only three of these countries find the common text sufficient for their needs. Whilst most of those expressing a requirement in the common text seem to be content with a time limit of 100 ms - 150 ms, Switzerland **(CH)** requires 12 ms. The basis for such a variation is difficult to comprehend.

Thirdly, having found no alternative place to put such requirements, many countries have provided requirements specifying the transient response between various other states.

These additional national remarks fall into six groups.

The first group (**F, D, NL, N, P & E**) attempts to provide an improved description of the change from the quiescent to the loop condition and in one case (**E**) the transition is defined with respect to some initial value of current. This Spanish remark satisfies the criticism which is addressed to all the other remarks.

The second group (**F**) applies specific constraints during the establishment of an outgoing call.

The third and fourth groups (**F**) again apply specific constraints during the answering of calls dependent on whether the ringing current is superimposed on dc.

The fifth group (**P & E**) deals with the response of any TE connected in series with the main TE.

Finally, the sixth group (**CH**) deals with transition from the loop state to the quiescent state.

In addition, in Chapter 10, Austria **(A)** and Portugal **(P)** have requirements for transients arising from contact bounce.

Harmonization feasibility

The basis on which the requirement is qualified by national comments and remarks suggests that the common text needs to be restructured so as to remove ambiguity. Once this is done significant harmonization seems possible. Once new requirements are agreed, it should be possible to draft harmonized tests for these requirements.

Cost benefit

Until it is possible to identify the nature of further for harmonization, it is not possible to comment on any possible costs or benefits.

2.4.2 Loop current transfer

Interpretation

This subclause specifies changes to line current values within a given period which occur as a result of switching the loop circuit between TEs or within a TE.

Comment

The requirements are, in general, intended to prevent false operation of the telephone network caused by changes in loop current values arising from changes in the circuitry that terminates the dc loop. It is known that such actions can cause false operation of the network by being detected as dial pulses, by overloading codecs in analogue to digital converters, or for other reasons. It seems, therefore, that such a requirement is appropriate. However, it is difficult to see how the network can detect a change in the circuitry terminating the dc loop other than by observing an associated line current.

National inputs

Three countries (**GR, IRL & GB**) have no mandatory requirements in this area and do not declare voluntary recommendations.

For all but four other countries (**A, N, E & S**), the common text seems sufficient. For these four countries additional national remarks have been provided. In the case of Austria this states that the duration of any interruption shall be less than 5 ms and it is difficult to see why this could not have been included in the common text since the national remark appears to add nothing. The Norwegian and Spanish remarks appear, in effect, to define a mask much in the way we would suggest is done for all. Finally, Sweden says that a concession is applied to the normal dc mask in subclause 2.3 and can be given for 10 ms.

For the remainder, the spread of requirements is not sufficient to suggest that further harmonization would not be possible (15 mA to 20 mA and 5 ms to 15 ms) if greater knowledge of the background were available.

Harmonization feasibility

1) It is suggested that further investigation is required into the need for such requirements so as to be sure that the final harmonized requirement is no more onerous than is necessary.

2) It is also thought that this might be better expressed as a mask of current against time applied to the terminals of the TE. It should be noted that if the dc mask of subclause 2.3 has no constraint in the lower region, then the permitted range of terminating conditions is exacerbated by the problems expressed in this subclause.

3) Once the requirement has been agreed, it should be relatively easy to define a comprehensive test for the requirement.

Cost benefit

Assuming the redefinition suggested above does not reveal significant other differences, the main benefit would be a single requirement for all countries. Since such a requirement should be based on the results of this investigation, it is unlikely that it will impose any significant additional cost on the network operators. As a result, some changes may be required in terminal design with the consequent additional cost for terminal equipment suppliers, but until the changes are known no judgement can be made about the likely magnitude of such costs.

2.5 Series resistance

Interpretation

This requirement sets out the additional loop circuit resistance permitted to be added by terminal equipment which itself has two ports and by means of those ports is connected between the network connection point and other terminal equipment which, of itself, terminates and thereby completes the dc current loop to the local exchange.

Comment

As mentioned in the requirement analysis of requirement in subclause 2.3, there is little technical justification to retain this requirement separate from subclause 2.3; however, from a terminal equipment point of view, it is useful to have this requirement set out separately in order to permit approval of specific equipment given a particular type of regulated installation.

Harmonization feasibility

The range of values stated varies well over an order of magnitude from minimum value to maximum value. Given the characteristics of various specific terminals currently in the field, values could be set at a single value with no cost and the remainder of resistance or the resistance needed to arrive at a single value could be transferred or obtained from the dc mask value specified in the requirement of subclause 2.3.

Although the harmonization of the requirement in this subclause can be achieved as suggested in the paragraph above, the disparity again emphasises the need to have a techno-regulatory decision concerning the nature of the network attachment of an installation and the equipment comprising that installation. It is clear that approval of any given terminal equipment cannot of itself guarantee operation of all terminal equipment interconnected in an installation. One Administration attempts to define a regulatory procedure to circumvent this difficulty; this approach adds complexity to the requirement, since both the technical characteristics of terminal equipment and of an installation comprising a number of terminal equipments (which an approval procedure cannot wholly control) are combined.

National inputs

It should be noted that nearly half of the Administrations do not specify the voltage drop of the series connected TE.

Austria: Mentions terminal-specific parameters and continues to study low-current conditions.

Denmark: Uses a mask to define dc characteristics of terminal equipment and incorporates a transient requirement.

France: Uses a mask to define the dc characteristics of certain terminal-specific applications and general series-connected terminal equipment.

Germany: Sets out terminal-specific requirements and mentions connection arrangements of an installation (equipment cords).

Great Britain: Also treats installation practice by attempting to control a total series resistance by means of a parameter termed "sen" or series equivalent number and the (non-technical) requirement that advice and statements relating to the installation as a whole should be supplied with the terminal equipment.

Tests

Tests are of two basic kinds: one type of test is performed with a short circuit across the output of the TE and the other type connects a resistor representing another terminal to the output. In both cases, electrical parameters relating to the dc loop resistance of the series terminal equipment are measured and its resistance is determined.

The harmonization of the various testing methods could be achieved with little difficulty; there are, however, terminal-specific requirements with various differing values and in some instances various feeding current ranges over which these values are to be measured. Testing correlation would be necessary, but this sort of study would be sensibly approached following the general determination of how, from a regulatory point of view, to consolidate this requirement in part with requirement given in subclause 2.3.

2.6 DC overload susceptibility

Interpretation

The intent of this requirement is to ensure that the apparatus is not permanently affected by high feed currents in such a way that it is no longer able to meet the requirements of the standard.

Different countries have interpreted the requirement in different ways, some covering the range of currents arising in normal conditions and others attempting to cater for network faults.

Overload conditions for series equipment are simulated by the connection of a dummy load to the output port.

Comment

In as much as the requirements of the standard are essential, it is clearly necessary that the equipment should operate without permanent damage over the full range of network feed conditions.

It is not so clear whether this requirement should be extended to include all possible network fault conditions or whether considerations of reasonable risk should be applied to network faults.

This subject is complicated by considerations of liability arising from potential network faults. Should the network operator be liable for damage caused by faults in his network or should all users be burdened with the additional cost of protection against such possible faults?

National inputs

Seven of the nineteen countries responding (**A, SF, IRL, NL, P, S, GB**) do not consider the requirement to be mandatory, possibly on the premise that the range of currents employed in the other tests give sufficient indication of the ability to withstand normal use. Three countries (**B, F, CH**) make the requirement mandatory, but quote "overload" conditions that relate to normal use.

Five countries (**CY, DK, IS, I, N**) quote requirements that demonstrate that the apparatus is required to withstand the effect of the feed resistance being halved by an earth fault in the network close to the terminal, whilst one country (**D**) requires a similar protection but with the battery voltage doubled as well. It is not clear where such a doubled voltage could arise from except by a fault involving feeds from two different exchanges.

The derivation of the other three countries' (**G, L, E**) requirements is not clear but they all lie between the two extremes described above.

It is known that some countries have a safety requirement (outside the scope of ETS 300 001 [3]) that equipment shall not overheat under some network fault conditions, but it should be noted that this aspect of safety is not dealt with in EN 41003 [4].

In addition, in Chapter 10, Finland has a requirement to survive overvoltages.

Harmonization feasibility

It is clearly not possible to harmonize the two distinct approaches to the problem of overload.

As the majority of countries consider that the normal testing gives sufficient protection, then one view is that it is possible to harmonize on no formal requirement.

On the other hand, nearly a third of the countries feel it necessary for equipment to protect itself against network fault conditions for reasons that are considered valid. If the views of these countries are to be respected, then the only possible harmonization is to deal with the worst case arising in any country.

Matters are further complicated by the differing feed conditions in different countries. What may be a "normal" current in a "high current" country may well be an "overload" condition in a country with "low current" feeds.

It should be possible to generate a harmonized requirement that gives sufficient protection to cover reasonable risks for those network operators that need it, without placing too great a burden on manufacturers of good quality equipment.

Cost benefit

Harmonization on "no requirement" could give some cost benefit to equipment manufacturers but it would not be significant to reputable suppliers who build into their equipment a reasonable margin of protection. Some Administrations may acquire significant costs arising from protection within the network or liability for damage consequent on faults on their systems.

Harmonization on an upper extreme requirement would create significant cost to manufacturers who would, in many cases, have to redesign existing product lines. Equipment prices may well be raised by such an approach. There would be no consequent cost to the network operator.

6.3 Chapter 3

Although this Chapter is entitled "Ringing signal characteristics" it actually specifies the various requirements for terminal equipment when a ringing signal is applied in both the quiescent and loop conditions.

3 Ringing signal characteristics

Interpretation

This Chapter deals with ringing signal characteristics and has two main elements viz:

a) input voltage-current characteristics;
b) overload susceptibility.

The requirements are generally related however to the ringing detector in the terminal equipment, and its characteristics.

Comment

In most countries it is permitted to have more than one ringing signal detector connected to the line at any time. This Chapter deals with methods for specifying the ringer impedance and controlling its effect on other ringers. Within this framework, harmonization of ringing characteristics demands the adoption of a solution based on the ability of the Network presentation to drive a given current through an impedance provided that a number of volts exist. This is basic Ohm's law. The only factor which has to feature in the equation is the ringing voltage available at the end of the longest telephone line. This information is not readily available in ETS 300 001 [3].

Ringing detectors that are to be connected in series are normally of low impedance (typically Resistance < 1 000 ohms and inductance < 10 H) whilst ringing detectors that are to be connected in parallel are high impedance (typically resistance > 5 000 ohms and inductance > 50 H). The series arrangement is sometimes used to prevent bell tinkle caused by loop disconnect dialling. This problem will diminish with the spread of DTMF signalling. Nowadays, in situations where the supplier is able to choose the type of ringing detector, it is likely to be high impedance. The reason for this is that the complexity of both the terminal and the wiring are reduced.

It is apparent that a number of series detectors connected in series could be equivalent to a number of parallel detectors connected in parallel, and this could be a measure of the capability of the Network. In reality it probably still does not represent the degree of freedom that could be accepted without problems by the telephone network. In truth, what is likely to prove more problematical is to provide a means by which users can determine, when purchasing new terminal equipment, whether the new device is likely to have a deleterious affect on the existing terminals in the installation. It is also be apparent that if different types of detectors are mixed in an installation then some may not work.

After studying the requirements and information in both Chapter 3 and Chapter 8 it is not possible to conclude which of the above connection arrangements for ringing detectors, if any, is permitted in some countries. It may be that some countries have a mixture.

3.1 Input voltage-current characteristics

Interpretation

The requirements given in the common text of this Chapter set out to control the loading of the network by a ringing detector by specifying the maximum current that can be drawn at a given supply voltage.

Comment

It is necessary to specify the characteristics of ringing detectors in order to control the loading that they place on the network:

(1) to enable the network operator to test the line plant and to predict failure;

(2) so as to prevent premature ring trip;

(3) to ensure in installations with more than one TE;

(3.1) that speech signals on the line and loop disconnect dialling are not degraded;

(3.2) that it is possible to operate other ringing detectors in that installation.

The fundamental network requirement is to control the effect on the network of a complete installation, which will typically include more than one terminal with its ringing detector. It is thus necessary either to assume a maximum number of terminals on any installation, or to provide some means of controlling the number of terminals dependent on the summation of the loads that they individually represent.

The requirements in the common text are based on an assumed maximum number of ringing detectors/installation, but unfortunately the number is unspecified.

Subclauses 3.1.1 and 3.1.2 cater for "Ringing detectors producing electrical signals" and "Ringing detectors producing discernible signals" respectively, although there can be no differing network effects to justify such a distinction.

Subclause 3.1.3 gives requirements for "Terminal equipment without signal detection facilities". A special classification of this kind can be justified for some implementations of national connection regulations.

The loading of the line by the ringing detector at speech frequencies is dealt with in Chapter 4.

An additional requirement may be necessary to control the distortion products sent to line by non-linear devices which it was noted, in some cases, could cause ring trip.

National inputs

Eleven of the nineteen countries (**CY, SF, D, GR, IS, IRL, L, NL, P, S, GB**) specify the same characteristics for ringing detectors with electrical outputs as for those with discernible outputs.

Two (**A, CH**) differentiate between electronic and electro-mechanical versions of detectors with discernible outputs.

Four countries (**B, F, N, E**) require ringers with electrical outputs to have approximately double the impedance of devices with discernible outputs.

Two of the nineteen responding countries (**D, E**) have other requirements which call for devices with electrical outputs to have a much higher impedance than devices with discernible outputs.

It is significant that fifteen of the nineteen Countries responding have requirements that cannot be catered for by the requirements of the common text of subclause 3.1, the main requirements controlling ringing detector loading. Two countries (**B, N**) specify additional requirements similar to those of the common text.

Eight countries (**D, IRL, NL, N, P, E, S, CH**) express the ringing detector loading as an impedance, rather than by specifying the current drawn.

Two countries (**NL, GB**) specify the permitted loading as a connection factor.

Eleven countries (**A, B, F, D, GR, IRL, I, NL, N, E, GB**) specify the capacitance of the ringing circuit, either to control the ring trip, to facilitate line testing, or to limit the distortion of loop disconnect dialling in parallel devices. There is little consistency in the values specified.

A number of countries have additional requirements such as limits of audio frequency distortion products, limits of dc current drawn, insertion loss of series equipment, response time, sensitivity, immunity and loudness. Some of these are more properly terminal requirements, rather than access requirements.

Two countries (**DK, E**) have requirements for insulation to accessible parts and/or earth which is really a safety matter.

Harmonization feasibility

It is clearly not possible to harmonize the present wide range of national requirements using methods based either on the requirements of the common text or on the various national responses. Differing national connection arrangements and regulations also tend to preclude harmonization although the use of an adaptor might possibly offer a transitional solution. On the other hand, there is much commonality in the design of modern ringing detectors.

A further difficulty is caused by the range of ringing frequencies specified.

One possible approach to harmonization would be to determine the current drawn by a ringing detector with a fixed supply voltage which is known to operate the current range of ringing detectors (say 20 V), and which is available from the network on the longest lines. This current would constitute a harmonized loading rating. Public networks could then declare an available current rating so that the maximum number of devices able to be connected could readily be determined.

Another approach could be harmonization on an impedance value and a fixed number of devices allowed to be connected. This has the disadvantage that the user is restricted from connecting a larger number of devices to his installation even if they have a higher than normal impedance and also prevents the use of a lower impedance device where the number of terminals is less than the limit allowed.

A third approach could be a regime based on the use of a connection factor similar to that described in the national comments of **GB** and **NL**. These systems avoid the problem of the fixed number of devices but tend to suffer from the fact that the numbers do not always add up correctly and operation cannot be guaranteed.

A major difficulty remains in the differing ringing detector capacitances specified. The range of values specified is such that harmonization is not possible, particularly in those countries with installation arrangements such that a change would affect loop disconnect signalling.

Testing

There is a range of test circuit values specified which derive mainly from the differing characteristics of the national networks. It will not be possible to harmonize the testing, which needs to emulate the networks, unless the requirements can be expressed in a different manner which is not dependent on the ringing frequency and feed characteristics.

Cost benefit

The current range of access requirements for ringing detectors is not so great that harmonization would generate a large cost benefit to suppliers, although if the capacitance could be harmonized, particularly to a lower value, some significant benefit might result.

Any attempt to harmonize the capacitance might have major cost implications for those countries where loop disconnect signalling was affected or where line test facilities required changing as a result.

Harmonization of the ringing detector requirements would not have a major impact on public exchanges, although there would be significant initial research costs in the evaluation of any new proposals and the generation of new network design data. On the other hand, harmonization of ringing supply frequencies would cause significant costs, both to network operators and PBX suppliers.

3.2 Overload susceptibility

Interpretation

This requirement is intended to ensure that the apparatus is not permanently affected by ringing currents applied either in the quiescent or loop condition in such a way that it is no longer able to meet any relevant requirements of the ETS.

Comment

It is clearly desirable that the equipment should operate without permanent damage over the likely range of normal ringing conditions.

This subject is complicated by considerations of liability arising from potential network faults. Differing national obligations lead to differing terminal requirements.

Different countries have interpreted the requirement in different ways. Some specify the range of ringing voltages and cadences arising from normal operating conditions; others, in addition, attempt to cater for potential network faults.

In many countries, these requirements are based on a historical need to ensure quality at the purchasing stage. In the new liberalised environment such requirements may not be considered appropriate and, in this case, the supplier could choose to meet them or not at his own risk.

It is not as clear whether this requirement should be extended to include all possible network fault conditions such as failure of network ring trip, or whether considerations of reasonable risk should be applied to network faults.

National Inputs

Eight of the nineteen countries (**A, CY, SF, F, IS, L, S, GB**) responding do not consider the requirement to be mandatory, possibly on the premise that the other tests give sufficient indication of the ability to withstand normal use. One country (**DK**) makes a quiescent condition test mandatory with a requirement not to cause secondary damage, but quotes no requirement for a loop condition test.

Seven countries (**DK, I, NL, N, P, E, CH**) call for a test with normal ringing voltages, whilst only three (**B, D, GR**) test with significant overvoltage. Nine countries (**B, D, GR, I, NL, N, P, E, CH**) use uncadenced ringing for the tests. Ireland fails to specify the test voltage but it is one of the only two countries (**IRL, CH**) to apply the loop condition test for a time representative of network ring trip failure.

Some countries have safety requirements that terminal equipment shall not overheat under certain network fault conditions, but it should be noted that safety and protection are outside the scope of ETS 300 001 [3] and that overload is not dealt with in EN 41003 [4].

Harmonization feasibility

It should be possible to generate a harmonized requirement that gives sufficient protection to cover reasonable risks for those network operators that need it, without placing too great a burden on manufacturers of good quality equipment. This approach is only possible if the necessary steps are taken to change the network operator's legal liabilities in those countries where they apply.

Seven countries (**B, GR, IRL, N, P, E, CH**) consider it necessary to test the overload susceptibility in the loop condition. The duration of such an "overload" is dependent on the ring trip characteristics of the network.

Testing

The harmonization of testing is inhibited by national network characteristics that differ one from the other. Therefore, the test conditions need to differ also.

It will not be possible to harmonize until the question of testing under fault conditions is settled. The presence of any local protection may have to be considered in this discussion.

Cost benefit

Harmonization on "no requirement" could give some cost benefit to equipment suppliers but it would not be significant to reputable suppliers who build into their equipment the necessary margin of protection. Some network operators could acquire costs arising from a need to limit fault voltages or from liability for damage consequent on faults on their systems unless they were suitably indemnified.

Harmonization on an extreme requirement would create significant cost to many suppliers who would have to redesign industry standard components. Equipment prices would also be raised by such an approach. There would be no direct cost to the network operator although it could deny a more liberal provider the potential call revenue generated by lower cost innovative products.

6.4 Chapter 4

This Chapter deals with those characteristics of terminal equipment which may affect the transmission performance of the network or of any other equipment connected on the same installation. Requirements are given for input impedance, unbalance about earth, insertion loss, power levels to line and noise levels.

4 Transmission characteristics

4.1. Input impedance

4.1.1 Input impedance of TE in the quiescent state

Interpretation

Regardless of the polarity presented by the exchange line, the impedance presented at the line terminals of the TE while in the quiescent condition shall be greater than the limits given over the specified ranges of frequency and feed conditions.

Comment

The intent of this requirement is to prevent other TEs connected to the same exchange line as the TE that is in the loop condition from:

- adversely affecting the impedance presented by the TE in the loop condition to the network;
- reducing the effective levels of signals transmitted to or received by the TE in loop condition; and
- in general, degrading the performance of the TE which is in the loop condition. This might be particularly important for modems (including facsimile machines) using complex modulation schemes where the effects of other terminals could distort the signal making it difficult (impossible?) to demodulate.

National inputs

Considering first the requirement in the speech-band (200 Hz to 2 000 Hz and 2 000 Hz to 4 000 Hz), with the exception of two countries (**IRL & NL**), the requirements are the same for both bands specified. The values range from 6 k ohms to 50 k ohms, and ultimately the choice of value will determine how many terminals can be connected to the line without causing premature tripping of the ringing signal or significant signal degradation.

One country (**F**) has chosen to measure the effect as an insertion loss. Whilst at first sight this appears to be a fairly pragmatic solution, given the range of impedances that terminals are permitted to exhibit in the loop state, the results are unlikely to represent reality. As the number of terminals permitted to be connected to the line increases, the disparity with reality is likely to become more evident. Given the stated tests i.e. that the insertion loss is with respect to 600 ohms source and load impedance, the declared value actually equates to a value of 12k ohms or more.

Considering secondly the region above the speech-band, it is difficult to see a logical reason for any requirement in the band 4 000 Hz to 11 500 Hz since signals in this band are not permitted and further attenuating any signals actually transmitted should prove beneficial rather than detrimental. For the frequency bands specifically around 12 000 Hz and 16 000 Hz, a requirement seems appropriate since these are popularly used for transmitting metering pulses as transverse signals. These signals already suffer considerable attenuation during transmission which makes them difficult to detect on the longest lines.

<u>Specific remarks:</u>

4.1.1(**DK**)1 the requirement finishes "...more than 6 dB/octave." . this needs to state an upper limit to the frequency otherwise the requirement extends to all frequencies including light and radio!

4.1.1(**S)**1 In the figure the capacitor is stated to be 60 nF but in subclause 4.1.2 it is stated to be 30 nF. Is this correct? The requirement for meter pulse receivers for a return loss of 20 dB permits an impedance of 1 045 ohms at 2 000 Hz. Given that Sweden allows the loop condition impedance to vary by 6 dB from the reference impedance which, for frequencies of less than 2 000 Hz, would permit a resistive termination of much greater than 2 500 ohms, this hardly seems likely to achieve the stated aims!

Harmonization feasibility

Harmonization of the "installation practice" is needed for this requirement to be harmonized. It could be argued that if ETS 300 001 [3] is concerned with access then the network really has no interest, but it is clear that at some level such a requirement will be required or complex connection arrangements need to be provided (see paragraph below) which in themselves deal with such problems.

The method of connection in some countries obviates the need for such a requirement when one TE enters the loop condition by effectively disconnecting all other TEs connected to the same line. Such arrangements are, in general, complex and unlikely to permit simple "Do It Yourself" (DIY) wiring of customer's installations. Many countries have simplified their installation practices to parallel connection and some, whilst not guaranteeing the operation of a second parallel telephone, certainly do not discourage its use.

Is a single value of input impedance the best answer? How many terminals might be physically connected to a single line at any one time? It is probably in the interests of all to allow the number of terminals to be as high as is practically possible, but setting a limit which is artificially high is not in anyone's interest. It would appear that a regime based on "connection factor" (**NL**) or REN (**GB**) offers the most versatile solution and maximises choice while not imposing intolerable requirements. For example, a supplier achieves some limit and assigns a value and, if as a result his terminal precludes many other terminals from being connected, the buyer will choose between either that terminal or the possibility of having more terminals.

It should be possible to produce a harmonized requirement once the "installation practice" has been sorted out and also on that basis for the testing to be harmonized.

Cost benefit

Until the "installation practice" is sorted out it seems difficult to assess the cost and/or benefits. However, it would appear that the adoption of a simplified wiring scheme (simple parallel wiring using 2- or 3-wires) would have some benefits in that it will reduce the costs to the end user if wiring by him can be permitted. This is, however, bound to have important, perhaps even legal, consequences for at least one or two countries (**D & S**).

4.1.2 Input impedance of TE in loop condition

Interpretation

This subclause requires that the impedance presented by the terminal (in the loop condition) to the telephone network is within the limits specified for a range of frequencies and dc feed conditions. The limits are usually described in terms of return loss with respect to a specified reference impedance and thereby describe an area in which an acceptable impedance falls.

Comment

The purpose of this requirement is twofold.

First, provided that the impedance remains within the limits described, the network operator knows that the performance of his network in terms of stability and echo loss will satisfy relevant CCITT Recommendations.

Second, it gives the supplier some guidance about the impedance presented by an analogue telephone network and, therefore, assists the supplier in optimising the performance when designing terminal equipment.

National inputs

The requirements are basically written around two practices using either a 600 ohm or an alternative complex reference impedance. Nine countries (**A, B, F, IRL, I, L, NL & E** (adjusted in frequency bands)) have a general requirement and three countries have a data requirement (**N, P & GB** (with no more than 50 ohms of inductive reactance)) for a return loss of 14 dB against 600 ohms. Five countries (**CY, DK, SF, IS & P**) have a requirement for a return loss of 10 dB against 600 ohms. Seven countries (**DK, D, GR, N, S, CH & GB**) have existing requirements for a return loss against a complex impedance. This impedance is the same for Germany and Switzerland but Germany varies the return loss with frequency.

Whilst generally if one were looking to harmonize, a move to 600 ohms (used by the majority of Administrations) might seem to be sensible, this move would ignore the benefits in improved quality that would accrue from using a complex impedance (see new Supplement 31 to CCITT Recommendation G.121 [5]). One country (**P**) has stated that they intend to introduce a complex impedance in the future.

France is currently evaluating whether any benefit might be gained from the introduction of a complex impedance and according to ITU-T Recommendation Q.552 [6], two other countries (**A,I**) have already considered the introduction of a complex impedance.

The remainder of the national remarks can be rationalised as follows:

- four countries (**B, DK, F & P**) alter the requirement based on the type of terminal;
- four countries (**F, NL, P & CH**) substitute alternative feeding conditions to those provided in the common text;
- two countries (**N, CH**) make specific statements about the return loss at meter pulse frequencies;
- one country (**F**) defines requirements for impedance while DTMF dialling;
- two countries (**N,GB**) specify the effect on return loss of series connected TEs;
- seven countries (**B, DK, D, GR, N, CH, & GB**) provide diagrams of their national complex impedance;
- two countries (**D & GR**) provide tolerances on the components used for reference. This concept is not understood because, in effect, this can be described as a relaxation in the limits described. It is for the test house to ensure that its reference components are sufficiently close to the norm to achieve the desired accuracy.

Testing

It needs to be made absolutely clear for this and all other tests that the principle of testing at points within a range of parameters does not absolve the supplier from meeting a requirement throughout the whole of a specified range.

Two factors need to be considered:

1) The feeding bridges in the national tests may not always exhibit sufficiently high impedance in the frequency band in question to ensure that the results are not affected. Whilst it is obviously possible for a test house to characterise its feeding bridge and take the effects into account, ETSI TC-TE feel it is desirable, in terms of repeatability, for the feeding bridge to have negligible effect on the measurements. The limits of the allowable effect should be defined as part of the testing criteria. For many other countries the values of the inductance (2 H) and capacitance (1,8 µF) specified for the feeding bridge (see Chapter 1, table 1.5) would be of significance when measuring return loss. These bridge values seem to be more in keeping with reality than with consistent results. Following an analysis of the effects of these values it was concluded that, in many cases, the effect of mutual inductance may have been forgotten. This analysis is contained in clause 4 of ETR 075-3 [2].

2) The cost of building terminals able to adjust their impedances to suit the line to which they are connected is likely to reduce in the future. In order that such terminals are not excluded from connection to the network, it is important that whilst under test they are able to detect a source impedance equal to the characteristic impedance against which their performance is being measured. At first, it may appear that two countries (**I & GB**) seem to have been confused by table A.4.1.2 and have inserted the reference impedance (Z_r) instead of the generator impedance (Z_G), but these entries also might reflect a desire to encompass such adaptive impedance balance techniques.

Harmonization feasibility

Studies suggest (clause 4 of the ETR 075-3 [2] provides the detailed analysis) that there is no possibility for harmonization without change. This arises because there is no common area for all countries at all frequencies. The proposed BT2 impedance only further clouds the issue by adding yet another variant to those to be harmonized without necessarily offering an acceptable solution.

Regardless of whether harmonization of the impedance values is achieved, it should be possible to specify a single harmonized test. It is considered to be of the utmost importance that such tests be described in sufficient detail so that the same test results are produced regardless of which testing authority performed the testing. The effect of the values of feeding bridge components is known to be significant and, therefore, target values should be specified.

Given the earlier statements, a clearer approach to harmonization can be suggested. One solution might be to require a return loss which is low enough to enable it to encompass all other impedance values. This is almost equivalent to saying there is no requirement (we don't care). How would suppliers get by if no impedance value were declared? The result of such a policy would be to seriously erode the stability and echo performance of most Public Telephone Networks with a resultant degradation in the performance of the terminals attached to those networks. Alternatively, assuming some common set of values could be identified, such a set of values would be of limited range at each frequency and most suppliers would find it costly or difficult to meet.

The alternative approach is to define an impedance, such as that postulated by ETSI STC-BTC 2, and associated return loss which is restrictive enough to be meaningful. How does one arrive at this value? If it is an "average" value then it will encourage suppliers to build terminals which, without changes to the network, would be unlikely to work as well as terminals designed to work to the appropriate national impedance.

To quantify the degradation likely to result from any change in impedance requires **dynamic** information which currently only the Public Telephone Network Operators have, and assessment that could involve many months of work.

As a harmonized solution it is suggested:

1) the retention of a 14 dB return loss with respect to a 600 ohm requirement. This recognises the existence of a large population of galvanic switching exchange equipment and associated 600 ohm TEs. In order to facilitate transition towards a complex (capacitive) impedance the permitted range of inductive reactance should be limited to no more than 50 ohms to100 ohms;

2) the introduction of, for example, 14 dB return loss with respect to a complex impedance such as 280 ohms in series with 720 ohms in parallel with 150 nF in place of all the other complex impedances;

3) any country wishing to move from 600 ohms to a complex impedance, might then only be permitted option 2).

The values of return loss, determined against a chosen reference these impedance will need to reflect the final application of ETS 300 001 [3] and whether Access or Terminal requirements or both are included.

Cost benefit

Any change of reference impedance that suggests changes to the network in order to maintain acceptable levels of transmission quality is likely to prove extremely expensive. The proposed options above, while not offering a unique solution have the potential benefit of not requiring changes to the network and the resultant levels of degradation should, for most countries, be insignificant (no cost). Countries that specify 600 ohms are permitted to retain 600 ohms (no cost). At any time they would be able to evaluate whether a change to a complex impedance would produce potential benefits.

4.2 Degree of unbalance about earth

Interpretation

The requirements of the subclauses 4.2.1 and 4.2.2 are intended to ensure that a TE input is well balanced about earth in order to reduce the effect of unwanted transverse signals received at the input port, when excited by a longitudinal signal according the CCITT Recommendation G.117 [7] and CCITT Recommendation O.9 (formerly O.121) [8].

This subclause concerns only two measurements (LCL, LCTL) of the twelve main measurements set defined in the CCITT Recommendation G.117 [7] (TRL, TCL, LCL, LIL, TOL, LOL, TTL, TCTL, LTL, LCTL, OSB, ILIL).

The measure of the effect termed Longitudinal Conversion Loss (LCL), concerns only the unwanted signals received by the TE when an unwanted signal is applied to the longitudinal path of the one port-TE or of the combination of a two-Port TE connected to a one-port TE.

The Longitudinal Conversion Transfer Loss (LCTL) is a parameter combining the LCL and the effect of the balance of the series-connected TE.

The requirements apply to a TE in both quiescent and loop conditions and also to a High input impedance TE.

The frequency range of the requirements and tests includes the voice band (300 Hz to 3 400 Hz), the ringing signal band and the electricity supply frequency with their harmonic components (15 Hz to 300 Hz), and also metering pulses frequencies (12 KHz, 16 KHz).

Comments

- About unbalance/earth requirements

In general, CCITT Recommendation G.117 [7] on the transmission aspects of unbalance about earth covers a comprehensive set of prescriptive measurements of twelve various balance parameters:

- some of them are related to the input impedance as a reflection factor expressed as return loss in relation of a reference impedance ;

- others are related to the receiving of correlated signals as a conversion factor expressed as losses or attenuation between the transverse and the longitudinal paths and for the input interfaces;

- others are related to the output of generated signals as a balanced output.

The LCL and LCTL parameters obviously mainly concern the specific transmission quality of the terminal. Consequently, these requirements should be in the specific ETS of the TE if the severity of the requirement takes different levels according to a specific target performance, or an access ETS if a common requirement value for all types of TE could be chosen without unacceptably increasing the cost of the TE.

For various technical reasons the Output signal balance loss (OSB) parameter seems more suitable as a method of expressing the unwanted longitudinal signals generated by the terminal itself.

The OSB requirement is proposed in the (**GB**) remark as "Signal balance" with the associated measurement figure, limited to TE with earth lead or terminal.

- About the frequency range

The outband frequencies of the OSB requirement and its associated test, relating to metering pulses should be defined at only 12 KHz and 16 KHz. At other frequencies the TE does not output any useful signals.

- About country inputs status

The summary status table about the country inputs demonstrates that the country contributions are not complete and sometimes not consistent. A question remains in the cases of Administrations which declare the requirement to be Not Mandatory (N.M.) or which do not complete the table (NF).

The LCTL requirement appears to be not relevant for the majority of the countries, fourteen countries consider it as not mandatory.

It is a fact that if the TE connected on the second port of the series-TE is well balanced according to the specifications, then the effect of lack of balance of the series-TE is negligible. As a result, fourteen countries out of nineteen do not consider this parameter and the withdrawal of the LCTL requirement is suggested.

- <u>About LCL requirement in quiescent condition</u>

A few countries consider that the LCL is not relevant in quiescent state. On the other hand, this requirement could be said to be relevant to the received signal quality performance of the TE, since any parallel TE with a poor quiescent LCL could cause unbalance.

- <u>About test figures</u>

Measurements of balance about earth parameters are sensitive in practice to the character of the measurement arrangements (impedance matching, measuring equipments, feeding-bridge and inductance balance about earth, etc.).

The results of these measurements are not easily reproducible and their repeatability is not insured if care is not taken with physical arrangements of the testing equipment and the TEUT.

Considering the wide variation in the test conditions used by various Administrations with respect to physical arrangements, especially with respect to the earth path, the position of the hand-set and its cord and also the use of foil, result values are understandably scattered, particularly in the speech-band (17 dB) and in the low frequency band (27 dB).

The measurement environment also requires careful consideration with respect to electro-magnetic interference, and in case of the TE with microphones, the acoustic environment needs to be specified.

It could be helpful to follow the CCITT Recommendations relevant to these tests but these specify neither the DC feeding of the TE under test nor the earth return path or environment conditions.

Figures A.4.2.a and A.4.2.b of ETS 300 001 [3] propose a measurement arrangement similar to the CCITT Recommendation and add a feeding bridge, but mainly, for practical reasons, most countries require two matched impedances rather than the centre-tapped coil defined by the CCITT.

Accordingly, it appears necessary to define a comprehensive detailed measurement arrangement with an associated testing method in which the following aspects should be considered:

- appropriate specification and description of the feeding bridge;
- balance specification of the measurement apparatus;
- physical arrangements;
- specification of the earth path (position and distance of the TE with respect to earth or artificial earth);
- special consideration of the position of the hand-set and its cord (artificial hand);
- electro-magnetic environment;
- acoustical environment in case of microphone use;
- definition of a reference one-port TE;
- dc feeding conditions;
- sampling value of the parameters (e.g. sampling frequency spaced of one third of octave).

- About requirement values

The table values are the same for all the various requirements described in this Chapter except for the cases where the requirements are not mandatory or unfilled.

In the view of TC-TE, the LCL or LCTL requirement in the quiescent condition should be more stringent than the LCL or LCTL requirement in the loop condition (e.g. alpha = 10 dB to 15 dB higher in quiescent condition) in order to permit the connection in one installation of several terminals in parallel with negligible effects.

In view of the little interest demonstrated by the countries' contributions about the LCTL requirement, and considering that the effect of the balance of the transfer function of series-TE is negligible when the LCL of the associated one-port TE is over the required value, it is suggested that the LCTL requirement be dropped.

National inputs

No entry from Malta.

- About the structure of the subclause 4.2

The structure of the subclause 4.2 is very confusing, which has probably contributed to conflicting values and sometimes unfilled table cells. It is suggested that the structure be revised in the light of the above comments.

- About test conditions

The majority of the countries (thirteen) use an earth plane as an earth path, under the TEUT (**CY, DK, SF, F, D, IS, I, NL, N, P, E, S, CH**) and two of them also use the foil as an earth path (**DK, I**).

One country uses only the foil as an earth path (**GR**).

In addition, one country defines an artificial hand for the hand-set earth-path (**DK**).

Three countries said that the earth path is not mandatory (**A, B, L**) and one country said nothing (**GB).**

In addition, most of the countries request some variations in the test arrangements as mentioned earlier.

Eight countries require the centre-tapped coil of the common text to be replaced by two matched impedances (**B, CY, DK, F, D, NL, N, GB**), one country (**DK**) specifies a simpler test arrangement without a feeding bridge and another country (**GB**) gives a test arrangement for the LCL, LCTL measurement and also the OSB of the signal being generated from the TE.

The values of the test figures in table A.4.2.b have large variations which might give some significant variations in the results at low frequencies (50 Hz): 2 µF < CL < 200 µF, 2 H < L < 15 H....etc.

(**A, IRL, L**) do not completely specify all the parameter values for the test and some countries do not specify the value of $Z_{2.}$ in the case of the test for a two-port TE (**F, D, IRL, N**); one country (**B**) specifies different values for one-port TE (600 Ω) and two-port TE (20 KΩ) and (**I**) specifies 10 kΩ for both cases rather than the common text value of 600 Ω.

- About requirements values

The four tables concerning the LCL requirement in quiescent and loop conditions for the one-port TE and the two-port TE contain the same values for most countries. The exception to this is where the requirement is not filled or is not mandatory.

The two tables concerning the LCTL requirement in quiescent and loop conditions for the two-port TE also contain the same data, but the majority of the countries (thirteen) declare that the requirement to be "not mandatory".

The requirement of the various countries are spread in a very large range of values: **27 dB** at low frequencies (15 Hz to 300 Hz), **17 dB** in the speech band (300 Hz to 3 400 Hz), **12 dB** at higher frequencies (12 kHz to 16 kHz).

Some countries require particularly onerous values of the speech band **LCL** parameter, **57 dB** (**CH**), **55 dB** (**S, DK, IRL, SF, E**) yet others require low values **40 dB** (**I, GR**). The remainder require medium values **46 dB to 52 dB** (**S, NL, N, IS, B, A, S, D, F, GB**) or declare the requirement to be "not mandatory" or leave the relevant table unfilled.

Some countries again require particularly onerous values at low frequencies (15 Hz to 300 Hz) **LCL** parameter **57 dB** (**CH**), whilst others are content with low values **30 dB** (**D**), **40dB** (**S, N, SF F, I, IRL, E)** and the remainder require medium values **46 dB to 52 dB** (**S, NL, CY, DK, E**) or declare the requirement to be "not mandatory" or leave the relevant table unfilled.

At 12 kHz to 16kHz, some countries require medium values for **LCL** parameter **50 dB** (**S, CY**), whilst others require decreasing values with a downward slope of 6 dB/octave <u>without a stop line</u>, starting from **57 dB** (**CH**), starting from **55 dB** (**E**), starting from **52 dB** (**GR**). The remainder have not declared any requirement in this frequency band.

Some countries declare that the LCL requirement is only applicable to TEs with an accessible earth part or earth terminal (**GB, IRL**).

One country (**NL**) specifies in the national remarks a longitudinal input impedance at 50 Hz for the case of TE with or without meter pulse. This seems to equate closely to the longitudinal impedance ratio loss (**LIL**) defined in the CCITT Recommendation G.117 [7]. It would seem more appropriate for this requirement to be addressed in subclause 9.2.2.1.

One country (**GB**) specifies a different requirement concerning the **signal balance about earth** corresponding to the **output signal balance loss** (**OSB**) defined in the CCITT Recommendation G.117 [7]. The requirement for **OSB** appears to be at least as relevant to network concerns as the requirement to limit **LCL**.

Harmonization feasibility

- <u>For the requirements</u>

It appears possible to harmonize the TCL requirement, which is principally terminal specific but the inconsistencies of the data available at this moment do not permit this while the testing method is not resolved and while the requirement values declared by Administrations remain incomplete or fail to take into account testing methods. The OSB requirement may also be relevant to the network attachment, and could be specified for both one-port-TE and series-connected-TE, but unfortunately no data is available because the common text did not include it.

- <u>For the testing methods</u>

It has been mentioned above that tests for this requirement are particularly sensitive to physical test arrangements if repeatability and reproducibility are to be achieved. Harmonization requires a precise definition of these arrangements as a first priority, but it would seem highly feasible to do such work.

It should also be noted that both TCL and OSB measurements can be made with identical physical arrangements by reversing the connections of source and load, and it is suggested that such a procedure would further aid harmonization.

Measurements concerning levels of output from TE under test clearly require an output signal which is the same from test to test and equipment to equipment as well as having characteristics which permit testing the parameters in question. In the case of TE using live speech, a particular pass band signal needs to be specified; for the case of data equipment, special software (which causes the TE to produce a particular pass band signal) needs to be used.

The importance of detail such as that mentioned above, which may not immediately appear to be a consequence, again emphasizes the need for a separate treatment of analogue testing, and suggests that a standard with an appropriate scope could well be a key part of harmonized and repeatable tests.

Cost benefit

Harmonization of LCL and OSB would not generate a significant cost to the manufacturers and product if the levels were set to reasonable values.

Nor would it generate a cost to the network operator but rather might well introduce a benefit to the end-to-end transmission quality.

The harmonization of the test method will generate benefit to the manufacturers and to test houses producing repeatable and comparable results.

The cancelling of the LCTL requirement would reduce the cost of the test of an unnecessary and unimportant parameter.

4.3 Series-connected insertion loss

Interpretation

This requirement specifies the ac pass band characteristics of terminal equipment with two ports. Although there a number of types of such equipment specified in the definition section of Chapter 1, the requirement makes no mention of any internal routing or switching function. It is, therefore, assumed that the series terminal equipment is of type 3 (II) or of type 4, with no account taken of switching activity.

This requirement is in fact three requirements distinguished one from the other by the pass band of measurement. The three classifications are:

1) measurements in the speech pass band;

2) measurements in the pass band used for the transmission of transverse metering signals;

3) measurements in the low-frequency out-band ringing signal pass band.

The intention of application of this requirement is to limit the loss of signals which have to pass through the equipment to other terminal equipment which terminates (and by inference, receives signals from) the line.

The requirement makes no provision for equipment deliberately intended to block signals.

Comment

Although the requirement is, in every case, specified by Administrations in such a way as to ensure that the basic loss parameters are measured, some Administrations specify loss with respect to reference impedances different from those quoted in subclause 4.1, some in addition specify distortion resulting from the signal as it passes from one port to another, and one Administration finds the requirement to be of non-mandatory status.

There is, in addition, no mention generally of the numerical limit of connection of series-connected terminal equipments, one to another; it has been assumed that the requirement values set out apply to either one only, and that only one equipment is expected to be interposed between the network termination and the terminating equipment, or that the requirement applies to all series-connected terminal equipment as a whole.

This distinction requires clarification.

It should be noted that this requirement generally has a close relationship with the requirements for dc series- connected terminal equipment (see the requirement in subclause 2.5 of ETS 300 001 [3]), in that the resistance loss quoted in that requirement bears a close correspondence in most cases to the ac loss resistance required herein. For those Administrations which have not correlated these two requirements, it is suggested that this work would be of benefit.

National inputs:

1) ac loss in the speech pass band: with the exception of three Administrations, terminal equipment is assumed to be terminated with other terminal equipment which itself provides the line loop. The Administrations which do not make the arrangements clear have been contacted for clarification.

Two Administrations ask for distortion targets to be met, and other Administrations may well wish to consider whether this should be a general aspect which is tested.

2) ac loss at meter pulse frequencies: this requirement is intended to determine the ability of series-connected terminal equipment to be transparent to meter pulse signals which are applied at frequencies well outside the speech pass band.

As various frequencies are used by various Administrations, there is no possibility (or, it could be argued, little point) for harmonization.

Two Administrations specify series loss at 16 kHz, four at 12 kHz, and two others specify a general outband series loss over a pass band from the top of the speechband to 17 kHz or 18 kHz, respectively. A third specifies outband loss to 10 kHz, a range over which no known meter pulses are used. There seems little technical reason why these various requirements cannot be harmonized; as written, there is almost universal declaration of loss value and load impedance.

3) ac ringing signal loss: two Administrations only specify losses to be determined at ringing signal frequencies. This may be a parameter which Administrations would find helpfully included in (say) a voluntary set particular to series connected terminal equipment, since such voltages are much larger than other ac signals encountered and are presented with typically a lower source impedance.

Harmonization feasibility

Requirement

A considerable degree of harmonization is already displayed by the national values and comment contained in this requirement. Since the requirement is in any case concerned with the partition of total requirements of terminal equipment terminating the line between those equipments which pass signals and those equipments which absorb signals (or provide line loop current), there is arguably more scope for adjustment of that part of the total requirement assigned to the series-connected equipment. There remains to be resolved a technical confusion concerning equipment intended to provide a termination without looping the line and without providing thereby a dc line current such as meter pulse recording equipment. Such equipment might well have requirements included in a terminal standard concerned with such functionality.

Testing methods

It is difficult to identify a technical reason for having a series of different testing methods for this set of requirements. For one thing, there is a high degree of commonality in testing method already, and those special tests set out are in fact electrically equivalent to the general method used by most Administrations. Although the meter pulse tests use different bandwidths, it is considered that single bandwidth values for each case concerned could be identified with no technical compromise necessarily following. The few anomalies in the set of testing methods are considered to be of minor technical importance.

Cost benefit:

It is considered that significant savings could result both in testing simplicity and in cost of design and production. The design of equipment to meet varying small differences in declared series loss is not economically insignificant nor inconsequential to production cost.

4.4 Transmission levels

Comment

This subclause of Chapter 4 sets out to control the levels of signals (peak values, inband and outband) that may be sent to line so as to prevent the network from being overloaded, to avoid the interfering effects of crosstalk, to enable out of band signalling system use and to preserve the out of band spectrum for other uses.

Its clarity would be improved by a more consistent presentation of the requirements which should remove the confusion as to the applicability of some requirements to live speech and MF signalling.

4.4.1 Maximum transmission levels

Interpretation

This requirement calls for the TE, when in the loop condition and at its maximum output gain setting, not to send to line speech band signals with a peak value greater than that specified over a range of DC current feeds.

The requirement embraces all types of TEs, whether sending data or code signals, recorded or live speech and, whether such live speech is derived from electronic or carbon microphones.

As the requirement does not apply in the dialling state, it is assumed not to apply to loop disconnect or MFPB dialling although if this is so, the reference to code signals is not clear.

Comment

The test contains a hidden requirement that all TEs sending any signals to line other than live speech or dialling, shall be accompanied by an instruction manual giving at least the information necessary to set it to give maximum output.

The test equipment is not defined closely enough to prevent different results being obtained at different test houses. The method described in subclause A.4.4.1(**GB**)1 contains a description of a test method that is likely to give repeatable results.

It is assumed that as the requirement does not apply to TE in the dialling state, it does not apply to transitional conditions encountered in changing to or from that state.

There is no method laid down for generating a suitable speech excitation signal.

National inputs

Five countries (**B, DK, IS, NL, N**) specify a peak signal in the region of 3,5 V. Seven countries (**C, GR, IRL, L, P, CH, GB**) specify peak signals close to 1,5 V.

Four countries (**A, F, E, S**) specify different peak signal values for speech and data signals. All of these, except France, allow speech signals to exceed the levels of data signals. Two countries (**A, D**) specify their limits in terms of dBm.

Six countries (**A, F, GR, IRL, I, GB**) specify that this requirement does not apply to live speech. Germany does not specify a requirement for speech signals, applies very restricted signal level limits to "non-regulated" services.

The tests are specified to be carried out at a number of different national feed conditions which it is not meaningful to classify by feed voltage or resistance. Some countries specify current values for testing but it is by no means certain that the values quoted are always appropriate or achievable. The French test requirement calls for two voltages and two feed resistors giving two tests at extremes of current.

Denmark specifies in Chapter 1 the feed voltage required to determine Imax. Two countries (**I, CH**) specify three voltages and three feed resistors, but it is not clear whether this implies that three or nine tests are intended.

Harmonization feasibility

It should be possible to group the feed conditions into "high" and "low" current categories. Two common sets of feed conditions could then be derived, but this would have the disadvantage of requiring testing at more currents than are required by any single National requirement.

Providing the differing feed conditions are harmonized into, say, two or possibly three groups, there should be good prospects for harmonizing this requirement into two groups of peak voltage levels particularly if the live speech requirement is removed.

The method of test could readily be harmonized but requires a closer specification of the methods of peak voltage detection.

Cost benefit

As the requirement is already substantially harmonized, there should be little cost or benefit arising from further convergence of the requirements.

The harmonization of the testing could give significant saving to manufacturers.

4.4.2 Speech band power levels of signals sent to line

4.4.2.1 Levels of recorded, synthetic or live, speech or music

Interpretation

This requirement is intended to limit the output levels of any recorded speech or music signals sent to line in the off-hook (loop) condition by specifying the average power to line over any period of 10 seconds. Measurements are made with a measurement bandwidth of 200 Hz - 4 000 Hz over a range of dc feed conditions.

The literal meaning of the requirement, paying particular attention to the punctuation, is taken to mean that it applies to recorded speech or music, whether derived from a synthetic or live source. It is understood not to apply to live speech or music when it has not been recorded.

As the requirement does not apply in the dialling state, it is assumed that it does not to apply to loop disconnect or MFPB dialling.

Comment

The test contains a hidden requirement that all TEs sending any speech band recorded signals to line in other than a dialling condition shall be accompanied by an instruction manual giving at least the information necessary to set it to give maximum output.

It is notable that the specification of a 10 second averaging time for measurement is not consistent with the normal period of one minute specified in CCITT Recommendation V.2 [9].

It is unfortunate that the use of commas in the title of this requirement has lead to confusion as to whether it applies to live speech (or music). This confusion is compounded by the test description which appears to consider TEs which are emitting non-recorded signals.

An ETSI Project Team (PT 26) had earlier recommended that this requirement should be merged with subclause 4.4.2.2 in order to clarify the intent of the standard. This should provide an improvement provided that the recorded/live speech part of the requirement is suitably clarified.

National inputs

The specified maximum speech levels fall into two main ranges. Four countries (**A, I, L, NL**), specify -6 dBm as a maximum speech level. Eleven (**CY, DK, SF, F, GR, IS, IRL, N, P, E, S**) specify -10 dBm. Switzerland specifies -13 dBm, whilst the Great Britain specifies -9 dBm for recorded speech and -12 dBm for music to take into account their differing characteristics.

Germany specifies no requirement, treating the level of speech or music, whether recorded or live, as a terminal requirement rather than as an access requirement. Four countries (**F, E, S, GB**) exempt live speech, Italy insists that levels need to be adjustable, and Norway insists that adjustments shall not be user accessible.

The tests are specified to be carried out at a number of different national feed conditions which it is not meaningful to classify by feed voltage or resistance. Some countries specify current values for testing but it is by no means certain that the values quoted are always appropriate or achievable. The French test requirement calls for two voltages and two feed resistors giving two tests at extremes of current.

Denmark fails to specify the feed voltage required to determine I_{max}. Two countries (**I, CH**) specify three voltages and three feed resistors, but it is not clear whether this implies that three or nine tests are intended.

Harmonization feasibility

There should be good prospects for harmonizing this requirement into two groups of speech power levels, particularly if the live speech situation is clarified.

It should be possible to group the feed conditions into potential "high" and "low" current types. Two common sets of feed current values could then be derived, but this would have the disadvantage of requiring testing at more currents than are required by any single National requirement.

The tests can be harmonized provided the differing feed conditions are harmonized into, say, two or possibly three groups.

Cost benefit

There would be no significant cost implication in harmonizing these requirements. There would be a small benefit to suppliers arising from the simplified tender procedures.

Harmonization of the testing would bring a worthwhile benefit to manufacturers and to test houses.

4.4.2.2 Levels of data or code signals

Interpretation

This requirement is intended to limit the output levels of any data or code signals sent to line in the off-hook (loop) condition by specifying the average power to line over any period of 200 ms. Measurements are made with a measurement bandwidth of 200 Hz - 4 000 Hz over a range of dc feed conditions.

Provision is made for a different limit of output signal to line for equipment capable of operating in the duplex mode (simultaneously sending and receiving).

As the requirement does not apply in the dialling state, it is assumed not to apply to loop disconnect or MFPB dialling although if this is so, the reference to code signals is not clear.

Comment

Although the requirement makes no reference to apparatus with adjustable power levels, the test requires the TE to be set to deliver maximum power to line.

It is notable that the specification of a 200 ms averaging time for measurement is not consistent with the normal period of one minute specified in CCITT Recommendation V.2 [9].

ETSI PT26 had suggested a major revision combining subclauses 4.4.2.2 and 4.4.2.1 into one requirement. This would clarify the standard and simplify the requirements.

The suggested split of requirements to produce different requirements for modems capable of transmitting in one direction or in two directions at the same time cannot be justified except for terminals which do not transmit for more than 30 seconds in any one minute period. TEs using half duplex transmission generally transmit the bulk of information in one direction, pausing to allow the other terminal to acknowledge whether the information was correctly received. As the bulk of such TEs are facsimile terminals which transmit for longer than 30 seconds, it is not desirable to complicate the standard by keeping such a differentiation.

It is, therefore, appropriate to simplify ETS 300 001 [3] by deleting the column referring to P_{d2}.

National inputs

The specified maximum signal power levels for TEs transmitting data in one direction fall into two main ranges. Six countries (**A, B, L, NL, P, CH**) specify -6 dBm, and ten (**CY, DK, SF, GR, IS, IRL, N, E, S, GB**) specify -10 dBm ± 1dBm. France and Italy specify **(F & I)** 0 dBm.

For TEs transmitting data in both directions at the same time, most countries have the same requirements as those for one direction of transmission. Only Italy, Sweden and Switzerland call for different requirements, in each case 3 dBm down on the one way limit. Ireland fails to specify a limit.

France and Germany specify that the output level has to be adjustable. Spain and GB require that if the level is adjustable, the means of adjustment should not be accessible to the normal user. Sweden allows higher levels (- 6 dBm) from push-button operated signals.

Spain measures the power over 200 ms, GB specifies one minute mean power with a measurement bandwidth from 200 Hz to 3 200 Hz. Both Spain and GB have special guard band requirements. Switzerland does not generally allow single frequency signals at speechband frequencies greater than 1 900 Hz.

Most countries accept the specified test method. Spain specifies the test in a little more detail and Great Britain lays down very detailed test requirements, particularly to cater for the CCITT specified one minute mean power measurement.

Harmonization feasibility

There seems to be good prospects for harmonizing this requirement into two groups of levels.

It should be possible to group the feed conditions into potential "high" and "low" current types. Two common sets of feed current values could then be derived, but this would have the disadvantage of requiring testing at more currents than are required by any single National requirement.

The tests can be harmonized providing the differing feed conditions are harmonized into, say, two or possibly three groups.

Cost benefit

There would be no significant cost implication in harmonizing these requirements. There would be a small benefit to suppliers arising from the simplified tender procedures.

Harmonization of the testing would bring a worthwhile benefit to manufacturers and to test houses.

4.4.3 Unwanted outband signals sent to line

This requirement limits the power of out of band signals sent to line over three frequency bands and over a range of dc feed conditions. It is difficult to see why it is necessary to specify outband signals separately from outband noise as both have the same effect on the network.

The requirement applies to all types of TEs, whether sending data or code signals, recorded or live speech, whether such live speech is derived from electronic or carbon microphones. Measurements are made with a bandwidth of 125 Hz.

The requirement does not apply in the loop disconnect or MFPB dialling state.

Comment

There is an error in the requirement in that whilst reference is made to tables 4.4.3.1.a and b, no reference is made to tables 4.4.3.2.a and b.

The requirement limits the output "arising from any form of excitation". This would embrace mechanical shock, particularly applied to telephone microphones. It is not believed that this was intended.

4.4.3.1 Levels of recorded, synthetic or live, speech or music

Interpretation

This requirement needs to be deduced from the title as it is no more than tables of values. The literal meaning of the title, paying particular attention to punctuation, appears to mean that subclause 4.4.3 applies to recorded speech or music, whether derived from a synthetic or live source. It appears not to apply to live speech or music when it has not been recorded.

By analogy with subclause 4.4.2.1, it is be assumed not to apply in the dialling state.

Comment

It is necessary to control the out of band signals arising from a terminal so as to prevent interference with network services operating at frequencies outside the normal speech band. There is no network reason for the limits on such unwanted signals being different for speech and data equipment, and only two Countries offer different limits for speech and data, although two more do not apply the requirement to speech or music signals.

The requirement needs to be elaborated so as to remove any ambiguity.

National inputs

Three countries (**F, S, GB**) add requirements for single frequency components.

The requirement is defined in three frequency bands. Three countries of the nineteen replying (**SF, IRL, CH**) have no requirement in any band. Belgium expresses its requirements in a totally different manner to the model, calling for out of band attenuation related to the in-band signal. Five countries (**F, NL, E, S, UK**) give graphs showing different break frequencies to the model.

Germany and Spain have requirements below 300 Hz.

Over the band 3,4 kHz - 4,3 kHz, seven countries specify requirements. Of these, five (**CY, DK, IS, N, P**) have the same specification. Greece and Great Britain have similar requirements.

Over the band 4,3 kHz - 28 kHz, eight countries (**A, CY, DK, D, GR, IS, I, L**) have requirements that appear to be intended to be identical although the manner in which they are expressed leads to differences of up to 0,5 dB, and the German limits apply to a different measurement bandwidth. Norway and Portugal have similar requirements but over a narrower range of frequencies (up to 16 kHz).

In the band 28 kHz - 150 kHz, eight countries (**A, CY, DK, D, GR, IS, I, L**) specify -70 dBm as the limit. Norway and Portugal specify -60 dBm.

In Great Britain the requirement is specified for frequencies up to 8 MHz. Spain has requirements up to 1 MHz. It is not known whether other countries have requirements at higher frequencies as they were not invited to input figures above 150 kHz.

The model test circuit is acceptable to all countries except Denmark, but Great Britain describes the test in far greater detail in an attempt to achieve repeatable results in the shortest possible time. Four countries (**B, D, E, GB**) perform their test with measurement bandwidths that differ from the model.

Harmonization feasibility

The requirement could be harmonized by selecting the most stringent limits that are used by the majority of countries, but this may be considered to place an unfair burden on manufacturers in the Countries with more relaxed requirements.

There is a reasonable prospect that, with some difficulties arising from differences in the bandwidths and measurement methods, the limits could be harmonized into three broad levels of out-of-band suppression.

Cost benefit

Harmonization would not generate a cost to the network operator and could give a marginal benefit of greater flexibility in the provision of services. It would be likely to create costs for the equipment providers in those countries with more relaxed requirements unless those requirements were called up.

Harmonization of the testing would bring a worthwhile benefit to manufacturers and to test houses.

4.4.3.2 Levels of data or code signals

Interpretation

This requirement needs to be deduced from the title as it is no more than tables of values. The title presumably means that subclause 4.4.3.2 applies to TEs when transmitting data or code signals.

By analogy with subclause 4.4.2.2 it is assumed not to apply in the dialling state.

Comment

As described above in the comment on subclause 4.4.3.1, there is no network-based reason for limits on out-of-band signals being different for speech and data equipment, and only two countries offer different limits for speech and data, although two more do not apply the requirement to speech or music signals.

The requirement needs to be properly spelt out so as to avoid any uncertainty but Administrations may wish to consider whether it is required in the present form.

National inputs

Only two countries (**F,I)** have different requirements to those in subclause 4.4.3.1, although another two (**IRL, CH**) have requirements only in this subclause.

The requirement is defined in three frequency bands. One country of the nineteen replying (**SF**) has no requirement in any band. Belgium expresses its requirements in a totally different manner to the model, calling for out of band attenuation related to the in-band signal. Switzerland expresses its requirement as a peak symmetric interference level. Five countries (**F, NL, E, S, GB**) give graphs showing different break frequencies to the model. France has different requirements for data and for code signals.

Germany, Italy and Spain have requirements below 300 Hz.

Over the band 3,4 kHz - 4,3 kHz, seven countries specify requirements. Of these, five (**CY, DK, IS, N, P**) have the same specification. Greece and the Great Britain have requirements that fall in the same area.

Over the band 4,3 kHz - 28 kHz, eight countries (**A, CY, DK, D, GR, IS, I, L**) have requirements that appear to be intended to be identical although the manner in which they are expressed leads to differences of up to 0,5 dB. Ireland, Norway and Portugal have similar requirements but over a narrower frequency band (up to 16 kHz).

In the band 28 kHz - 150 kHz, eight countries (**A, CY, DK, D, GR, IS, I, L**) specify -70 dBm as the limit. Norway and Portugal specify -60 dBm.

Harmonization feasibility

This subclause could readily be harmonized by its total removal as the requirement can be covered by subclause 4.4.2.1.

Cost benefit

Harmonization would not generate a cost to the network operator and could give a marginal benefit of greater flexibility in the provision of services. It would be likely to create costs for the equipment providers in those countries with more relaxed requirements.

Harmonization of the testing would bring a worthwhile benefit to manufacturers and to test houses.

4.5 Noise level

Interpretation

This requirement is divided into two parts, and each involves evaluation of the terminal equipment in both quiescent and looped conditions. Hence the requirement concerns itself with in fact four variations, each of which is separate. The two parts are concerned with output noise levels, measured within and outside the speech pass band. The requirement is unusual in that it is especially expected to be met at both polarities of feeding current. Taking into account this parameter, the requirement in fact involves eight separate evaluations.

It could be argued that this set of requirements might well be rationalised to include, for example, two sets of noise measurements over the entire bandwidth of interest, one for terminal equipment in the quiescent condition and one for terminal equipment in the loop condition. The merit of two additional and separate determinations for each case in which only polarity is reversed is clearly not immediately self-evident.

Nonetheless, there is considerable commonality displayed in the various Administration-declared values and methods. This topic is one which has been studied to some considerable depth by the CCITT and this influence is clearly seen.

4.5.1 Inband noise

National inputs

Both requirement and test are closely aligned with CCITT Recommendation O.41 [10]. All except one of the Administrations, for which the requirement is mandatory, require that it be met in the loop condition; a second Administration requires compliance in only the quiescent condition. Three Administrations consider the test to be not mandatory.

One Administration alters the requirement to specify different load resistors in the loop and quiescent states, and that Administration and another introduce both a peak and a mean level threshold; two Administrations require only speech (presumably live speech) related terminal equipment to meet a noise requirement when in the loop state. The mandatory status of the requirement applied by still another Administration is unclear for the loop state.

One Administration additionally applies the requirement to a series-connected terminal equipment.

Harmonization feasibility

Although there is much common ground in the statement and application of this requirement, some Administrations take the view that a considerable amount of complex investigation needs to be undertaken to ensure compliance. Others approach the measurement for compliance in a simple way; there is, however, from national input to national input some disparity in the selection of a measuring instrument and its use.

In addition, the spread of values is surprisingly large when compared with the minimum signal-to-noise levels which can be expected of terminal equipment in an operational state, and when one considers the transverse noise found on a typical subscriber line which is terminated by a load resistance or impedance similar to that which a terminal equipment in the quiescent condition might present.

Typical loop condition signal minimum levels can be expected to be of the order of (say) - 50 dBm; the effect of the requirement taking this "yardstick" as a measure provides an operational signal-to-noise ratio of from 10 dB to 22 dB in the loop state. This spread of national values in the requirement suggests that the requirement is not based on objective criteria considered by each Administration in the same way, and that a review of the target values and types of terminals to which they might be applied is an appropriate suggestion. It is clearly in order to suggest that, in light of the large number of international connections throughout Europe, targets for terminal to terminal interworking signal to noise ratios need not differ substantially from country to country.

Moreover, the requirement for noise levels of the order of less than a quarter of a microvolt to be generated by a terminal when in the quiescent state, when typical transverse noise levels on the line to which the terminal is connected might well measure from 50 millivolts to 200 millivolts, is clearly technically difficult to endorse.

The harmonization feasibility is high, based on perhaps three postulations:

1) the requirement may be considered to be a quality matter and hence removed from mandatory status;

2) the effect of the requirement value variation is much less than the effect of any single declared value;

3) requirements concerning in-band noise are perhaps a matter relating to the performance of certain (live speech) terminal equipments.

Cost benefit

It is expensive to design and to manufacture equipment with extremely low noise levels; moreover, it is expensive to test for such parameters. Some of the values declared in this requirement are within 2 dB of the noise floor which current test equipment can provide.

The benefit could be high for suppliers, and it is difficult to see how network operators could be presented with a cost of any kind, since their networks may well be much noisier in any case than any of the terminal noise level targets specified.

4.5.2 Outband noise

National inputs

Only six Administrations consider this requirement mandatory; of the six, four call up a straight-forward test according to the common text. The remaining two introduce variable complication ranging from variations in test method to the requirement that state-of-the-art measurements be made to determine noise levels only one or two dB higher than the noise floor of modern test equipment.

Moreover, the out-band noise requirements declared by one Administration as mandatory for terminal equipment are such that the terminal equipment is required to generate noise signals of the order of four to six orders of magnitude less than the out-band noise which might well be found on the line plant to which it is connected (due, for example, to inductive or other environmental effects). This may well be seen as difficult to justify as a mandatory requirement, although it could be argued that as a quality target, there is some merit in certain cases.

Outband noise requirements are related to the number of terminals connected to the line and to the connection method, but need to be constrained so that the cable spectrum is not filled with noise by the many terminals connected to it. It could also be argued (and indeed is argued) that this requirement is properly considered as one concerned with Electro-Magnetic Compatibility (EMC).

Cost benefit

As stated earlier, the design and production of terminal equipment with extremely low noise levels, particularly when those noise levels approach a minimum measurement or physical limit, is expensive.

Moreover, it is difficult to see any negative effect upon the infrastructure as a whole if terminal equipment connecting to that infrastructure is permitted to produce noises only an order of magnitude less than those normally found present within that infrastructure in operational cases.

6.5 Chapter 5

Chapter 5 deals with the various aspects of dialling to the network, both manually and automatically, and also with the generation of identification signals by automatic terminals.

5 Calling function

5.1 General

Interpretation

This is a general statement defining the calling function. This covers line seizure (Chapter 2), dial tone detection (subclause 5.2), dialling (subclauses 5.3 or 5.4), limitation of the frequency of Repetitive Automatic Attempts (subclause 5.6) enabling of transmission after dialling (subclause 5.5) and reversion to the quiescent condition (subclause 5.6).

Comment

The subclauses on dial tone detection should we be placed in subclause 5.6 as a part of the general control of Automatic Calling. The studies undertaken suggest that there is no reason to treat "reversion to the quiescent condition" in this subclause any differently from general procedures for the clearing of calls which have been automatically originated or answered. It is, therefore, suggested that a separate Chapter be created to deal with the Call Clearing Function.

Some of the requirements are difficult to test without special access to the circuitry. All requirements should be related to effects appearing external to the equipment.

National inputs

No national remarks exist.

Harmonization feasibility

The remarks in the comment above should assist in encouraging harmonization by drawing requirements into common areas where commonality or the reasons for differences can be more closely identified.

5.2 Dial tone detector

5.2.1 Dial tone detector sensitivity

Interpretation

This requirement is only intended to be applied to TEs providing a "dial tone" detector. The intention is to describe the range of signals which a "dial tone" detector should acknowledge as being valid signals. TEs are required to detect "dial tone" when applied to its network connections at various levels whilst being fed with various line currents.

Comment

This requirement would be more properly described as applying to the detector function rather than the detector itself, which may well be inaccessible to the tester. The operation of any function can only be detected by its effect at the line terminals.

The following observations need to be addressed in order to that the feasibility for harmonization of the requirement can be properly addressed.

The requirement only appears to be relevant to TEs falling within the scope of subclause 5.6 and therefore should be incorporated in that subclause.

Whether a cadence within the signal could have a specific meaning (e.g. special "dial tone") and therefore need to be either detected as a "dial tone" or ignored.

Although unclear, TC-TE believes that for many countries "dial tone" may consists of two frequencies sent simultaneously not a single frequency having a tolerance. This is further supported by reference to ETS 300 001 [3], tables 1.7.1 and 5.2.1, where some of the entries are identical and others not, and to the table 1 and figure 1 in this subclause, below. In table 1 (**Summary of the dial tone characteristics**) and figure 1 (**Graph of the dial tone frequecy distribution**), it can be seen that for some countries the difference between the upper and lower frequencies is much more than is tangible for a allowance on frequency generation. Assuming our assertion is correct then each frequency will obviously have a tolerance on its generation of say ± 1 Hz. If it is a single frequency then it should be expressed as X Hz ± Y, 350 Hz ± 15 Hz and 440 Hz ± 15 Hz. Clarification of the exact position (one or two frequencies) for each country is essential before any decision can be made about the feasibility of harmonization. It is proposed that in future the wording is amended to indicate "the nominal frequency or lower frequency", "the higher frequency" and the "tolerance".

Table 1: Summary of the dial tone characteristics

Dial Tone								
Country Name		**Frequency(ies)**				**Level / dBm**		**Cadence**
		Frequ. 1	Frequ. 2	Average	Tolerance (±)	Maxi	Mini	(Y/N)
Austria	A	400	500	450,0	± 50	-6,5	-26,0	Y
Belgium	B	420	455	437,5	± 17,5	-4,0	-14,0	N
Cyprus	CY	325	375	350,0	± 25,0	-7,0	-22,0	N
Denmark	DK	350	450	400,0	± 50,0	-6,5	-26,0	N
Finland	SF	325	525	425,0	± 25 ,0	-6,0	-15,5	N
France	F	425	455	440,0	± 15,0	-10,0	-25,0	N
Germany	D	380	490	435,0	± 55,0	-4,0	-27,0	N
Greece	GR	400	475	437,5	± 37,5	-4,0	-25,0	N
Iceland	IS	400	450	425,0	± 25,0	-7,0	-30,0	N
Ireland	IRL	400	450	425,0	± 25,0	0,0	-16,0	N
Italy	I	410	440	425,0	± 15,0	0,0	-25,0	Y
Luxembourg	L	380	490	435,0	± 55,0	-4,0	-27,0	N
Malta	M							no information
The Netherlands	NL	340	550	445,0	± 115,0	-3,8	-25,7	N
Norway	N	410	440	425,0	± 15,0	-1,0	-30,0	N
Portugal	P	300	450	375,0	± 75,0	-5,0	-30,0	N
Spain	E	410	440	425,0	± 15,0	-5,0	-20,0	N
Sweden	S	400	450	425,0	± 25,0	-10,0	-30,0	N
Switzerland	CH	400	450	425,0	± 25,0	-6,5	-18,0	N
Great Britain	GB	350	440	395,0	± 45,0	0,0	-27,0	N
Average		**380,3**	**461,8**			**-4,8**	**-24,2**	

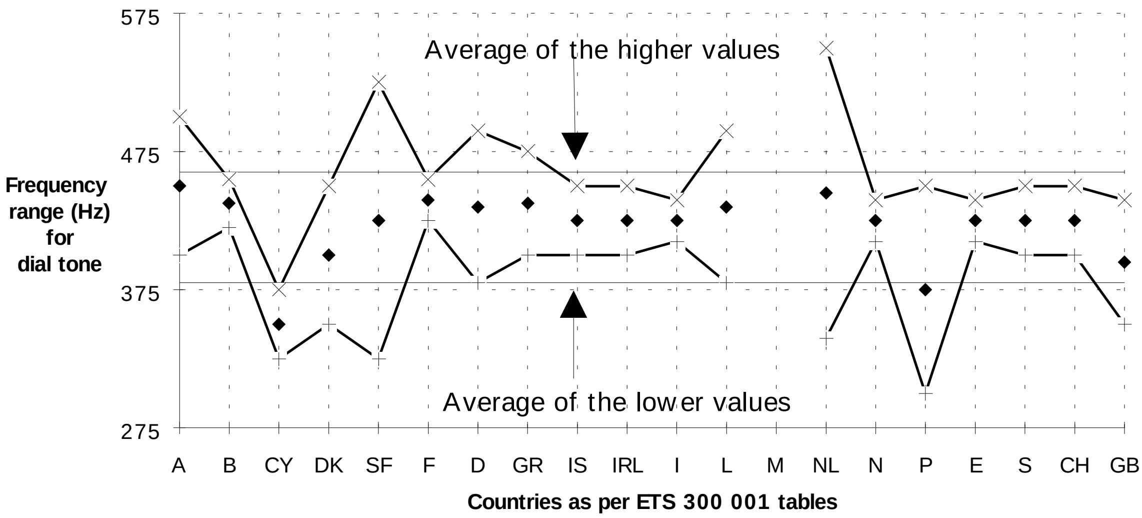


Figure 1: Graph of the dial tone frequecy distribution

It would appear that for this and perhaps many of the other requirements in ETS 300 001 [3] that there should be some correlation between the levels of dial tone and the feed conditions. It seems unrealistic to have the highest level of dial tone, when the feed current and voltage are at their lowest values, which, it is presumed, then represents the longest local line.

The time limit t_d needs to be better specified. Its function does not appear to be clearly understood. It could be construed to be the minimum time for which "dial tone" will have been present before the detector is permitted to indicate its presence or once "dial tone" has been applied, placing a limit on the time by which the TE detects dial tone.

The requirement is in itself ambiguous since a TE having a dial tone detector which fails to detect the specified tones is clearly **not capable** of detecting a dial tone and, therefore, falls outside the scope of the requirement.

Dial tone could therefore be specified as either a single tone with a frequency in the band 420 Hz ± 80 Hz or of two tones the lower frequency being in the band 380 Hz ± 40 Hz and the upper frequency falling in the range 460 Hz ± 40 Hz. This would encompass all but the lower frequency of **CY, SF, NL** (these may be obsolete or obsolescent) and **P** and the upper frequencies of **SF** and **NL**.

CEPT Recommendation T/CS 20-15 [11] (last ratified in 1981) states that the frequency of "dial tone" should be 425 Hz ± 15 Hz and the range of levels as being -8 dBm to -12 dBm (with a tolerance of ± 3 dB) although the measurement point is not clear. CCITT Recommendation E.180 [12] also refers to dial tones.

National inputs

B, F, D, I, NL, P, E, S & CH have found it necessary to provide national inputs beyond those that could be encompassed in the table with the common text. These inputs are analysed in Annex A. **A, CY, DK, SF, GR, IS, IRL, L, M, N & GB** have not. Austria and Italy appear to be the only countries which have cadenced national dial tone.

The entries for Luxembourg and Malta are blank and in Ireland and Great Britain the requirement is not mandatory

Other additional dial tones are the subject of the requirements for **B, F, E & CH**. Many of the other national entries (**D, P, E, S & CH)** attempt to make good some of the deficiencies in the requirement by stipulating times before which and/or after which the detector needs to have reacted. Two countries **I & E** appear to have cadenced dial tones, whilst **F** wishes the detector to be able to ignore breaks in dial tone of 30 ms. **D** stipulates that the detector is not be energised (remains de-activated) during an incoming call.

Harmonization feasibility

There may be significant possibilities for harmonizing this requirement, however these are masked by the poor expression of the requirement, which may have caused divergence in the national inputs. At the same time we have to recognise that, if alternative networks are introduced in countries to compete with the existing national network, then the operators will wish to distinguish calls routed in their networks from calls routed in other networks. The normal means of doing this is likely to be a distinctive dial tone.

Cost benefit

Assuming that a reasonable level of performance can still be achieved by allowing the tolerances to widen the costs should be small though perhaps significant particularly to those Network Operators that might be required to affect changes to the national dial tone.

5.2.2 Dial tone detector insensitivity

Interpretation

The requirement basically asks for a "dial tone" detector not to detect anything which is not dial tone as specified by subclause 5.2.1.

Comment

Some countries are worried about the potential lost traffic caused by equipment dialling unnecessarily into the network. The expression of the insensitivity requirements is a perfect example of where things can get completely out of hand. The TE has a right to expect that having detected voltage on the line when it seizes the line it will be provided with "dial tone" within the prescribed limits or an alternative tone indicating the lack of available service. To expect it not to detect "dial tone" which has gone "funny" is the very thing that restricts the feasibility for harmonizing the detection of "dial tone". In particular, a requirement (see subclause 5.2.2(S)1) not to ignore breaks in "dial tone" means that a detector cannot be built to work in both a country where the dial tone is cadence and where it is not. It is, however, clear that such a detector should not be activated by any network tone (other than dial tone) that could legitimately be connected to the TE by the network at that phase in the call. Either nations need to be more realistic in their approach to insensitivity or we would promote the deletion of this requirement. The expression of the requirement as it exists at the moment means that a detector has to be able to reject just about anything other than dial tone and even "dial tone" if the level is low no matter how it was produced. It seems incredible to ask a TE not to dial if, for instance, as a result of a cable fault "dial tone" appears on the line at any (sensible) level -40 dBm or -50 dBm.

National inputs

A, B, DK, F, IS, I, NL, N, E, S & CH have found it necessary to provide national inputs beyond those that could be encompassed in the table with the common text. These inputs are analysed in Annex A. **CY, SF, D, GR, IRL, L, M, P & GB** do not.

The entries for Luxembourg and Malta are blank and in Cyprus, Germany, Ireland and Great Britain the requirement is not mandatory.

Austria and Switzerland say that some values are for further study so clearly the requirement cannot currently be mandatory. France seems to have seen some sense in stating that "The "improper cadenced" signals for which the detector shall not be activated are busy tone and call progress tone". The remaining requirements are so diverse that the least one could hope for is the deletion of all these national inputs.

Harmonization feasibility

Unless a more realistic approach is taken to the question of insensitivity there is little hope of harmonizing this feature.

Cost benefit

The major cost arising from these requirements is fragmentation of the European market, because it is not possible to build a single detector which could satisfy the current requirements. TC-TE believe that these requirements could be harmonized with negligible or small cost to the network operator and consequent benefits to the TE suppliers.

5.3 Decadic dialling (Loop pulsing)

General comment

The technical scope of this subclause of Chapter five is that of setting out the requirements for terminal equipment functionality associated with loop-disconnect (or pulse) dialling. The sub-headings are set out roughly chronologically as the dialling function proceeds.

The technical content of this subclause appears to be vast. This is in large part because of the nature of detailed information it contains. There is some technical justification for this detail, since the requirements generally need to be met in order that the terminal equipment interoperates successfully with the network, but the emphasis is on occasion placed on terminal equipment functionality rather than what signals terminal equipment might generate and introduce to the network. Hence the technical content is a mixture of requirements which could be said to be those the network equipment needs terminal equipment to meet in order successfully to interoperate and what requirements terminal equipment might be required to meet of and for itself (possibly to enhance the terminal equipment-user interface).

Moreover, this subclause deals with a network interoperability requirement which is steeped in history - the first requirements of this kind appeared in the literature before the turn of this century. Although network modernisation has produced some technical convergence from Administration to Administration, the diverse nature of various networks (which have evolved largely in isolation within each country) remains a significant factor. Terminal requirements in ETS 300 001 [3] do not always reflect this convergence and are on occasion over-biased with historical content.

Although there is significant commonality in the various subclauses of this subclause, it is not considered necessary or sensible to attach to this part of the document a high priority of harmonization and, therefore, to dedicate a significant measure of resources to such an activity. There is a growing trend for network equipment to interoperate with tone-based dialling which is far more harmonized and offers greater functionality to the user, and harmonization should address this (newer) technology. This aspect is further elaborated in the analysis of subclause 5.4 which can be found elsewhere in this ETR.

The analysis of this subclause consists of comments related to the various subclauses and, where relevant, the associated national unclassified parts in Chapter 10. In order to preserve simplicity, the detail under various subclauses is included in the comment related to the subclause as a whole.

National inputs

In general, National inputs either qualify or to a limited extent modify testing procedures or main text. A significant portion of the technical content of this subclause is the presentation of current-time masks with arbitrary dimensions which Administrations can specify according to their current practice. The extent of harmonization possible for each of these time-current points will be discussed under the comment and analysis of each subclause.

One Administration has chosen to place virtually the whole of their technical requirements in Chapter 10 rather than to consolidate their requirements in Chapter 5. In addition, this Administration and others have added a number of requirements which are terminal-specific and which have a technical relationship to Terminal Equipment network attachment which is difficult to understand. These requirements are not analysed in detail, since it is assumed they are effectively outside the scope of the document.

Other related requirements in Chapter 10 appear to reflect national technical variations and are discussed at the end of the analysis of this subclause.

Introduction

This subclause introduces the function and puts forward a set of graphical masks with literal dimensions to which Administrations can assign numerical values. By definition, the presentation and general nature of the requirements implied are harmonized. In addition, the values of feeding conditions applicable to the requirements are set out in a table.

Interpretation

This requirement specifies timings of decadic dialling by reference to diagrams defining a number of events.

Comment

In some cases, feeding conditions conflict with the conditions specified in Chapter 1, and it is difficult to see why this is technically so. It is suggested that feeding conditions generally be reviewed by Administrations.

The requirement masks and introductory text seem sufficiently general to encompass National values appropriate to their network specificities. Subject to the requirement timing changes which would follow a harmonization of testing for compliance to the various masks, there can be little justification in attempting to harmonize further the values resulting from this action -- these represent the historical evolution of terminal procurement specifications and any change would with little doubt fail to be a cost-effective activity.

National inputs

These mention certain testing variations (two Administrations) and non-technical matters of policy concerning the use of tone dialling (MFPB). One Administration sets out two time-current graphs which relate to tests to be made at two feeding conditions.

Harmonization feasibility

As mentioned above, the requirement is harmonized in general by virtue of its presentation. Harmonization of testing and removal of text not related to network attachment technical requirements is likely to produce a large degree of harmonization.

5.3.1 Format and timing

5.3.1.1 Dial numbering

5.3.1.2 Dial pulse timing

Interpretation

These requirements set out the general characteristics of the dialling function. The number of pulses to be generated by each numbered dial position and the rate and timing of the generated pulses are included in two separate subclauses.

National inputs

With respect to pulses per dial digit assignment, one Administration specifies differently this assignment (due to historical variation) and one other requires that no more than ten pulses be generated by any digit (implied in any case by the current wording).

With respect to pulse timing, the values set out appear to differ significantly because the times declared relate to variable values of current threshold.

With respect to pulse rate, there are two fundamentally different rate definitions used by Administrations. Whilst only one definition could be used, this would require re-evaluation of testing procedures.

Harmonization feasibility

A harmonization of the testing method and thresholds declared would result in almost complete harmonization of the time values specified. A re-definition of pulse rate would involve the two Administrations using the second definition in re-evaluating testing procedures.

One Administration specifies its testing in such a way as to use neither definition of pulse rate; there appears to be no technical reason why the one or the other of the seven definitions stated was not chosen instead.

5.3.2 Pre-pulsing period current and loop resistance

Interpretation

The essence of this requirement is to set out operating conditions within the terminal which ensure that for a time prior to the interruption of loop current (to signal to the network a "digit") the dialler or dial tone detector is drawing sufficient current to allow the network equipment to distinguish between the two states of terminal equipment current maxima and minima.

Comment

This requirement is specified by approximately half of the Administrations. In every case of use, the requirement does not impose more stringent conditions than those in the requirement in Chapter 2 which sets out the current to be drawn by the terminal equipment during the basic loop condition. There seems to be no technical reason why that requirement cannot be used instead; for example, "The requirement (in chapter 2) shall be met for a time t before loop current is interrupted". The time t is likely to be related to existing network technology and less amenable to harmonization.

National inputs

National inputs specify qualifying conditions for the timing in the requirement or small variations in the feeding conditions appropriate to the requirement. At least one Administration makes (implied) reference to general loop condition requirements in Chapter 2.

Harmonization feasibility

High (but see earlier general comments).

5.3.3 Pulsing period current and loop resistance

5.3.3.1 Break pulse period current and loop resistance

5.3.3.2 Make pulse period current and loop resistance

Interpretation

This subclause contains, in effect, two linked requirements which deal with the current drawn by the terminal equipment during the "make" period and the "break" period of the dialling sequence. The requirements set out the appropriate values of the time and current thresholds referred to in the general introductory section and in some cases the values of resistance required during these two states. Transients are dealt with by the general timing masks in most cases.

Comment

As mentioned in subclause 5.3.2, there is considerable commonality between Administration-declared values and with harmonization of tests and current-time thresholds this fact would be self-evident.

National inputs

The National inputs for both of the requirements in this subclause are few, and relate to detailed differences in the interpretation of results and measurement methods.

Harmonization feasibility

High (subject to earlier comments).

5.3.4 Interpulsing period

5.3.4.1 Interdigital pause

5.3.4.1.1 Automatic or stored digit outpulsing

5.3.4.1.2 Real time outpulsing

5.3.4.2 Current and loop resistance

Interpretation and comment

This subclause includes a number of requirements concerned with the definition of and terminal equipment technical characteristics during the time between successive pulse trains in a dialling process.

With respect to timing, a distinction is drawn (and not used by approximately half of the Administrations) between the minimum permitted duration of interdigital pauses required of equipment with a manual dial and with automatic dialling (the presumption here seems to be control by a chip-based process). Although there are clear technical differences in each, it is difficult to justify generally why network detection equipment should of itself require such a differentiation.

There is a technical argument which suggests that "everlasting" interdigital pauses consume common equipment resources and may result in mis-dialling, and it is clear that in the extreme this may well be the case. It is usual to find that such matters are dealt with in fundamental network design, and it may well suffice simply to state a recommended maximum time value, since the parameter cannot be controlled when dialling is effected manually and in any case the network cannot know about the technical origins of terminal dialling signals.

With respect to terminal electrical characteristics, the second part of this subclause sets out the loop current and resistance parameters terminal equipment shall meet during the interdigital pause. This is simply a re-statement technically of the requirement of terminal equipment to present to the network during the minimum time above a resistance such that the its loop current can be interpreted by network detection equipment as resulting from the completion of a pulse train; only the terminal equipment itself can know (and then can know only in certain cases of automatic dialling) whether the pulse train just completed is the last in the current dialling sequence.

National inputs

With respect to interdigital pause times to be required by terminal equipment with automatic dialling, virtually all Administrations specify ranges with minimum and maximum values which are largely common. Most (perhaps sensibly) also include in this range timing values associated with manual dialling, even when these are listed separately.

Other timing comments relate largely to further clarification of the interdigital pause time, although this is dimensioned in the general timing masks at the beginning of the subclause. Tests are virtually harmonized as they stand.

With respect to the dc conditions to be met during the interdigital pause, approximately half of the Administrations choose to have this requirement; of those, all call up dc characteristics not different from the basic dc values set out in Chapter 2. Again, tests are virtually harmonized as they stand.

Harmonization feasibility

High (subject to general comments above).

5.3.5 Post-pulsing period

Interpretation and comment

This requirement is similar to that required to be met during the interdigital pause period above (since neither the terminal nor the network, except in certain cases, can know which is in fact present) and specifies minimum times and dc characteristics to be met during those times. Again, approximately half of the Administrations do not require this requirement to be mandatory. Those which do assume that the post-dialling condition in the terminal equipment is technically different from the (steady-state) loop condition and this may well be the case.

With respect to dc conditions, those Administrations which call up this requirement again set out in the main those conditions already required of terminal equipment in the loop condition in Chapter 2.

National inputs

With respect to timing, all national comment relates one way or another with the further definition of the period and, in addition, one Administration requires terminal equipment to be immune to changes in network dc feeding conditions, and one specifies more fully the transition from terminal equipment technical characteristics in the "dialling state" to the "loop" state,

Tests are largely harmonized, with the exception of a special test to check for dc feeding interruption immunity. It should be noted that both timing and dc tests are integrated in this subclause, whilst they are set out separately in others. Technically, it is not clear why this needs be so.

Harmonization feasibility

Subject to the general conditions mentioned above, the feasibility for harmonization is high.

5.3.6 Spark quench

Interpretation

This subclause contains one requirement, which is intended to control the rise and fall times of dialling pulses (or interruption of loop current during the dialling sequence). It arises because of the historical approach of connecting a series capacitor and resistor across the dialling contacts of a mechanical assembly to control rise times and excessive voltages due to inductance in the entire circuit.

It can be argued and in fact is the case in virtually all modern equipment that loop current rise times and excessive voltages are controlled by active circuitry, and hence the requirement per se is out of date. Nonetheless, the effect of applying the requirement is to control pulse shape (or distortion).

Comment

It is the case that the shape of interrupted loop current pulses is largely controlled by the time-current masks set out in the introduction to this subclause. Because of the laws of physics, which dictate the behaviour of the circuitry concerned, it is most difficult to technically justify the additional application of this requirement. Moreover, since the network detection circuitry cannot know and certainly cannot "care" about any physical parameters other than those set out in the current-time masks earlier referred to, compliance to the masks shall ensure entirely that technical requirements for loop current pulse shape are met.

National inputs

Only five Administrations require the use of this subclause. Of these, one appears to require the connection of a physical resistor and capacitor in any case, one tests for absence of excessive voltages only, one states that, in its opinion, the requirement is an EMC matter and outside the scope of the ETS, and one puts forward an extremely complicated alternative test intended to determine "pulse distortion" without measuring that distortion per se.

Since all of the above Administrations require all other sections of this subclause to be applied (in common with all other Administrations), it is difficult to understand, from a technical point of view, the reasons for the additional application of this requirement or (in the case of the one Administration putting forward an alternative requirement) for an additional related requirement.

Harmonization feasibility

Subject to the general case mentioned above, it is difficult to see why this test or a related alternative should be required at all. Harmonization is suggested by removal of this requirement from the text and the modification of other requirements within the text as necessary by the relevant Administrations.

However, note should be taken of the countries for which national remarks do not exist.

5.4 Dialling with MFPB (DTMF) tone bursts.

This subclause actually consists of eight further subclauses each dealing with various aspects of dialling using DTMF tone bursts. The eight aspects are as follows: "General requirements" (subclause 5.4.1), "Signalling frequencies and format" (subclause 5.4.2), "Signalling codes" (subclause 5.4.3), "Sending levels" (subclause 5.4.4), "Unwanted frequency components" (subclause 5.4.5), "MFPB transient timing" (includes rise time, and fall time, subclause 5.4.6), "MFPB output signal duration" (subclause 5.4.7) and "Suppression of unassociated signals" (subclause 5.4.8). It is strongly recommended that the basis for harmonization be the relevant CCITT and CEPT Recommendations. In the analysis that follows the report has highlighted any differences between the CCITT/CEPT and national approaches. The ability for TEs to be able to generate MFPB signals is fundamental to the ability to use many of the network and "kiosk" services that exist or will exist in the future. In many cases, when calling a PABX, users are faced with announcements which using MFPB allows them to choose the department they wish to speak to, such facilities are impractical without widespread availability of TEs having DTMF capability. For this, if no other reason, it is desirable that the demise of decadic dialling is instigated.

Spain has produced much of its input on this matter in Chapter 10. It is by no means clear why this could not have been incorporated in the appropriate Chapter, or in some cases, why the common text was not used.

5.4.1 General requirements

Interpretation

This subclause requires a TE, whilst in the DTMF dialling condition, to meet some or all of the normal on-line requirements for insulation resistance (subclause 2.2.2), dc characteristics (subclause 2.3), input impedance (subclause 4.1.2) and degree of unbalance about earth (subclause 4.2).

Comment

The same problems arise when requiring TEs to meet this subclause as arose when dealing with the original subclauses. On the assumption that signalling over the PSTN for purposes other than call establishment will continue to be encouraged, there seems to be no reason why all other relevant requirements applicable to a TE in the on-line condition should not be applied.

National inputs

Norway has no mandatory requirements at all in respect of this subclause; Malta and Luxembourg have made no reply. For Denmark it is stated that it is mandatory to provide MFPB on all telephone sets.

This then leaves seventeen other countries of which six **(A, CY, SF, D, NL & GB)** have no requirement for insulation resistance in MFPB mode. With the exception of Belgium and France, who have entered not mandatory, in table 2.2.2 this lines up fairly closely with the national approaches in subclause 2.2.2.

Subclause 2.3 The Netherlands has no requirement for the dc characteristics to be maintained, which seems at variance with their requirement given in subclause 2.3 (NL) 1 that "In the **loop closure state** the dc properties of the terminal shall comply with the dc mask in figure 2.3 (NL)1.". This can be implied to apply throughout the on-line condition. It should be noted that there is no specific statement about the dc characteristic remaining constant (being preserved) prior to signalling to the network using MFPB. Failure to maintain the dc conditions may cause the exchange to presume it is about to receive decadic dialling rather than MFPB and thereby miss the first digit dialled.

Subclause 4.1.2 Finland has no requirement for input impedance. Sweden appears to require TEs to generally be in line with CEPT Recommendation T/CS 34-08 [13], subclause 5.1), whilst **GB** permits both 600 ohm and complex senders with a more relaxed return loss of just 11 dB. Germany on the other hand requires 18 dB against its complex impedance. Spain, apart from providing more detail on the testing required, appears only to require testing of the impedance during the pauses in between MFPB pulses. Some incompatibilities exist when compared to impedances specified in later parts of subclause 5.4 (c.f. tables A.5.4.2, 5.4.4.b, 5.4.5, A.5.4.8).

Subclause 4.2 Whilst the majority of countries are happy to apply subclause 4.2, which in itself of course has national variations, Belgium, whilst content to accept 48 dB in the range 300 Hz to 3 400 Hz for both the Longitudinal Conversion Loss for one port TE and the Longitudinal Conversion Loss and Longitudinal Conversion Transfer Loss for a two port series connected TE, require 50 dB in the range 300 Hz to 600 Hz and 55 dB in range 600 Hz to 3 400 Hz. The need for Belgium to also request 40 dB in the range 40 Hz to 300 Hz is questioned. This is, however in line with CEPT Recommendation T/CS 46-02 [14], subclause 2.4.3.

Harmonization feasibility

The harmonization possibilities for this subclause should have been the same as those of the clauses too. This has been further complicated by some countries who "need" to apply different requirements to the MFPB dialling condition to that for a general TE.

Cost benefit

The cost of harmonization in this area is difficult to assess because it is not known whether in fact modifications, above and beyond those already detailed in the parent subclauses, would give rise to further costs because of the need to redesign of the MF receiver in the exchange. Almost certainly, a medium/large cost might fall on the terminal supplier arising from the need to adapt his design to a harmonized European standard. Assuming that it is possible, the resulting benefits are likely to be large.

5.4.2 Signalling frequencies and format

Interpretation

This subclause defines two sets of four frequencies (the high set and the low set) and a tolerance on the frequency generated. It also requires the output signal to be comprised of two frequencies (one from each set) to be transmitted simultaneously.

Comment

It is clear that for this signalling system to be of any practical use, the frequencies generated need to be as specified and fairly tightly toleranced. CCITT Recommendation Q.23 [15], subclause 7.1 requires that the tolerances on the nominal value of ± 1,8% be maintained. CEPT Recommendation T/CS 46-02 [14], subclause 2.3.1, requires ± 1,5 % to be maintained for the range of different line impedances stating that in their opinion ± 1,5 % could be achieved in practice without any difficulty. Generation of stable frequencies is now fairly simple and it is suggested that the CEPT figure of ± 1,5 % is adopted as the harmonized value.

The requirements of this subclause could have been amalgamated with subclause 5.4.3, since they deal with the frequencies to be generated and the codes they represent.

Within the testing subclause, a requirement appears which states that "This accuracy requirement shall be met for continuous signals as well as for bursts of signals of 50 ms duration separated by 40 ms of no signal output". Firstly, the proper place for such a requirement is in subclause 5.4.2 not in the testing document and secondly, this could be interpreted as a requirement for such a sender to be able to send continuously, say when a key is held down.

The accuracy of the frequency measurement could readily be increased to 0,1 % by use of a suitable spectrum analyser.

National inputs

All countries adhere to the use of the standard frequencies specified in CCITT Recommendation Q.23 [15] and CEPT Recommendation T/CS 46-02 [14].

Again there are no contributions from Luxembourg and Malta. Of the remaining eighteen countries, sixteen specify a tolerance of ± 1,5 % whilst Greece asks for ± 1,6 % and Germany for ± 1,8 %. On a frequency of 697 Hz (the lowest) this is a frequency tolerance of ± 10,45 Hz for ± 1,5 % and ± 12,55 Hz for ± 1,8 %.

The feed conditions for the test vary from one nation to another, Spain being the only country to attempt to specify a range of line impedances in support of the CEPT Recommendation. Spain also specifies that the input impedance of the meter used for measurement shall be greater than 50k ohms.

Four countries **(N, P, S & GB)** specify, for the purpose of this test, special feed conditions. In respect of these four countries; with the exception of Norway which specifies the use of a current generator instead of the standard bridge, the remainder seem to be the standard feed conditions for the country or a sub-set thereof.

Harmonization feasibility

In essence this requirement is already harmonized since Greece and Germany are unlikely to suffer significantly from adoption of the ± 1,5 % tolerance. Any discrepancies about feeding conditions will be solved, if and when, the dc mask problems are resolved.

Cost benefit

Since this is only a subset of the MFPB signalling requirements it would be wrong to give the impression that any major benefit would accrue from harmonization. Benefit will only accrue if all or a significant proportion can be harmonized. That said as a part of the whole, this represents a significant step which should be gained at relatively small cost.

5.4.3 Signalling codes

Interpretation

This specifies the way in which combinations of the eight frequencies, specified in subclause 5.4.2, are to be chosen in order to represent the digits 0 - 9, *,# and the letters A,B,C & D. The common text makes provision for a TE to provide only digits 0 - 9, digits 0 - 9 + * and # or all 16 combinations.

Comment

The combinations specified align exactly with CCITT Recommendation Q.23 [15] and CEPT Recommendation T/CS 46-02 [14]. As noted in the comments to subclause 5.4.2, there seems no reason why these have been separated into two subclauses.

National inputs

For every country the provision of the codes A, B, C & D is optional. Only four countries **(D,DK, F & N)** specify the provision twelve combinations (i.e. require the provision of * and #). Spain requires a warning to appear where only the ten digits are available. The remainder are satisfied with ten as a mandatory set. In Chapter 10 (subclause 10.5(S) 1), Sweden has a number of requirements, but without tests relating to the marking of the buttons. These requirements which have been re-iterated below, seem to be common sense, so that whether on a mandatory or voluntary basis, it is difficult to see other countries objecting to their introduction, perhaps after further clarification and addition of objective test methods, into the common text at an appropriate place.

"10.5(S)1 Symbols

The symbols (*) and square (#) shall have a shape easily identified as the corresponding symbols described in CCITT Recommendation E.161 [16].

A keypad, that is solely intended for decadic pulsing, shall not be signed with symbols that can be identified as star or square, since standardized procedures with these symbols imply push-button tone signalling.

If register recall signal is provided, the corresponding button shall be designed with a letter R (capital) on, or next to, the button. The designation R shall not be used in any other sense."

Harmonization feasibility

This requirement, in common with subclause 5.4.2, is almost already harmonized. For the future, in order to enable emerging facilities to be used, it is suggested that the combination associated with twelve codes should become the minimum set (i.e. 0 - 9 + * and #).

Cost benefit

Even after considering the additions suggested above, harmonization should be achievable for relatively small cost, with medium/large benefits available to service and network operators due to the widespread availability of TEs capable of signalling using MFPB.

5.4.4 Sending levels.

Interpretation

This subclause specifies the levels at which DTMF tones should be transmitted for reliable reception and decoding. Two level options are specified and for both options the level of higher frequency component is specified to be 2 dB ± 1 dB greater than the lower frequency component. For some countries the accuracy of the transmitted level (and it is suspected the frequency) is required to be maintained in the presence of dial tone.

Comment

Whilst it is clear that the first MFPB signal needs to be generated in the face of dial tone, for all subsequent pulses dial tone should have been removed by the public (or private) exchange. If an MFPB sender is poorly designed it is clear that the level sent to line and, in particular the frequencies generated, could be affected by the presence of dial tone.

The unwanted effects of the feed bridge on the measurement of levels could be eliminated by calculation.

The lack of guidance, e.g. on headings, seems to have resulted in confusion by some countries as to the required content of table A.5.4.4.

Again in subclause 2.1.2, four countries **(D, GR, S & CH)** have specified complex impedances as their sole target for input impedance, three countries **(DK, N & GB)** specify a mandatory complex impedance for telephony whilst the remainder specify 600 ohms. For some of the countries specifying a complex impedance, there appears to be a lack of consistency in their approach when considering MFPB.

National inputs

Again there are seventeen contributions (nothing having been received from Ireland, Luxembourg and Malta). Of these seventeen countries, eight countries **(A, B, CY, F, GR, I, E & CH)** specify the higher and six countries **(DK, NL, N, P, S & UK)** specify the lower of the two transmit level options, two countries **(SF & IS)** are content to accept both.

Germany specifies a complex impedance and the transmit level (in V r.m.s. with respect to 775 mV) of the composite signal, whilst Great Britain specifies the transmit level in dBV with the option of either 600 Ohms or a complex impedance.

In the case of the lack of input from Ireland this is particularly perplexing since they have specified that a test of levels, etc., in the face of dial tone is mandatory.

Four countries **(SF, D, NL & GB)** explicitly state that the presence of dial tone is not required for tests. Spain requires it to be present for some tests but not for others.

France specifies that the maximum peak value of the signal shall be less than 3 V and GB specifies a value of 5 V in subclause 5.4.6 ("transient between loop condition and MFPB condition").

Belgium specifies that if current regulation is used it should be in accordance with the CEPT Recommendation T/S 46-04 [17] and another set of levels (variable since they are expressed in dBm0) for use with PABXs.

GB specifies the option of either 600 Ohms or its complex impedance, permits both regulated and unregulated transmit levels and a "twist" of between 1 dB and 4 dB.

Four countries **(N, P, E & GB)** specify, for the purpose of this test, special feed conditions. In respect of these four countries; with the exception of Norway which specifies the use of a current generator instead of the standard bridge, the remainder seem to be the standard feed conditions specified for that country or a sub-set thereof.

Harmonization feasibility

Recognising that the use of MFPB from both the keypad and perhaps other dedicated terminals during an established call is likely to become the norm, it would seem sensible to adopt the lower (Option 1) signalling level since such levels are unlikely to produce problems with overloading systems or saturation of codecs even during sustained use. The use of a regulated output could also be considered as an option (in line with the GB contribution) since this facilitates the adjustment of the transmit levels so that they are somewhere near correct for the line to which the TE is connected.

It is also suggested that a "twist" or difference between the higher frequency group and lower frequency group of 2 dB ± 1 dB may not be sufficient for reliable detection at a distant terminal rather than in the network. The twist may therefore need to be reviewed.

When considering the testing we would suggest as a first step towards harmonization that this test be done with a dial tone consisting of 380 Hz and 460 Hz at a level of -5 dBm . Alternatively, still using our suggested dial tone, a test can be performed using digit chosen at random and then the remainder of the tests repeated for all buttons. The requirement will need to be expressed so as to ensure that the test remains within the scope of the requirement.

Cost benefit

Even after considering the modifications suggested above, harmonization should be achievable for relatively small cost, The only tangible benefits that can accrue are those from having the open market.

5.4.5 Unwanted frequency components

Interpretation

This subclause sets out limits for unwanted signals both total in-band and narrow band both in and out-of band.

Comment

The requirements for total in-band noise are necessary to ensure satisfactory interworking with the network. The requirement for out-band unwanted frequency components is necessary to prevent the cross-talk effect between the lines and also to reduce the level of the intermodulated outband - components which could return in-band (aliasing effect).

National inputs

No reply has been received from Luxembourg and Malta.

Four (**A, SF, D, P,**) of the eighteen countries replying do not have in-band requirements.

Four (**CY, SF, F, N,**) do not have out-of-band requirements.

Two countries (**CY, DK**) ask for the requirements to apply in the interdigital pauses. Belgium asks for its normal noise requirements in the interdigital pauses. Sweden requires -60 dBm and Great Britain requires -60 dBmp.

Denmark has special noise requirements for telephone sets.

France has noise requirements specified as levels in a number of bands which differ slightly from the model.

Germany requires the total power of unwanted frequencies to be 26 dB down over a band from 4 kHz to 28 kHz. Portugal specifies out-of-band noise levels different from the model. Spain calls for its standard outband power limits when in the MFPB mode. Sweden has national requirements for individual unwanted frequencies.

Germany, Spain and Great Britain have special test requirements.

Harmonization feasibility

There is a good prospect of harmonization, particularly of the total in-band requirement. For the outband unwanted frequency component, the requirement may be superfluous as it is probably covered by subclause 4.4.3.2.

Cost benefit

The cost of harmonization on the more stringent out-of-band requirements could be high to equipment manufacturers and to the cost for testing. There would be little countervailing benefit to network operators.

5.4.6 MFPB transient timing

Interpretation

This requirement is intended to provide a definition of rate of rise and fall of the MFPB signals and specifies the dc feed conditions over which it needs to meet.

Comment

It would be helpful to combine this subclause with subclause 5.4.7 into one subclause entitled MFPB timing.

The transient timing shown in figure 5.4.6 and the resultant definitions of rise and fall times are of doubtful practicality.

This requirement tends to reflect an obsolete technology as it is intended to ensure a maximum signal period when the duration is determined solely by manual operation of the keypad. Otherwise it is of doubtful value in itself as the fundamental network requirement is for a detectable signal duration greater than some minimum.

A requirement for maximum rise time can be justified in order to prevent false operation of the detector, as the rise is a transient state where the spectral components are unstable.

National inputs

No reply has been received from Luxembourg and Malta.

Three countries (**SF, GR, IRL**) of those replying have no requirement.

Spain and Norway define the rate of rise in a manner different to the model.

Sweden has National feeding conditions.

Great Britain specifies a maximum transient peak voltage.

Testing

For no obvious reason, testing is specified with a different circuit to that used for other MFPB tests. Germany Norway and Spain call for test circuits that have a defined load impedance.

Three countries **(P, S, UK)** have special feed conditions.

Harmonization feasibility

This requirement could best be harmonized by removal of at least the fall time requirement.

Cost benefit

Harmonization would reduce the cost of testing. It is unlikely to generate other costs or other savings.

5.4.6.1 MFPB signal rise time

Interpretation

This specifies the rise time of the signal.

National inputs

No reply has been received from Luxembourg and Malta.

There is no requirement for two of the countries (**SF, GR**) replying.

The rise times specified are 5 ms (**F, E**), 7 ms (**B, CY, DK, D, IS, IRL, I, NL, N, S, CH**), 10 ms (**A**), 15 ms (**GB**), and 18 ms (**P**).

The 18 ms for Portugal includes the time before the start of the signal. The Portuguese note is wrongly ascribed to Norway.

Testing

The intent of table A.5.4.6.1 is not clear. Six countries (**B, CY, D, IRL, NL, N)** use the table to describe the test as mandatory. Other countries with mandatory requirements have no entry. The table is best deleted.

Harmonization feasibility

If the requirement is not removed, it should be possible to harmonize into two or three groups of values.

Cost benefit

Both the cost and benefit of harmonization should be small.

5.4.6.2 MFPB signal fall time

Interpretation

This specifies the fall time of the signal.

National inputs

No reply has been received from Luxembourg and Malta.

Seven countries (**SF, D, G, IRL, I, N, S**) have no requirement for fall time.

France, Spain and Switzerland specify 5 ms. Five countries (**B, CY, DK, IS, NL**) specify 7 ms. Austria and Great Britain specify 10 ms and Portugal 18 ms.

Harmonization feasibility

The removal of this requirement is suggested, but if it is not removed it should be possible to harmonize into two or three groups of values.

Testing

The intent of table A.5.4.6.2 is not clear. Three countries (**B, CY, NL**) use the table to describe the test as mandatory and two (**IRL, N)** as non-mandatory. Other countries with mandatory requirements have no entry. The table is best deleted.

Cost benefit

Both the cost and benefit of harmonization should be small.

5.4.7 MFPB output signal duration

It would be helpful to combine this subclause with 5.4.6 into one subclause entitled MFPB timing.

It may be introducing unnecessary complication to separate the requirements into manually controlled and automatically controlled timings. Much modern equipment determines the minimum signal duration by means of its internal processor. Perhaps this should be made mandatory? It is not necessary to specify a mandatory maximum signal duration as it is in the common interests of the user, the equipment supplier and the network operator to keep the time as short as possible.

The requirements for automatic operation should be suitable for both manually and automatically controlled equipment.

5.4.7.1 MFPB senders with manually controlled output times

Interpretation

This requirement specifies requirements for the duration of signals and pauses between signals of manually controlled MFPB senders. It describes senders where the timing is directly related to the button push and senders where the time is controlled by internal circuitry.

Comment

Of the two alternatives given, only the internal circuit controlled timing is testable. The status of apparatus with timings controlled by the button push is not clear as no compliance test is required.

For all countries specifying values, the required signal durations are different to those required for the test of signal frequencies and format given in subclause A.5.4.2.

National inputs

No reply has been received from Luxembourg and Malta.

Three countries replying (**IRL, N, GB**) have no mandatory requirement.

Germany and Sweden have no mandatory requirement for pause time.

Spain allows an optional pause time if a warning is provided in the user manual.

Denmark and Sweden define a maximum signal duration.

Austria has a different definition of the timing.

Signal times range from 40 ms to 78 ms with most (eleven countries) specifying 65 ms.

Pause times range from 55 ms to 135 ms with most (nine countries) specifying 65 ms.

Testing

Four countries (**B, CY, D, NL**) describe the test as mandatory.

Portugal and Spain specify special feed conditions.

Harmonization feasibility

In most modern MFPB diallers even for manually operated devices, the timing is controlled by an integrated circuit.

Harmonization seems reasonably possible with two groups of values.

Cost benefit

The would be little cost or benefit in harmonization of this requirement.

5.4.7.2 MFPB senders with automatic operation

Interpretation

This requirement specifies requirements for the duration of signals and pauses between signals of automatically controlled MFPB senders.

National inputs

No reply has been received from Luxembourg and Malta.

Greece has not specified any requirement.

Seven countries (**B, SF, IS, NL, E, S, GB**) specify only a minimum duration for the signal time.

Where signal times are specified (**A, CY, DK, F, D, IRL, I, N, P, CH**), the range of timings specified is small ranging from 70 - 90 to 65 - 150.

Seven countries (**B, SF, IS, IRL, NL, S, GB**) specify only a minimum duration for the pause time.

Where pause times are specified (**A, CY, F, D, I, N, P, E, CH**), the range of timings specified is generally small ranging from 70 - 90 to 65 - 150, except for Spain which specifies 135 - 1 200.

Harmonization feasibility

There is scope for harmonization into two groups of requirements.

Testing

Seven countries **(B, CY, D, IS, IRL, NL, N)** describe the test as mandatory.

Portugal and Spain have special feed requirements.

Cost benefit

Both the cost and benefit of harmonization would be small.

5.4.8 Suppression of unassociated signals

Interpretation

This is a requirement to suppress the normal output from the apparatus during dialling by a given attenuation.

National inputs

No reply has been received from Luxembourg and Malta.

Greece does not specify any requirement.

For five countries **(A, SF, D, IS, IRL)** of those replying, this parameter is not mandatory.

Portugal specifies 30 dB, seven countries **(CY, DK, I, N, E, CH, GB)** specify 50 dB, France specifies 55 dB and Belgium and Sweden 60 dB.

Harmonization feasibility

Harmonization into two groups of values should be possible.

Three countries (**NL, E, GB**) have additional requirements.

Testing

Five countries (**A, SF, D, IS, IRL**) describe the test as non-mandatory or have no requirements.

Five countries **(B, NL, N, P, E)** have National test requirements.

Cost benefit

Neither the cost nor benefit of reasonable harmonization should be significant.

5.5 Switching after the dialling condition

Interpretation

This requires for a TE that is capable of dialling, within a specified period of time (in seconds) after completion of dialling, that the TE is able to revert to the loop condition (i.e. transmission circuits are activated). For telephones this specifically implies that the shunting of the transmitter is to be removed.

Comment

The values vary between 0,1 s and 2 s. It is absolutely clear that at some time a TE needs to leave the dialling condition in order that it can perform its prime function, which it is assumed is never just the sending of call establishment data. When subjected to test, any TE which fails to leave this state is unlikely to satisfy other test criteria to the satisfaction of the approval authority. It should be noted that modern exchanges coupled with MFPB signalling can achieve call set-up in very short times and it is, therefore, important that the appropriate circuitry is connected to monitor the call. It is even possible, where the call is answered by automatic equipment, that the calling party will fail to receive and, therefore, detect any network supervisory tone (ringing tone). This would cause confusion for users and, a problem for automatic terminals expecting to receive it.

National inputs

There are five national contributions for this subclause **(A, D, P, E & S)**. Austria simply states that the times specified include the post pulsing period of decadic dialling and the transient time of the speech circuit. The only observation to make is that in order for such a requirement to be applicable to all TEs, these times should be subtracted from the time expressed and, if necessary, be specified elsewhere. This would permit the requirement to be applied to for instance a facsimile machine using MFPB. Portugal states that terminal standards may make this mandatory while Sweden, states in effect, that the requirement only applies to devices with a acoustic transducer for receiving (telephony?). Germany provides information similar to the requirements for this subclause but in subclauses 10.2 (D) 1.1 and 10.2 (D) 1.2. The text of these appear to be terminal specific (telephony). Spain describes extensively the action it expects TEs to perform on leaving the dialling state in subclauses 10.5 (E) 8 to 10.5 (E) 11. Individually, each of the options could be stated to be terminal specific.

Harmonization feasibility

If one ignores the extensive national comment, harmonization can easily be achieved by specifying that the TE needs to be capable of this not later than 2 s after completion of dialling. Such a statement makes it clear that a TE has to leave the dialling condition and permits a terminal to do this as fast as the manufacturer deems necessary within the constraint of 2 s Another benefit is that since the time window is comparatively wide the precision with which the time to start measurement is known should rarely be crucial in deciding pass fail criteria. However, the point at which dialling should be considered completed (and perhaps begins) needs to be unambiguously stated in subclauses 5.3 and 5.4. The test itself, is substantially harmonized already, but may benefit from further precision in its description. Total harmonization will need to await agreement on a harmonized set of feed conditions.

Cost benefit

The cost is likely to be negligible/small for both the supplier and Network operator. A few Network operators may argue that the cost to them is not negligible.

5.6 Automatic calling functions

Interpretation

For automated terminal use, the requirements described in this subclause are intended:

1) to insure the automatic or semi-automatic connection of two terminals through the network (PSTN);

2) to control the transmission duration;

3) to ensure the connection release at the end of the transmission (clearing), interworking in compliance with the PSTN timings and with the hand-shaking protocol of the distant equipment and also according the operator rules about the PSTN exploitation.

In case of unsuccessful calls, when the distant party does not answer at all, or does not answer properly, or is busy or when the traffic is congested, the requirements control the loop disconnection and the repeat call attempts, in order to avoid unexpected occupation of the network equipment and in order to avoid the disturbance of the traffic on the line due to the incoming calls.

Comment

The requirements insure that the equipment is built with the hardware and the associated software in such a manner as to avoid the accidental corruption of the process parameters, the use of some corrupted or wrong address numbers stored in the memory and also to provide some audible warning device to alert the user when manual action is needed.

These precautions are undertaken in order to reduce the dialling errors and the improper line seizure which would occupy the network equipment too much and sometimes could monopolise it.

The requirement also insures loop disconnection in case of unsuccessful calls and at the end of the transmission.

The purpose of these requirements are two fold:

a) to ensure the success of the connection as well as possibly considering the interworking aspects and to prevent the erroneous call attempts with respect to the service quality aspects;

b) to restrict the abusive and useless solicitation of the PSTN equipments which reduce the availability for more productive traffic. The aspects of the user interest protection should also be taken into account regarding the charges for unproductive connections.

Nationals inputs

No entry from Malta

Spain does not fill most of the tables in a common format but refers, by remarks, to subclauses 10.5(E) 1 to 10.5(E) 11 where the national variations are described in probably the original national specification format.

It is unfortunate that the Spanish requirements cannot be studied in depth because they are not within the common format and remain in subclause 10.5 as additional comments described in National form. This study requires further work and it would be helpful if the Spanish Administration could attempt to translate it into the common format.

Cost benefit

More and more, the automatic use of the network generates much business for the operators and also benefits the providers of the services and the customers for which the use of an automated service is an efficient economic factor and very often a factor of security in case of tele-supervision use (e.g. alarm systems).

Nevertheless, the above requirements have to regulate these facilities in order to prevent abusive and useless occupations of the network which could induce losses in the operator's business when the PSTN circuits are unavailable for the profitable charged traffic.

The majority of these requirements need to be applied in order to prevent excessive unprofitable traffic which could disturb the PSTN services at an unacceptable level, according the forecasted proliferation of the automated equipments in the future (e.g. for the domestic field).

These requirements also address the customer benefit, because the useless traffic is also a loss for the users and also it is necessary to avoid lengthy, or indefinite, useless charged connections which could induce some dispute between the operators and the customer.

It is obvious that the protection of the users is a benefit for the involved parties, the operator the provider of the service and of course the customer himself.

The cost of the harmonization process is small and the benefit is substantial.

5.6.1 General requirements

Comment

The purpose of the "**Hardware/software realisation**" requirement is to insure the reliability and the integrity of the process parameters in order to prevent some eventual erroneous or erratic interworking with the PSTN which would induce too many ineffective calls, in other words, which would induce improper occupation of the PSTN equipments.

The majority of the countries recognise its utility, but one country (**GB**), declares it not mandatory and requires instead several statements from the supplier to describe the provided features, mainly concerning the available altering means, for the use of the specialised installer.

The purpose of the "**Call up memory**" requirement is to insure the reliability and the integrity of the stored number directory in order to prevent some eventual erroneous or erratic calls which would also induce too many ineffective calls, in other words, which would induce improper occupation of the PSTN equipments.

One country (**F**) adds some variations which should be considered in the general requirement:

- about the line seizure for the storage and consultation operation which is not permitted for a memory capacity greater than twenty numbers, because the excessive use of the line seizure could occupy too much the PSTN equipments;

- a monitor is requested in order to allow number checking where the memory capacity is greater than four call numbers and where a remote number storage is in use, this precaution is useful in order to prevent wrong numbering which would induce excessive solicitations of the PSTN equipments;

- information and means should be provided in order to allow for the numbering plan modification in the future, this is necessary in France at this moment and may be in other countries but the new numbering plan could be already in application before the harmonized ETS would be in application.

National inputs

The majority of the countries (eleven out of nineteen) declare that the **Hardware/software realisation** requirement is **mandatory**., Six countries (**IRL, NL, N, E, CH, GB**) declare it is not mandatory and two countries (**CY, L**) have not filled the table.

The majority of the countries (twelve out of nineteen) declare that the **call up from memory** requirement is **mandatory**. Six countries (**SF, IRL, NL, N, E, GB**) declare it is not mandatory and one country (**L**) has not filled the table.

Fewer countries (nine out of nineteen) declare that the **call progress monitoring** requirement is **mandatory**., Nine countries (**SF, GR, IRL, NL, N, E, S, CH, GB**) declare it is not mandatory and one country (**L**) has not filled the table.

The country (**E**) does not fill most of the tables in a common format but refers by remarks to the subclauses 10.5(E) 1 to10.5(E) 11 of Chapter 10 of ETS 300 001 [3].

Harmonization feasibility

The requirements about the "**hardware/software realisation**", the "**call up from memory**" and the "**call progress monitoring**" could be harmonized without any problem considering the majority of the answers received from the country but the appreciation is left to the technical committee in order to determine if those requirements are essential or not. The decision is binary (YES or NO) but the wording of these requirements could be made in more general expression if an essential aspect would be argued.

5.6.2 Automatic checking of line condition

Comment

The majority of the countries do not consider this requirement mandatory, but yet this requirement seems more and more important for complex installations with parallel and series TEs associated on the same line, where the action of an automatic apparatus could disturb the engaged transmissions.

This is a matter which is very dependant on the TE association rules and the answer to this requirement should be reconsidered by all the countries which have declared it not mandatory, regarding the new European rules (if any) for the TE associations.

Some countries, such as (**F**) also consider the incoming call to have higher priority than the outgoing call, in this case it is not sufficient to check only the dc loop but also the ac ringing signal.

The case of alarm calls should be generally treated in the reverse way because the priority aspect is different due to the emergency services considerations and, in most cases, the alarm TE is able to disrupt the engaged line because of this highest level of priority.

The levels of priority and the nature of TE features (manual or automatic) could have an influence on the TE association rules, e.g. (**F**) require the installation of the TE with automatic seizure at the head of the line.

This requirement may not directly harm the PSTN, but an erratic functioning of one installation could increase too much the unsuccessful PSTN access and also could degrade too much the quality of the service, multiplying the customers complaints against the operators.

National inputs

Only two countries (**F, D**) declare that this requirement is **mandatory**, fourteen countries (**B, CY, DK, SF, IS, IR, I, NL, N,P, E, S, CH, GB**) declare it is not mandatory and two countries (**GR, L**) have not filled the table.

Harmonization feasibility

The "**automatic checking of line condition**" requirement, regarding the minority of the positive answer could be ignored as it does not affect the PSTN, but it should be reconsidered taking into account the rules of TE association on the same line, the possible disturbance of the engaged or incoming traffic on the line and also considering the priority aspect of the emergency apparatus.

5.6.3 Initiation of dialling

Comment

The content of this requirement is confusing because there is a conflict in the case of combination of the initiation of calling timer use (t1) and the dial tone detector feature where the end of time t1 could fall before the end of time t2 or t3.

The combination of dial tone detector and timer should refer to another timer which reverts the TE to idle state when the t3 is elapsed in case of no dial tone presence.

This requirement should be reworded more clearly and, unfortunately, the answer of the countries may be distorted by this confusion.

In the reverse of the common requirement statement, for some countries (**A, D, B, F, NL,N, P**) the timer function is not permitted in case of automatic dialling initiation and is only permitted with "speech TE" for (**CH**). If the TE has a dial tone detector it is not reasonable and not useful to use the timer function (t1) for the dialling initiation which conflicts with the timer (t3) which reverts the TE to the idle state after t3 is elapsed.

With the automatic call initiation the timer t1 use should be prohibited for the above reason and because the availability of the PSTN register is not guaranteed before the time t1 is elapsed and often the mean waiting time for the dial tone is about 20 s and could in some case reach one minute.

It could be acceptable to use a timer t1 where the user is able to control the dialling progress with a monitoring feature (with handset or loud speaker...).

The table 5.6.3.1 inputs are not clear because within the table the data for the manual initiation of dialling and that for automatic initiation of dialling are amalgamated in the same table called "Automatic initiation of dialling", therefore this is confusing and e.g. where the countries declare that the audible monitoring is not mandatory, the answer may be referring to the automatic initiation. It could be mandatory for the manual initiation!

In order to clarify the inputs, a separate table should be used in order to distinguish the manual initiation case.

Nevertheless, when dialling is manually initiated, the progress of the dialling could be controlled automatically by a dial tone detector, e.g. where there is a second dial tone, as is the case for four or five countries in Europe such as (**F,E,P,GB...**).

In case of alarm systems (**F**) where the alarm event is a manual action, e.g. emergency about old people, the case should be treated as a full automatic call.

Some countries in the remarks require detection of special dial tones **(F**) and also of busy tone and congestion tone (**NL**). The detection of busy tone and congestion tone seems useful in the case of automatic repetition of call attempt.

The country values of time "t1 min" where the dialling is not initiated after loop seizure are spread in a range of 1 s to 6 s, the more common time is about 2 s.

The country values of time "t1 max" where the dialling is initiated after loop seizure are spread in a range of 3 s to 10 s, the more common time is about 5 s.

The country values of time "t2" where the dialling shall start after the application of PSTN dial tone are spread in a range of 2 s to 5 s, the more common time is about 4 s.

The country values of time "t3" where the TE shall revert to idle state if the dial tone is not yet detected, are spread in a range of 5 s to 60 s, the more common time is about 10 s.

The large spread of the above values and the many variations added in the remark area demonstrate the complexity of the matter and the difficulties of the harmonization process.

National inputs

With respect to the timer times (t1min, t1max), the countries (**D, L, NL, S**) do not fill any value in the table and Denmark declares that it is not applicable because the dial tone detector is mandatory. It is not known whether they do not use timers in the case of automatic initiation.

One country (**SF**) does not specify either the time **t1max** or the time **t3.** It is not clear in this case when and how the TE reverts to the idle state if the PSTN park state occurs before the initiation of the dialling or if the dial tone does not arrive.

The majority of the countries (eleven out of nineteen) consider the dial tone detector as mandatory in the automatic initiation case, but five countries declare that it is not mandatory (**SF, GR, IR, P, GB**). It is not clear if they use the timer function only for the automatic initiation of dialling the 50 % of the countries (nine out of nineteen) consider audible monitoring, as mandatory in the automatic initiation case, but five countries declare that it is not mandatory (**SF, GR, IR, P, GB**); it seems that there is a confusion between the automatic and manual initiation because they are amalgamated in the same table which refers only to the automatic case.

One country (**F**) has also some important variations which cannot be inserted within the table in the common format, e.g. some safety equipments for old people are fully automated but the alarm is originated by manual action which should be distinguished from normal manual call initiation. and also the case of the last number redialled is described.

The remark in subclause **5.6.3.1(GB)1** seems to lacks clarity because the sentence is split in two cases (where dial tone is returned and where dial tone is not returned) and the requirements a) and b) are exactly the same for the two cases. This remark needs rewording.

Harmonization feasibility

The "**initiation of dialling**" gathers several requirements and because the inputs of automatic and manual initiation were amalgamated, it is not possible to know for which purpose the answer is made. Nevertheless, it could be possible to harmonize the following:

1) a dial tone detector mandatory for the automatic dialling initiation;

2) an audible monitoring with a minimum acoustic level mandatory for the manual dialling initiation;

3) a timer t1 for the dialling initiation where no tone detector is provided and where an audible monitoring is available on the TE.

The large spread of the values of t1, t2, t3 do not permit any possibility for the harmonization, but it should be possible to propose a target values which should be submitted for the countries' approval.

5.6.4 Automatic control of call progress

Comment

The majority of the countries have declared that this requirement is not mandatory.

Of course this requirement cannot be mandatory for the simple TEs without tone detectors and if the automatic control of call progress were to become mandatory, that would increase the cost of simple TEs too greatly.

(**B, NL**) declare the requirement is only applicable if the function is provided within the TE, this seems reasonable because the unsuccessful call state could be detected by other means as "no answer after an elapsed time".

In the case of simple automatic TEs and of manual initiation TEs with a monitoring function, this requirement cannot be imposed. For this reason it is surprising that two countries (**I,CH**) apply this requirement without restriction.

In case of automatic calls with TEs which include tone detectors it should be reasonable to use the detection of the busy tone and of the congestion tone because the extra cost is then negligible, but it is not really a reason to require it, considering the inputs of the majority of the countries which declare it not mandatory.

National inputs

The majority of the countries (fifteen out of nineteen) declare that this requirement is not mandatory, only two countries (**I, CH**) consider it, as mandatory. Two countries (**B, NL)** first declare the requirement as not mandatory but in the remark give cases where it is mandatory.

Harmonization feasibility

The "**automatic control of call progress**" requirement does not seem relevant because the large majority of the countries (sixteen) declare it "not mandatory", only two countries (**I,CH**) require it, and two countries (**B,NL**) require it only if the tone detector is provided within the TE.

5.6.5 Initiation of transmission

Comment

The term "initiation of the transmission" in this subclause is interpreted as the start of sending and receiving the data or the voice signal, because, in fact, just after the dialling stage for the caller TE and the on line state of the distant party, the TEs are automatically able to transmit the voice band signals in order to exchange the identifications signals. It should be more appropriate to use the term "initiation of the data or message exchange".

The time periods t4 and t6 are not really relevant according to the answers of the countries where nobody or few countries declare it to be mandatory, these requirements seem more relevant to the TE interworking and could be a terminal dependent requirement.

The time period t5 which ensures the release of the connection in case of identification recognition failure, is relevant because this reflects some unsuccessful exchange conditions. In fact, if the TE remains connected, this situation does not really disturb the PSTN equipment because the dialling and the connection are successful. On the other hand, a useless communication, not released for an indefinite time, occupies the PSTN circuits which remain unavailable for productive traffic, produces losses in the operator business and may cause unexpected user charges which could induce litigation between the user and the operator.

With the exception of one country (**I**) which declares a very short time period for t5 (t5 = 5,1 s), 50 % of the countries declare a relatively consistent value (60 s to 100 s) and six countries declare it not mandatory. It is not known whether for these last countries, it is a terminal specific requirement or only a recommendation for the attention of the manufacturers in order to achieve this feature which is obviously requested for the user interest.

One country (**F**) distinguishes between automatic and the manual answering for t5 giving more time in the manual case (45 s for the network delay, 15 s for the automatic answer delay and 30 s for the off hook reaction of the user) and also declares a complementary requirements for the signals which should be sent from the caller TE (calling tones, code messages, repetitive speech) and also for the end recognition of the calling tone as the CCITT Recommendation.

The "harmonization" of the identification signals could be of great benefit in recognition of the TE type in order to direct automatically the incoming call towards a similar equipment able to answer it, among several TE connected in parallel, e.g. distinction between incoming fax call or phone call or other data terminal.

National inputs

1) case of automatic initiation of the transmission

No country declares the time **period t4** mandatory, the majority (**twelve**) do not fill in the table and the others declare it not mandatory (**A, CY, SF, D**), not applicable (**P**) or TE type dependent (**CH**).

The majority of the countries (**eleven**) declare the time **period t5** mandatory, the remainder (**DK, GR, IS, IR, S, GB**) declare it not mandatory.

Only two countries (**B, I**) declare the time **period t6** mandatory, more than 50 % do not fill the table and the others declare it not mandatory (**A, CY, SF, D**), not applicable (**P**) or TE type dependent (**CH**).

One country (**F**) describes in detail the identification procedure in order to achieve the automatic calling.

2) case of manual initiation of the transmission

About 50 % of the countries (**CY, F, GR, IS, IR, N, S, GB**) declare that this **period t7** requirement is not mandatory or do not fill the table (**B, L,**), one country (**F**) confirms that in this case the monitoring system is mandatory.

Harmonization feasibility

The "**automatic initiation of transmission**" gathers several requirements: The time t4 about the delay for the automatic initiation of transmission with timer and the time t6 about the delay for automatic initiation of transmission after the start of the identification signal, seem not to be relevant for the PSTN interface and are more a specific terminal requirement.

In the reverse, the time t5 which has to ensure the TE reversal in the idle state, if the identification signal is not received, is absolutely necessary in order to avoid an ineffective and useless connection which is against the interest of the user. The feasibility of the harmonization for this last requirement is very high and a target value between 60 s to 90 s could be submitted.

In case of "**manual initiation of transmission**", the requirement time t7 which reverts the TE to idle state where the user fails to initiate the transmission, does not seem important when the TE is controlled by the user with the monitoring system. For the majority of the countries a call progress monitoring seem to be required.

5.6.6 Transmission duration control

Comment

The majority of the countries declare the "**automatic transmission duration control**" requirement as mandatory for both duration control cases, by a timer (t8) and by monitoring the flow (t9).

Data TE which complies with the CCITT Recommendations as e.g. the fax machine using a comprehensive protocol exchange under which the flow is controlled, fall into this requirement in case of manual or accidental interruption of protocol exchange.

The requirement does not indicate clearly the start point of the time t8 and to this aim one country (**F**) describes it as "as soon the answer of the distant party is detected" if this state is able to be detected, or "at the end of the dialling" if it is not possible. One country (**GB**) also mentions the start point as "at the end of dialling".

The values provided in the common format within the table are spread from **60 s to 300 s for t8** and **15 s to 180 s for t9**. The harmonization could be achieved by a choice of a common value (maximum or average time period). The value of these times needs to be as short as possible because where the distant party releases the line, the period during which the caller party remains improperly connected (park condition) could induce unprofitable traffic for the operator. The time t8 (timer case) needs to be long enough in order to permit the completion of the data or message transfer between the two terminals. The time t9 (flow monitoring case) could be shorter but for some services such as remotely transmitted control signals, the value of T9 does not have to be too short in order to permit the consultation by the operator of some relatively long message e.g. in case of remote consultation by the user of its own answering machine or some voice-bank.

In addition the following national remarks are expressed:

- **Denmark** mentions an exception where it is permissible to maintain the communication 20 mn after recognition of an unambiguous code signal, this is a particular case for which TC-TE do not know the application, which may not be a valid requirement;

- **France** clarifies the origin of the time t8 which is not stated in the common requirement and which is different if the answer of the distant party is detected or not;

- **France** points out the use of polarity inversion as an information signal when the remote party has released the line; this information is very interesting in the case of answering TE use where the record time could be cut short as soon the caller has released the line, using the battery reversal signal The polarity reversal existence in most PSTN interfaces in France is historic and remains very complex, nevertheless it is possible to use it by following some rules which covers most cases. Unfortunately, this signal is not available in most European countries, as stated in the subclause 6.4.4, consequently although no requirement could be made of it, it should remain a national option which could be used without guarantee;

- **France** also refers to the specific case of the series-TE, which shall reconnect the line for the other TE of the installation within 2 s after the start of the quiescent state which is released the line;

- **Great Britain** requires only a time-out duration (t8) after the termination of the dialling which seems to be more a call progress control where the time-out includes the transmission period (of successful calls) and where the tone indicative of ineffective calls may be detected for an immediate clear to the idle state. Three different TE mode are distinguished: the BT emergency (999), voice alert calls and the other types of calls;

- the "**manual transmission duration control**" requirement for which an audible warning may be mandatory. Six countries (**B, CY,DK,F,D,I,**) declare it mandatory and eleven of the others (**A, SF, IS, IR, L, NL, N, P, S,C H, GB**) declare it not mandatory; When the TE is under the user control, only the monitoring system should be mandatory.

National inputs

1) <u>case of automatic transmission duration control</u>

The majority of the countries (**thirteen**) declare the time **period t8** mandatory, the remainder (**IS, IR, S**) declare it as not mandatory and (**CH**) TE type dependent.

The majority of the countries (**ten**) declare the time **period t9** mandatory, the remainder (**IS, IR, S, GB**) declare it as not mandatory and (**CH**) TE type dependent.

One country (**N**) confirms if busy/congestion tone is detected, the line shall be released. This seems a requirement more appropriate to the subclause 5.6.4, "Automatic control of the call progress" where they declare this requirement as not mandatory. This seems to be an inconsistency.

2) case of manual transmission duration control

Six countries (**B, CY, DK, F, D, I,**) declare that the audible warning device is mandatory the remainder (**A, SF , IS, IR, NL, P, S, CH, GB**) declare that it is not mandatory. The table seems to address only the requirement of an audible warning device and not the requirement of the control transfer to the user.

Harmonization feasibility

The "**automatic transmission duration control**" requirement is applied to either the timer control or the flow control which insures the TE reversion to the idle state at the end of transmission within, respectively, the time period t8 or t9 and is a relevant requirement which avoids a useless line connection. The harmonization feasibility is high and an average of the values **t8 = 180 s, T9 = 100 s** could be submitted to the technical committee. For the "**manual transmission control**" requirement the harmonization could be achieved by proposing at least an audible monitoring control for speech and data TE or also a visual monitoring for the data TE, but may be not necessarily a warning device.

5.6.7 Automatic repeat function

Comment

The case of emergency or alarm calls should be specified in a separate requirement because of their urgency and priority characters. shorter delay between the call attempts and a greater number of call attempts should be permitted and also a higher level of priority against the line being already engaged or against any incoming calls.

It is reasonable to adopt this proposal because assuming that the classification as alarm use should restrict the application to real cases of emergency, and that the alarm apparatus has to be reliable, the emergency calls should not represent a great traffic in comparison e.g. to the facsimile traffic with which the people are tempted to make auto-advertising use.

1) Repeat call attempts (delay period)

The values of the time periods t10, between the first unsuccessful call and the second call attempt, and of the time t11, between the subsequent call attempts, are very consistent and should be harmonized very easily, but there are a lot of **variations provided** in the remarks as listed below:

- in general, alarm calls are treated in a specific manner according to their urgency and priority characters. e.g. in one country (**F**) the seizure of the line takes priority over the engaged communication on the line (series-alarm-TE cases) and over the incoming calls;
- the time periods are different if the call attempt follows an outgoing call or an incoming call;
- the TEs are grouped in three categories (Group 1; Group 2; Group 3) for respectively e.g. (simple dialling equipment, simple alarm system, modems, fax, alarms systems);
- the delay t10 is also applied as time period between the first and the second call attempt;
- the time t11 applies for the first call attempt in case of redialling the same destination number;
- call patterns nominated by the supplier among four different patterns;
- case of subsequent time period > 2 mn or 10 mn or 3 mn where a congestion tone is able to be detected;
- no requirements are specified for the minimum durations between call attempts, where it applies to different destination numbers;
- call pattern, where the sequence is permitted within a period of 2 hours.

The above variations prevent the possibility of harmonization as a common requirement.

2) Number of repeat call attempts

The widely spread values of the call attempts numbers (per time unit), the case of limited numbers of call attempts without consideration of time period, makes it difficult to find a common value for the harmonization and also in addition important **variations provided** in the remarks as listed below totally prevent the harmonization with a common procedure;

- in general, the alarm calls are treated in the specific manner according their urgency and priority characters. e.g. in one country (**F**) the seizure of the line has priority against the engaged communication on the line (series-alarm-TE cases) and against the incoming calls;

- the TEs are grouped in three categories (Group 1; Group 2; Group 3) for respectively e.g. (simple dialling equipment; simple alarm system; modems, facsimile, alarms systems);

- distinction between the redialling call attempts and successive call attempts for different destination numbers;

- the case of recognition of a successful call by metering pulse or by an answering signal is not applicable in one country (**A**);

- call attempt number (16/H) only if a congestion tone is able to be detected by the TE.

In addition, one country (**F**) does not permit the repetition of the call attempt where the call is verified erroneous for the second time in cases where the TE has the ability to distinguish between erroneous call and ineffective call, and where the call remains unsuccessful in the series of 6 call attempts within the hour in case where the TE is not able to distinguish between erroneous and ineffective call.

(**GB**) requires 4 call attempt patterns without special consideration for alarm calls, where the (A,B) patterns are the most restrictive with, respectively, 5 and 7 maximum number of calls per 2 hours period, and where the (C,D) patterns are similar to the (**F**) requirements. For the C case, the frequency is limited to **6** attempts per hour (**t11=10 mn**), and for the D case the frequency is limited between **16 to 17** attempts per hour (**t11=3 mn**), but is only applicable for TE which is able to recognise the **congestion tone**.

National inputs

1) Repeat call attempts (delay period)

With the exception of two countries (**M, L**) which do not input any value, the great majority of the countries (seventeen out of nineteen) agree to control the automatic repeat function with very consistent values (t10 = 5 s, t11 = 1 mn) and the other with very close values or optional values in the various cases (**DK** [t10 = 2 s, t11 = 2 mn]**, F** [t10 = 2 s or 6 s]**, E** [t10 = 2 s or 5s]**, S** [t10 = 2 s, t11 = 2 mn]**, GB** [t11 = 1 mn, 2 mn, 3 mn or 10 mn], nevertheless some important variations are provided by some countries (**F, D, N, E, CH, GB**), which cannot be inserted in the common format; an exception is found for Portugal (**P** [t10 = 60 s]) where the t10 value is very different to the others.

In the national variations the countries are distinguishing several cases (**F, CH, GB**), or several kind of terminals arranged in three groups (**D**).

For the most of the countries the case of **alarm TEs** related to **emergency matters**, is described under a lot of special provisions or variations which characterise the **urgency and the priority** of the emergency calls.

2) Number of repeat call attempts

Two countries (**M, L**) do not input any value, the majority of the countries (seventeen out of nineteen) agree to control the automatic repeat function with the maximum call attempts number and frequency, but the range of value about the number of call attempts per hour are widely spread (from n1/H = 2,5 to n1/H = 15 and from n2/H = 2,5 to n2/H = 16), and in eight cases (**A, DK, D, IS, N, P, S, CH**) the number is limited at (n1 = 3 to n1 = 10 and n2 = 3 to n2 = 15) without consideration of the time period. In addition, some important variations are provided by countries (**A, F, D, N, E, CH, GB**),which cannot be inserted in the common format.

In the national variations the countries distinguish several cases (**B, F, CH, GB**), or several kind of terminals arranged in three groups (**A, D**).

Two countries (**SF, GR**) do not specify the limit of the number of call attempts in the case of alarm calls (n2 = not specified) and one country (**GB**) authorises four repeat attempt patterns. Same comment as above section a) about the **alarm TEs**.

Harmonization feasibility

The "**Automatic repeat call attempt**" requirement cannot be harmonized, regarding the large number of the variations exhibited by the countries. Distinguishing the specific case of the alarms devices (e.g. restricted about only the safety of people and the security of the property) a common pattern could be chosen after further study and tender procedure to the countries.

5.7 Identification signals

Interpretation

The requirement addressed by this subclause actually consists of a main clause and two related subclauses the latter being terminal specific. The intent of the clause is to ensure that following dialling using an auto-calling terminal some form of identification signal is put on the line so that the answering terminal can be aware that the call has been made automatically.

Comment

There is a basic difficulty with this subclause in that the main requirement specifies that the actions should occur within a period of time and one of the subclauses (5.7.2) fails to specify a time limit.

Requirements can roughly be divided into three types viz. voice or speech, fax and other non-voice

- Voice or speech

Whilst the main clause specifies that the signals shall appear within a specified period of time, this subclause provides no value for this time and, therefore, the requirement clearly cannot be applied.

- Facsimile

Facsimile is a highly defined service, the Japanese having produced a de facto standard which has been carried forward into the appropriate CCITT Recommendations. It is the view of TC-TE that, as a result, it is unlikely that any facsimile machine will be found that does not send 1 100 Hz calling tone. If it does not it is probably for reasons of security i.e. the user does not wish it to be able to "talk" to other standard facsimile machines. Additional uses have been found for the such signals in identifying the facsimile service. As the transmission rates of facsimile increase, problems occur because of the compression techniques (DCME) used to make efficient use of international links. The result is that devices detect the presence of the facsimile signal and demodulate it, sending the facsimile signal on as a digital signal and at the other end of the digital link it is remodulated for onward transmission. With non-voice terminals the presence of these tones has fortuitously provided a method by which it is possible for a line diversion device to extend the call to an appropriate terminal (often known as a Fax switch).

- Other non-voice

There are a large number of non-voice terminals both within Europe and outside that instead of providing the calling signal, transit a signal consisting of the normal modulated or unmodulated data signal. The signal transmitted is sufficient to identify the TE and to facilitate interworking.

National inputs

- Data-related tones

In this case we have seven countries **(SF, D, IS, M, NL, P, S, & GB)** with blanks or unqualified statements that there are no mandatory requirements. To this can be added (P), which states that other standards could make such a requirement mandatory which therefore suggests that it is not mandatory in P currently. The remainder, thirteen countries, can be sorted into two broad groups those that require strict adherence to the CCITT Recommendations V.25 [18] and T.30 [19] **(A, DK, F, N, E & CH)** and those which whilst demanding a calling tone are content to permit anything in a broad range of frequencies **(B, CY, GR, IRL, I & L)**. Belgium, in effect, seems to recommend the use of CCITT signals rather than make them mandatory. For those countries specifying this to be a mandatory requirement, the signal shall have appeared within 5 s. Only three countries **(F, I & CH)** specify other times and these are all less than 5 s. Again it can be argued that since for seven countries there is no mandatory requirement and their networks and calls between their networks and other networks are successful that the requirement cannot be necessary for the operation of the network.

- For speech and non-data related tones

Two countries **(GR & M)** have not indicated their preference, eleven countries **(A, B, CY, DK, SF, D, IS, IRL, L, S & UK)** state without qualification that there is no mandatory requirement. Two countries **(I & NL)** state without qualification that there is a mandatory. The remaining countries can be analysed as follows: (F) refers to another clause but in effect the requirement is mandatory; (N) does not apply requirement to TEs performing an alarm function, (P) states that other standards could make such a requirement mandatory which suggests that it is not mandatory in P currently, (E) effectively requires the TE not to be silent & (CH) states that the requirement is under consideration i.e. they do not apply it currently.

The overall analysis would therefore be that it is currently applied by five countries but not by fifteen. Many calls originate in one country and terminate in another, and call establishment is still possible, i.e. it does not affect the network, it can therefore be argued that however desirable it might be, it cannot be necessary for the operation of the network.

Harmonization feasibility

TC-TE considers that the requirements are too terminal specific to be considered in a general standard for connection to the PSTN. The requirements should be deleted from ETS 300 001 [3] and, if necessary, other more appropriate requirements included in terminal specific standards.

It is believed that, whether voluntarily or mandatorily, most TEs conform to the spirit of this requirement by sending something. Provided it does not clash with a network signal, allowing the maximum latitude should not cause problems for the network. Other terminal standards can specify the signal as a mandatory or optional facility. In both cases where such a signal is present it will be tested to comply with the agreed requirements.

Cost benefit

If the approach specified above is adopted the cost will be negligible to all, since the spirit of the requirement is already met no benefit is likely to be found.

6.6 Chapter 6

Chapter 6 treats the various aspects of automatic answering such as the sensitivity of ringing detectors and insensitivity to unwanted signals, together with some aspects of automatic clearing.

6 Answering function

Introduction

Chapter 6 consists of four parts :

- 6.1 General
- 6.2 Ringing signal reception
- 6.3 Automatic answering function
- 6.4 Automatic control of the loop condition.

Subclause 6.1 is a preamble to the rest of Chapter 6 and as such contains nothing of significance except an ambiguous statement. A TE having a ringing signal "detector" which is switched off or which fails to meet the requirements of Chapter 6 is clearly **not capable** of detecting a ringing signal and therefore falls outside the scope of the requirement.

6.2 Ringing Signal Reception

Introduction

This clause consists of three parts:

- 6.2.1 Ringing signal detector sensitivity
- 6.2.2 Ringing signal detector insensitivity
- 6.2.3 Immunity to decadic dialling from a parallel TE.

The whole of section 6.2 seems to have more in common with Chapter 3 than the remainder of Chapter 6.

Since the requirements are all terminal specific it can be questioned whether they should be in an access standard.

6.2.1 Ringing signal detector sensitivity

Interpretation

This requirement attempts to describe the limits in terms of voltage, frequency and time for a TE to respond to a ringing signal.

Comment

In general the intent of this requirement is confused (declared response times range from 200 ms to 10s, to not specified) and it is clear that timings shall be clarified before the standard can be applied realistically. Of the nineteen countries declaring values five (**GR, IRL, I, P & GB**) use frequencies around 16,66 Hz (which we believe to be obsolescent, if not obsolete), Fifteen countries (**B, CY, DK, SF, D, IS, IRL, L, NL, N, P, E, S, CH & GB**) use 25 Hz and a further eight countries (**A, CY, F, D, GR, I, S & CH**) use 50 Hz.

The criteria for the split between Chapters 3 and 6 which cover related subjects is not immediately apparent. It would seem more sensible to deal with TEs with discernible output either in a product related standard or in Chapter 3, leaving Chapter 6 to deal solely with automatic answering.

It can be expected that some correlation exists between line length, ringing voltages and feed currents. As written at the moment, ETS 300 001 [3] implies that any value in the specified range of one parameter can occur with any value in the specified range of another; this produces perhaps an unnecessarily large multi-dimensional matrix of tests.

The relationship of the available ringing voltage to the terminal loading is unclear. Many terminals can impose extra load on the ringing supply which (coupled with long lines) may cause the available voltage to be low.

The criteria for determining whether a detector has been activated are not described in the common text. Bearing in mind that such a requirement can be applied to a ringing current detector with no audible output, a electronic ringer and an electro-mechanical ringer, all of which could be part of a users installation, it is not clear at what point the ringer will have been activated. If this point is at a certain output power for audible detectors and when the loop is applied for automatic equipment, the value to respond is unlikely to be the same.

For most entries the activation time is 200 ms whilst Norway asks for 350 ms and Portugal asks for <u>10 s</u>. It is thought that most countries determine this time in terms of acoustic output. Normally, the only detectable output from an automatic terminal is line seizure and any TE would wish to integrate the pulses of ringing current, so as not to expose itself to false operation.

For some networks the dc bias is not present when the ringing signal is on i.e. it is only present during the off cadence. Where this is the case it should be made clear, since clearly the network cannot detect the answer until it places its detector in circuit.

The entry in ETS 300 001 [3], table 6.2.1, 'Δf' has encouraged misleading entries e.g. Italy and Switzerland where unless a network fault occurs a frequency of say 38 Hz is highly unlikely to occur.

It is clear that some value of voltage (e.g. 20 V at 25 Hz) needs to be defined at which all ringing detectors are expected to function. This point requires further work to define the connection practice and number of terminals (see clause on Chapter 3), but a value should be chosen at which all devices connected to the same line will function.

National inputs

France and Portugal state that this clause does not apply to auto-answering (subclause 6.3.1 applies). France also states that the requirements do not apply to cordless telephones.

Germany and France ask that the timing of the acoustic signal produced by the TE shall closely correspond to the application of the ringing current

Austria asks that electro-mechanical (ringing detectors) sounders operate at 15 V which is 3 V lower than for other types of ringing detector.

UK reference should be to Chapter 3 not Chapter 10.3 of ETS 300 001 [3].

Harmonization feasibility

The ability to harmonize this requirement, essential or not, is inextricably linked to the sorting out of the connection arrangements as explained in our report on Chapter 3.

Cost benefit

The cost cannot be determined until it is clear what might, or might not, require change in order to achieve harmonization. It is thought that ringing frequencies of 20 Hz or less can probably be excluded from studies.

6.2.2 Ringing signal detector insensitivity

Interpretation

This requirement attempts to describe the limits of a ringing signal in terms of voltage and frequency for which a TE should not respond.

Since the frequency set out in this requirement is generally the same as that specified in the sensitivity requirement, this actually specifies the voltage at which a ringing detector should not be 'activated'.

Comment

It is believed that the intent of this requirement is to ensure that ringing detectors are not activated by transient and induced mains voltages on the line as a result of other TEs going on and off line, testing, etc. The voltages specified for most countries are low enough that a margin, although not substantial, exists between all the national requirements for sensitivity and the insensitivity requirements. However, Austria asks that a ringing detector functions at 15 V and five countries (**DK, GR, I N & E**) require it not to function at such voltages. If they are justified clearly such requirements cannot be reconciled.

National inputs

There are six national remarks (**F, D, P, E, S & CH**).

France again states that the requirements are not applicable to TEs when Auto-answering, whilst Portugal only wishes it to be applied to TEs which Auto-answer.

Sweden defines a short pulse of ringing current to which the TE is expected to be immune.

Switzerland defines a very low frequency signal, apparently used to permit multiple users on the same pair of wires (shared service), to which (for reasons of security) etc. the detector should not react. Switzerland requires (as do **UK** in succlause 6.2.3) that the detector should not be activated by speech-band signals generated by a parallel TE.

The inputs from Spain and Germany are confusing and problems have been been experienced in extracting the underlying principles.

Germany has four remarks the third of which (6.2.2(D)3) appears to be a sensitivity requirement, since it states "...shall respond and switch off reliably.", rather than an insensitivity requirement. It is not thought conceivable that the German ringing frequency actually extends over the complete frequency range 23 Hz to 54 Hz. Whilst designing apparatus which is tuned to work at both 25 Hz ± 2 Hz and 50 Hz ± 4 Hz may not prove a problem, enabling it to encompass intermediate frequencies could reduce its reliability or add extra expense.

The constant references by Spain to entries in Chapter 10 makes their requirements difficult to follow, although in truth they seem to be well thought out. However, considering table 6.2.2(E) 1, which specifies signals to which ringing detectors are expected to be insensitive, it is not clear why entries i and ii were not combined since the voltage and the frequency ranges are the same for both and the duration of the signals are continuous. The values of voltage (25 V) for continuous signals to which the detector is expected to be insensitive seem a little high and would certainly preclude harmonization.

Harmonization feasibility

The statements made in Subclause 6.2.1 also apply here, in that it is necessary to be sure that all the requirements are referred to similar conditions before it is possible to determine whether or not harmonization is feasible and then what a harmonized value might be.

Cost benefit

An assessment of the cost/benefit relationship needs to await clarification of the requirements and the determination of harmonization possibilities.

6.2.3 Immunity to decadic dialling from a parallel TE.

Interpretation

This requirement is intended to prevent the detectors in other TEs connected to the same line from being activated when a TE dials using decadic (loop-disconnect) dialling.

Comment

Five countries (**DK, D, IS, NL & N**) say this requirement is not mandatory. It is known for instance that the current German connection arrangements could not give rise to "bell tinkle" but if these were scrapped in favour of a simple parallel system, we feel strongly that the German response would be for a requirement.

When studying subclause 5.3 of ETS 300 001 [3] the comment was made that efforts to harmonize decadic (loop-disconnect) dialling might not be of great value and went on to state that effort should not be directed to this task.

Whilst the dialling pulse rate does not differ significantly for most of the remaining thirteen countries that declare values(no entry from SF and M), a dial pulse rate of 9 pps -11 pps would suffice.

The test in the common text has no inductive component which is seen by five countries (**F, I, E, S & GB**) as a serious deficiency. It is strongly suggested that one example be used, and we would suggest the Italian or Spanish example as it represents more closely the "real world".

The effects of this are not network affecting except where parallel equipment is caused to auto-answer although conceivably the network operator may receive complaints if the bells tinkle. In the absence of any warnings/information, education of users is likely to take some time.

National inputs

This clause contains seven national remarks (**F, IRL, P, E, S, CH & GB**).

France states that these requirements do not need to be applied to TEs producing discernible signals, provided that they use the shunt wire to avoid bell tinkle. This is also thought to be the case in GB (What is a discernible signal? What conditions apply to TEs not producing discernible signals?). France then go on to describe a requirement which is more closely aligned to a practical situation than the core text.

Ireland, Portugal, Spain and Switzerland require that when another TE is (decadic) dialling, auto-answering TEs should not assume the loop condition. Switzerland states that it is also recommended for other types of TE.

Sweden restates its feeding conditions and says the requirements are not mandatory for 2-wire connected TEs.

Great Britain state they are not interested in parameters other than Δf, however the test calls for a dial with a nominal break of 67 ms to be used (would a dial with say 2ms break suffice?). GB also asks that when "speech voltages" are present the detector should not respond. This comment seems more appropriate to subclause 6.2.2.

Harmonization feasibility

Having selected a single requirement and test, we would suggest that apparatus which fails to comply with the requirement need not be failed provided that the user is given adequate warning that the TE ringing detector is likely to be activated by other apparatus using decadic dialling on the same line. Encouraging the obsolescence of decadic dialling would reduce the need for this requirement.

Cost benefit

It is believed that the cost of adopting our proposed solution is small if not negligible for all parties concerned.

6.3 Automatic answering function

Introduction

This subclause consists of three parts:

- 6.3.1 Automatic establishment of the loop condition;
- 6.3.2 Insensitivity to ringing signal;
- 6.3.3 Answering signal.

6.3.1 Automatic establishment of loop condition

Interpretation

This requirement specifies the sensitivity and both a minimum and maximum time to answer for apparatus that seizes the line automatically on receipt of ringing signals.

Comment

The reason for the minimum time requirement is not clear, except possibly to prevent answer before the caller has received ring tone. The requirement for maximum time is intended to enforce a user friendly operation and to limit the unproductive use of common network equipment, although some countries take the view that in some circumstances, the subsequent revenue earning call justifies a longer time to answer.

National inputs

There is no mandatory requirement in either Iceland or GB. Sweden states that the requirement is not mandatory although there is a requirement for minimum time to answer in the Swedish remark.

Malta has made no input.

For minimum time to answer, four Countries (**A, D, GR, N**) specify no value.

Specified values range from one second or less (**DK, F, NL, P**) to 4 seconds to 6 seconds (**B, CY, F, I**, **L**). Switzerland and Sweden forbid answer prior to the second ringing burst. France has special requirements for a polarised call.

For maximum time to answer, Denmark Finland and Sweden specify no value.

Three countries (**A, IR, I**) specify 7 seconds to 10 seconds, four (**F, L, NL, N**) specify 15 seconds to 16 seconds and three (**B, CY, GR**) specify 20 seconds.

Germany requires answer before five ringing cycles and Portugal before ten cycles.

Great Britain permits unlimited time to answer where the caller is expected to have special knowledge or equipment. Otherwise a maximum delay of 15 seconds must be offered, although other delays are optionally permitted.

Following similar thinking, France permits an answer time of 35seconds to 45 seconds for remote control of domestic equipment. France specifies different ringing cadences for polarised and non-polarised calls. It also requires that the answer delay of stand alone modems shall not be programmable by the DTE.

Germany has a requirement that the TE shall be automatically connected to line only if its operating state is reached within 0,5 seconds.

Germany, Spain and Sweden call up subclause 6.2.1 for ringing detector sensitivity. Switzerland repeats the requirements of subclause 6.2.1 but modified to add a reference to testing over the full tolerance range.

Testing

France, Germany and GB describe special National test circuits. France, Ireland, the Netherlands and Norway describe special ringing cadences or supplies.

Harmonization feasibility

There is such a wide range of National requirements as to preclude a simple harmonization process.

Any harmonization of the sensitivity part of the requirement would be dependent on the harmonization of connection arrangements and ringing supplies.

No reason is seen as to why the time to answer part cannot be harmonized across all administrations although deletion should be considered, as should expressing the requirement in ringing cycles.

Cost benefit

With regard to the sensitivity, there could be significant terminal costs in the harmonization of this requirement, and also significant network costs in the consequently required harmonization of ringing supplies.

The harmonization of the time to answer involves minimal cost.

6.3.2 Insensitivity to ringing signal

Interpretation

This requirement calls for the TE not to answer when a ringing signal below a specified value is applied for a specified time.

Comment

This requirement is intended to prevent spurious operation of the TE. Many countries specify a wide range of signals, some of which represent line testing signals.

National inputs

This requirement is said to be not mandatory for Iceland, Sweden and Great Britain, although Sweden calls up the normal ringing insensitivity requirements of subclause 6.2.2 in its remark.

Spain calls up the normal ringing insensitivity requirements of subclause 6.2.2 plus a test for immunity to a series of single stray noise pulses.

Otherwise, there are no two countries with the same requirement. Many requirements in this clause differ from the requirements for ringing detector insensitivity given in subclause 6.2.1.

Twelve Countries (**A, B, CY, DK, F, D, IRL, I, L, N, P, CH**) specify the same frequency bands as those used for ringing tests. Three (**F, GR, NL**) specify frequencies within the ringing band although Finland requires testing up to 3 400 Hz.

Six countries specify that the TE shall not operate with 10 volts applied. Three (**GR, I, NL**) specify 15 volts, and other values range from 3 volts to 120 volts.

The times of application of the signal range from 90 ms to 40 seconds with the majority (seven) specifying 20 seconds.

Denmark France, Ireland and Switzerland specify a high voltage pulse test. The Netherlands, Spain and Switzerland require immunity to decadic dial pulses from a parallel connected TE.

France, Germany, Ireland, the Netherlands, Spain and Switzerland specify a number of other signals to which the TE shall not respond.

Testing

Four Countries (**DK, F, D, NL**) give special test circuits. Six Countries (**A, F IRL, NL, N,CH**) specify ringing cadences. France, Ireland, the Netherlands and Switzerland also describe other special test conditions and signals.

Harmonization feasibility

There is such a wide range of differing National requirements in this clause as to preclude any simple harmonization of this requirement. Such harmonization as may be possible would also be dependant on the harmonization of connection arrangements and ringing supplies.

Cost benefit

There could be significant terminal costs in the harmonization of this requirement, and also significant network costs in the consequently required harmonization of ringing supplies.

6.3.3 Answering signal

Interpretation

This clause requires that a TE shall respond with a recorded message or a tone of specified level within a minimum specified time after seizing the line.

Comment

This requirement facilitates end-to-end inter-working and although it has no interaction with the network, it can be considered an essential requirement of the reserved telephony service that some answer indication be given due to its human factors implications. As such it could be considered an essential requirement for any other usage of the voice telephony service that is likely to access or be accessed by a telephone.

National inputs

Five countries (**SF, D, G, IS, S**) declare the requirement to be non-mandatory.

The range of frequencies specified for answer tone falls into three main groups. Three countries (**A, CY, F**) specify echo suppresser tone, four (**B, DK, N, GB**) specify a wider range of frequencies that embraces echo suppresser tone, and four (**D**, **IRL, I**, **L**) allow the whole of the speech band. Portugal and Switzerland give no requirements for the tone.

The maximum times to answer range from 0,5 seconds to 5 seconds with most countries (7) specifying 2,5 seconds.

The minimum specified duration of the tone ranges from 2 seconds to 4 seconds, with most (7) specifying 2,6 seconds.

Most countries specify the same timings for speech signals although Austria and France allow 3 seconds for the start of speech and Switzerland 10 seconds. France specifies a minimum duration of 5 seconds for speech signals and Austria and Switzerland 10 seconds. There is no GB timing requirement for speech or music signals.

Netherlands forbids answering with any network tone. GB does not require the application of answer tone if the user has knowledge of the TE being called, but requires the telephone number of such an installation to be kept confidential.

Harmonization feasibility

The requirement is best harmonized by broadening the signal requirements so as to embrace any audible signal other than network tones. In this way it should easily be possible to harmonize requirements both for tones and speech signals, although for timing requirements it is rather more difficult.

Cost benefit

There should be little cost in harmonizing tone requirements as most data equipment already meets harmonized requirements. For speech or music equipment the cost of new timings could be significant and the benefit relatively small.

6.4 Automatic control of the loop condition.

Introduction

This subclause consists of 4 major parts, one part having 3 sub-parts:

- 6.4.1 TE without information related control of the loop condition.
- 6.4.2 TE with information related control of the loop condition.
  - 6.4.2.1 Data or code signal related control
  - 6.4.2.2 Incoming speech or other non-data signal related control
  - 6.4.2.3 Remotely transmitted control signals
- 6.4.3 TE with network tone related control of the loop condition.
- 6.4.4 TE with control of the loop condition related to certain network dc conditions.

In the comments on Chapter 5, it is stated that there is no reason to treat reversion to the quiescent condition in that clause any differently from general procedures for the clearing of calls which have been automatically originated or answered. This clause is the complimentary clause in Chapter 6.

It has to be noted that the requirements expressed in this section are, for the most part, highly dependant on terminal design and cannot in anyway be said to address the needs of the network.

That is because the requirements are written in terms of what people think they can expect of a TE, not what the network needs. The result is that application of these requirements is likely to inhibit innovation.

Also it needs to be noted that, in general the gain of non-voice TEs is not a function of the line voltage or current and as such there is no point in varying the values for all of the tests. Once it has been established that the TE meets other relevant requirements in this ETS at various currents a single or one upper and one lower value should suffice.

6.4.1 TE without information related control of the loop condition.

Interpretation

This requirement sets the time for which an automatic answering terminal can stay in the on-line condition if it does not periodically exchange signals with the calling terminal to determine its continued availability.

Comment

It is not desirable from the point of view of the user or the network operator for a terminal to be in the on-line condition performing no useful function. In such circumstances the network will be prevented from delivering calls, the content of which may, or may not, be important to the user. It is also clear that alarm terminals, bearing in mind that they perform an important security function should, were warranted, be treated less stringently than the majority of terminals. In trying to apply these requirements, however a problem arises in that provided it can demonstrated that a terminal can perform an alarm function a more relaxed limit can be claimed. Pragmatically, for TE with no information related control it may be appropriate to set one fairly relaxed limit which begins when the TE enters the on-line condition. This same limit could also be applied to TE with information related control, however in this circumstance the time might apply from the moment the information is interrupted or replaced by network tones.

National inputs

There are nine national remarks (**DK, SF, F, D, N, P, E, S & CH**).

Denmark having stated 60 s in the table goes on to allow 300 s for certain classes of TE.

For Finland the time only starts once the message (whatever it is) has finished.

France in certain circumstances permits the time to be extended to 360 s, provided that the user can set it back to 180 s.

Germany makes the point that they do not consider this an access requirement and limits, should they be needed, will be found in terminal standards.

Norway again permits its limit of 90 s to be extended to 180 s for alarm equipment.

Spain makes reference to Chapter 10, subclause 10.6 where it states that the terminal shall either emit a signal to alert the user or go off-line in 90 s. For alarm terminals this limit can be extended to 300 s. A terminal must go off-line within 35 s of the user alert being activated if the user does not intervene.

The Swedish comment is not interesting since it simply restates the feeding conditions.

Harmonization feasibility

Harmonization relies on writing the standard to reflect the needs of the networks rather than centred upon the terminal functionality. This approach has the added benefit of a single set of tests for all the terminal implementations.

Cost benefit

A simple easy to understand set of criteria, which protect the user and network resource, should emerge at negligible to small cost.

6.4.2 TE with information related control of the loop condition.

6.4.2.1 Data or code signal related control
6.4.2.2 Incoming speech or other non-data signal related control
6.4.2.3 Remotely transmitted control signals

The requirements have not been well thought through. For example, whilst subclause 6.4.2.1 specifies conditions under which a TE must clear, whilst subclause 6.4.2.2 specifies conditions under which the TE must remain on-line. The titles of the subclauses suggest that they were intended to be alternatives rather than complementary.

It is by no means certain that many modern TEs (e.g. modems using V.32 and V.32bis) could demonstrate compliance with these requirements, without being specially modified for testing. Tests under such conditions can give no assurance that terminal equipment in the field operates to specification.

6.4.2.1 Data or code signal related control

Interpretation

This clause specifies that TEs must clear when signals fall below a certain level for a certain period. It additionally requires that the timer controlling clearing must be reset when the signal rises above another level.

Comment

Although the requirement makes no mention of a specific type of TE, all the limits are those given in the CCITT V series Recommendations for modems. These requirements are highly implementation dependent, which the network neither knows about nor cares about. It is difficult to see the place of such a requirement in an access standard. Moreover the tests would be difficult to apply to non-voice TEs in general, since many modern non-voice TEs send and receive in the same frequency band by using echo cancelling techniques and only the receiver in the TE can distinguish the send and received signals. Removal of either signal will cause the TEs to lose synchronisation and hence clear the call. The requirement may be inappropriate as some modems may only operate at high speed over a restricted range of levels, and may choose to clear the call if these levels are not sustained rather than reduce the speed or take some other appropriate action.

National inputs

There are nine national remarks (**A, B, DK, F, D, N, P, E & CH**).

Austria states that the requirement only applies to the receiver of simplex and half-duplex modems.

Belgium states that the time can vary between 5 s and 60 s, it is thought that the upper limit is the only one applicable.

Denmark seems to say that information must be exchanged at not less than 15 s intervals although exceptionally if a TE receives a special code signal it is permitted to remain on-line for up to 1 200 s from the establishment of the call.

France states that the TE must enter the quiescent condition if the received data signal remains below -48 dBm for in excess of 180 s. Half duplex terminals, not capable of detecting howler tone, must limit each sending period to 180s although fax machines can send for 540s. France then goes on to state that when a modem is receiving data signals which exceed -43 dBm, it must stay on line. Two incompatible non-voice terminals may establish a call, say a fax and a modem. Both will be receiving a carrier signal which, hopefully will exceed -43 dBm, but the call is ineffective.

If this requirement is applied as written they would have to stay on-line until the network attenuates the signal to less than -43 dBm. France also states that a non-voice TE must not detect howler tone as a data signal.

Germany again makes the point that they do not consider this an access requirement and limits, should they be needed, will be found in terminal standards This also applies to subclauses 6.4.2.2 and 6.4.2.3).

Norway, contrary to CCITT Recommendation V.2 [9], asks for a power level to be measured over 200 ms. When/if the level falls below -54 dBm for more than 20 s, the TE shall release the line within 10 s.

Portugal has specific requirements for what would appear to be Asymmetric Duplex transmission, where if the level falls below -43 dBm for more than 0,25 s the TE shall release the line within 10 s. They then go on to say that the ability to reset the timer when the signal level restores is not applicable for other types of TE.

Spain again refers to Chapter 10, subclauses 10.6 (E) 6.4 and 10.6 (E) 6.5. In subclause 10.6 (E) 6.4 they make a similar mistake to France in requiring a TE to remain on line while the signal level is in excess of -43 dBm. We find the "Provision" towards the end of this clause incomprehensible. Chapter 10, subclause 10.6 (E) 6.5 appears to be almost identical to the common text and other national remarks so we have trouble understanding why Spain did not put their requirements in the appropriate place.

Switzerland states this to be of a terminal specific nature and points to Chapter 10 (nothing exists for Switzerland in subclause 10.6) and the CCITT Recommendations.

Harmonization feasibility

The only sensible means for harmonizing these requirements in this access standard is deletion, since they do not reflect what the network needs or would like and are highly terminal specific. If they are allowed to remain they will hinder innovation since the are drafted to reflect the terminal technology of today and application to future (even some current) technology without specific modification for the purpose of test would cause them to fail.

Cost benefit

Assuming a requirement can be written that achieves the same result, and we believe it can, then the cost to the PNO is negligible and at the same time, gains no benefit. For the TE supplier the costs should also be negligible, since all the TEs he currently manufactures should meet the revised requirements without modification, however he should benefit from the flexibility gained.

6.4.2.2 Incoming speech or other non-data signal related control

Interpretation

A TE shall remain in the on-line condition so long as the signal it receives exceeds a stated upper threshold. When signal levels are less than a stated lower threshold the TE shall enter the quiescent condition.

Comment

This requirement is unrealistic. If applied as written it will cause all TEs to remain on-line whilst a signal is received irrespective of the nature of the signal and the ability of the terminal to make use of it.

National inputs

There are seven national remarks (**DK, F, D, N, E, S & CH**).

Denmark as Subclause 6.4.2.1.

France has four national remarks. The first states that the TE must remain on line when the active average speech remains below -50 dBm for not greater than 6 s. The phrase "active average speech" lacks precision. The second comment implies that if the signal remains below -50 dBm after 6 s then TE must be quiescent within a further 6 s. Thirdly, the TE must not recognise howler tone as a valid speech signal and, finally, a TE which is not capable of simultaneously sending and monitoring the received signal shall cease sending and observe the received signal at least every 180 s.

Germany as Subclause 6.4.2.1.

Norway states that the signal shall be measured over a period of 10 s.

Spain as Subclause 6.4.2.1.

Sweden requires that signals of a level lower than 0 dBm outside the band 300 Hz - 3 400 Hz shall not cause the TE to remain on line. The test is equally vague requiring signals to be applied at levels of 0 dBm to -60 dBm at any frequency outside the band 300 Hz to 3 400 Hz without a specified upper limit. Although the out of band spectrum in subclause 4.4.3 would permit a TE to send signals of -33 dBm at 3 400 Hz and -55 dBm at 150 kHz.

Switzerland wants the time period t_9 to be measured from a different reference point and then goes on to point out that it is terminal specific (Aspect 3). It then goes on to state that the values t_8 and t_9 are under study and, therefore, it would seem that currently they cannot be being applied as a mandatory requirement.

Harmonization feasibility

Harmonization can only be achieved by adopting a more realistic approach, by basing the requirement upon what the network requires rather than on current Terminal technology . The level at which a TE is able to extract meaningful information from the signal it receives is in part a function of the skill of the designer and the cost the supplier believes the public will pay. It may be that for the particular application the user has in mind a the TE should only work with signal levels down to -35 dBm or it may continue to work down to -55 dBm, the Network has no need to know.

We would suggest that the requirement be deleted unless it was intended that this requirement should only deal with low signal level (as does subclause 6.4.2.1) but for speech and other non-voice signals.

Cost benefit

The cost to the network operator should be negligible, with negligible benefit, whilst the supplier should benefit from being able to tailor his product for the market in which he wishes to sell it. Whether this is a cost or not will vary from application to application.

6.4.2.3 Remotely transmitted control signals

Interpretation

For a TE which relies on the receipt of signals to control its functions, failure to receive the control signal at an appropriate level within an appropriate time shall result in the TE entering the quiescent condition.

Comment

Only four countries **(A, F, GR & P)** have indicated that this requirement is mandatory. Other countries (**B, DK, & E**) apply subclause 6.4.2.1 instead.

National inputs

There are seven national remarks **(B, DK, F, D, GR, E & CH)**.

France imposes requirements which seem to have significantly more to do with the TE and its technology than what the network knows about or needs. They also seem to be concerned about end-to-end signalling using DTMF signals. France may wish to follow other countries in classifying this as a terminal requirement. Belgium, Denmark and Spain refer to the requirements of subclause 6.4.2.1 as being applicable to control signals.

Germany states as for subclause 6.4.2.1 (no requirement) and Switzerland again states this is aspect 3.

Greece amplifies the feeding conditions.

Harmonization feasibility

As in subclause 6.4.2.1, the only sensible means for harmonizing these requirements in this access standard is deletion, since they do not reflect what the network needs or would like and are highly terminal specific.

Cost benefit

The cost to the network operator should be negligible, with negligible benefit, whilst the supplier should benefit from being able to tailor his product for the market in which he wishes to sell it. Whether this is a cost or not will vary from application to application.

6.4.3 TE with network tone related control of the loop condition.

Interpretation

This requirement states that TEs having the facility to clear calls on detection of network tones, shall go to the quiescent condition when the tones listed are received.

Comment

This requirement relates to the clearing of certain calls and covers the case in which network tones indicate that the call is no longer useful. The method by which this is achieved relates to the design of the terminal in question. Other speech band signals could be used to control the loop condition e.g. silence, or a signal inappropriate to the terminal operation.

National inputs

There are eleven (**A, B, F, D, GR, NL, N, P, E, CH & GB**) national remarks.

Austria points to the relevant tone detection sensitivity and insensitivity clauses.

Belgium states that this requirement which is non-mandatory or optional can only be used in addition to the requirements of subclauses 6.4.2.1 and 6.4.2.2.

France asks that TEs for which tone detection is the only means of clearing a failed call to be able to monitor (at least every 20 s) the line, especially for howler tone, when the TE is both sending and/or receiving.

Germany points to subclause 5.6.3.1. The meaning of this reference is unclear. Greece and GB describe this facility as optional, but if it is provided, compliance is mandatory.

Norway states these requirements are only applicable to apparatus with a dial tone detector.

Portugal: the requirements are highly specific to certain types of TE.

Spain makes reference to subclauses 10.6(E) 4 to 10.6(E) 6 and in particular to subclause 10.6(E) 6.6. Terminals are required to go to the quiescent state in 10 s in the face of some signals while they are permitted 60 s for others. Again it is difficult to see why Spain could not have made use of the common text and national remarks in subclause 6.4.3 to enter this information.

Switzerland indicates that whilst 90 % (and increasing) of exchanges offer the tones described, the remainder (10 % and falling) do not.

Harmonization feasibility

The current requirements are fairly diverse, but offer the best prospect of a realistic approach to clearing failed calls.

Cost benefit

The cost to the network operator should be negligible, with negligible benefit, whilst the supplier should benefit from being able to tailor his product for the market in which he wishes to sell it. Whether this is a cost or not will vary from application to application.

6.4.4 TE with control of the loop condition related to certain network dc conditions.

Interpretation

This requirement sets out criteria whereby a TE can recognise a dc signal from the network as indicating the call has cleared.

Comment

Potentially, this is considered to be a useful feature, however it would appear that few networks have such a feature available. fifteen countries out of nineteen consider this to be non-mandatory. Belgium uses increased loop resistance whilst France and Spain use polarity inversion, which in the case of Spain appears to be accompanied by an extremely short disconnection. The remainder, perhaps including Spain, use a short disconnection of the loop current.

National inputs

There are six (**A, B, F, E, CH & GB**) national remarks.

Austria, states the requirement to be mandatory for speech and any other TE that is non-data. A second remark about time related loop current interruption presumably refers to equipment within the scope of subclause 6.4.1. Austria goes on to point out that the requirements and test for detection (sensitivity and insensitivity) are given in subclause 9.4.2.

Belgium states that this is an optional feature only available to TEs complying with subclause 6.4.1.

France lays down detailed requirements for this facility including a statement that it cannot be used on its own.

Spain refers to subclause 10.6(E) 6.7.

Switzerland interrupts the loop current for not less than 100 ms and expects the terminal to recognise 90 ms. This facility is optional and not available on all exchanges.

Great Britain describes a loop current interruption which may be used at the suppliers discretion.

Harmonization feasibility

Only four countries use this requirement and due to the considerable variety in the signals, harmonization is not likely to prove possible.

Cost benefit

No harmonization therefore no cost and no benefit.

6.7 Chapter 7

This Chapter gives requirements for the terminal following failure of its power supply.

7 Power Failure

7.1 Power failure with TE in quiescent condition

Interpretation

The requirement has two parts:

1. Terminal equipment which is quiescent and which in that condition loses power shall not be able subsequently to initiate any sequence of actions which cannot be completed without loss of power;

2. Subsequent re-application of power to quiescent Terminal Equipment which has had its power interrupted shall not of itself cause the Terminal Equipment to assume any other state which is not intentionally programmed. Any such state assumed is required to be executable in full.

The essence of the requirement is to cause the terminal equipment which is in a quiescent condition to be independent of such power loss or re-application.

Comment

The requirement does not set out clearly nor define the practical meaning of terminal power and power loss. Two Administrations (**D, NL**) declare this requirement to be not mandatory; ten others (**A, CY, F, GR, IS, I, E, S, CH, GB**) add remarks.

National inputs

National inputs further qualify the existing requirement or add to the basic requirement other specific requirements with the following topics:

1. the definition of external power (**A, GB, E**) and "power interruption" (**F, CH, GR**) and their nominal (acceptable) limit values (**A, N, E, CH, GR**);

2. the inter-dependency of a number of Terminal Equipments in an installation connected to a single standard analogue interface (**A** {series}, **GR, IS, E, S, CH, GB**);

3. the effects of power interruption on memory content used to determine certain automatic functions in various types of Terminal Equipment (**A, CY, F, CH**);

4. the response of Terminal Equipment to restoration of power (**S, CH**);

5. the continuation of telephony functions upon power fail by certain Terminal Equipment (**A,, CY, F, GR, I, N, CH**);

6. for call routing apparatus (PBX), certain connection arrangements which must take into account power failure (**A, I**).

7. the TE should not revert to the loop condition when power is restored (**A, CY**).

The remainder of the remarks are unclassified miscellaneous (**A, N, E, CH, S**).

Harmonization feasibility

The requirement appears to be too general to answer the various needs of Administrations. Given a comprehensive definition of "power source" and "loss of power" there should be no difficulty in harmonizing the general requirement.

The responses from administrations suggest there to be other 'hidden' requirements related to installations, general functionality (which could be said to be subsumed in the current text) and specific functionality (telephony, memory storage, and the like). Harmonization would require the addition of these requirements in this chapter or the transfer of these requirements to other chapters in this or other standards.

Cost benefit

The major beneficiary of harmonization would seem to be the supplier sector: the removal of country-specific detail would reduce the cost of design, manufacture, and market entry.

7.2 Power failure with TE in other conditions than the quiescent condition

Interpretation

This requirement contains two linked requirements:

1. Terminal Equipment, when in other than quiescent state, which has its power source interrupted shall, if able, subsequently continue without functional change or otherwise shall revert to the quiescent condition within "t" seconds.

2. Terminal Equipment which was not quiescent and which is subject to power interruption and which as a consequence assumes an quiescent condition shall stay quiescent when the power is restored unless the equipment is programmed to go to another state and is able to complete its functions in accordance with the other sections of this standard.

The essence of this requirement is two-fold: Firstly, terminal equipment which is operational when power is lost shall either function normally or shall revert to a quiescent condition; secondly, terminal equipment which has so reverted shall stay quiescent when its power is restored unless it is intended that another state or states are to be assumed and the terminal equipment can complete its functionality in compliance with other parts of the ETS.

Comment

This requirement and the previous requirement concern two different states of the same technical functionality. As a consequence of this, tests are duplicated, and the technical character of the equipment is effectively examined twice. It would be far better to restructure these requirements to align with the technical character of the equipment. An unrelated additional problem is that of the previous requirement overlap; power sources other than line power are not defined precisely enough to prevent ambiguity and to prevent the addition of many national qualifications which qualify or add to the requirement in an attempt to reduce this ambiguity.

National inputs

As with the previous requirement, these inputs consist of qualifications and additions to the common text. A number of Administrations repeat in this requirement their comments made against requirement 7.1: (**A, F, GB, S, GR, CH, N, CY**):

1. the definition of external power (**A, GB**) and "power interruption" (**F, CH, GR**) and their nominal (acceptable) limit values (**A, E, CH, GR**);

2. the inter-dependency of a number of Terminal Equipments in an installation connected to a single standard analogue interface (**A** {series}, **GR, S, CH, GB**);

3. the effects of power interruption on memory content used to determine certain automatic functions in various types of Terminal Equipment (**A, CY, F,**);

4. the response of Terminal Equipment to restoration of power(**S**);

5. the continuation of telephony functions upon power fail by certain Terminal Equipment (**A, CY, F, GR, I, GB**);

6. for call routing apparatus (PBX), certain connection arrangements which must take into account power failure (**A, I**).

The remainder of the remarks are unclassified miscellaneous (**A, CY, N, E, CH, S**).

Harmonization feasibility

The comments which were made for requirement 7.1 apply in this case also. It is impossible to propose how (and if so, what effect might follow) harmonization might pragmatically be effected unless the requirements in this Chapter are made independent one from the other. It could be suggested that if this were the case, harmonization could be effected without difficulty.

Cost benefit

Since the two requirements are linked together, the comment for this requirement is as for the previous requirement.

6.8 Chapter 8

Chapter which deals with the various national connection methods was not considered.

6.9 Chapter 9

Chapter 9 contains an assortment of requirements such as register recall, meter pulse detection, disabling of echo control devices, loop current detection, tone detection and detection of signals from a remote terminal.

9 Special Functions

9.1 Register recall

Interpretation

This clause describes the timed break register recall function in terms of a pre-break period, a break period and a post break period, illustrated by a diagram defining various loop currents and timings.

Comment

The diagram is of greater complexity than is proved necessary by the various National replies.

National inputs

Spain makes its customary input listing various Spanish notes and provisions.

Denmark limits bounce and similar phenomena to 5 ms.

Sweden gives two different current limits during the break pulse for two supply voltages.

Testing

The testing of this parameter needs further study. The method given, although simple, suffers from the defect that the resistance of the battery feed affects the time constant of the spark quench circuit in the terminal equipment, thus giving a different timing result for each different feed condition.

9.1.1 Break period

Interpretation

Requirements are given for the time interval between the first fall of the current below a given threshold to the last rise of the current above a second threshold value. In addition a further time interval is given for the current to remain below a third threshold value. An additional requirement specifies a maximum fall (or rise) time.

Comment

This requirement is important for the development of new pan-European value added services. It appears to be over-specified, as the network can only detect the period for which the current is below some threshold value (or values if there is hysteresis in the detector).

National inputs

Germany and Ireland describe the requirement as non-mandatory. Greece, Luxembourg and Malta have made no input.

All except two (**CY, F**) of the fifteen countries replying treat the period below a minimum current threshold as being the same as the minimum value of the period between the rise and fall thresholds.

The minimum break periods specified range from 50 ms to 220 ms, seven countries specifying a value of 50 ms. The maximum break periods range from 103 ms to 320 ms, with eight countries specifying a maximum of 130 ms.

Ten of eleven countries giving values quote equal values for threshold currents I_1 and I_2, although they quote a wide range of values from 0,5 mA to 18 mA.

Nine countries specify a value for I_m (the value below which the current must fall), and the values given range from 0,48 mA to 2,5 mA. Six countries specify instead a minimum resistance value ranging from 70 kohms to 100 kohms.

Denmark has a requirement that depressing the key for 50 ms or longer must cause loop disconnect to occur. The meaning of this statement is unclear. Such a requirement is very difficult to test in a repeatable manner.

Only four countries (**CY, P, E, CH**) specify values for rise and fall times. The values quoted are all different, with values ranging from 5 ms to 15 ms.

Harmonization feasibility

This requirement is currently over-specified, and the complex method of description chosen has led to the differing threshold currents and timings. A review is needed.

Investigation would probably show that most networks could be satisfied by a simpler description of the recall signal, with wider tolerances.

Cost benefit

The cost of harmonizing this requirement could be significant to some of the network operators. The benefit to TE suppliers would not be significant but the cost would be minimal. There would be benefit to the user population through the facilitation of new services.

9.1.2 Pre-break and post-break period

Interpretation

This clause is intended to control the dc characteristics of the terminal during any period of disturbance to the loop condition immediately before and immediately after the break period of the recall signal. The maximum periods of disturbance before and after the break are specified as is the loop current or terminal resistance or alternatively, the additional voltage drop.

Comment

There is an error in the common text of the requirement which asks that "the additional voltage drop shall be greater than U(V)" rather than "shall not be greater than". The error has caused the only respondent in this area (Belgium) to spell out the requirement correctly in a National input.

It is not clear why any requirement is needed here except possibly to give a transient relaxation of the normal loop conditions.

National inputs

Nine countries (**A, CY, DK, D, IS, IRL, N, S, GB**) reply that this requirement is either not mandatory, not specified or not applicable. Four others (**SF, GR, L, M**) have made no reply.

Only three of the seven countries with requirements place a time limit on the pre-break or post break period, Italy and Switzerland specifying 100 ms and Spain 1 200 ms all for both periods.

Belgium has specified a voltage by which the voltage drop across the terminals must not increase, but has not specified any time limit on this increased voltage.

Switzerland allows an unspecified resistance drop during pre and post break periods no greater than 100 ms.

Spain has specified a resistance limit lower than normal loop conditions.

Portugal has specified a terminal resistance limit and also a current limit both tighter than normal loop conditions, but has not placed any time limit on these conditions.

France specifies both maximum and minimum currents

The Netherlands requires the loop condition after the timed break to persist for 150 ms. Switzerland requires 250 ms.

Harmonization feasibility

It is believed that this requirement is unnecessary, and reflects the general over-specification of the parameters. The transient relaxation of loop condition is generally not necessary with modern equipment and this requirement can probably best be harmonized by removal.

Cost benefit

There could be a small benefit to some equipment manufacturers arising from the removal of this requirement. It is unlikely to create any cost to network operators, except possibly to those which specify a minimum duration of the post break period.

9.2 Meter pulse reception

General

Generally, the meter pulses are supplied by the network operators for the use of pay-phone services in the public area, but also in private establishments such as a bar or hotel. More and more the pay-phone is demanded for the residential use in a rented flat, or where peoples are living in the community or simply for cost information and self-cost-control of the communication.

Generally, the operators do not guarantee the reliability of the pulse metering outside the central-exchange, which is essentially meter dependent, consequently for most operators the billing cannot be checked with any meter pulse apparatus in the customer premises.

Mainly two systems are used in the field, the 50 Hz meter pulsing which is the oldest one and the 12 kHz or 16 kHz meter pulsing which is more modern and appear to be the most widespread, used by seventeen countries in Europe (**A, B, CY, DK, SF, F, D, GR, IS, IRL, I, L, N, P, E, S, CH**).

Some countries (**NL, GB**) use only the 50 Hz meter pulsing and some other (**F, L, E**) use both systems.

In the majority of the countries the meter pulses are supplied by the exchange on the customer's request only, except for some old exchanges where the pulses are always sent, but in other countries such as Germany and Switzerland the pulses are provided as standard for all the lines and may be disconnected on the modern exchanges at the customer's request.

9.2.1 12 kHz or 16 kHz meter pulses

Interpretation

This requirement relates to specific terminal equipment which is able to detect 12 kHz or 16 kHz pulses, mainly for pay-phone applications or for meter pulses apparatus which is connected at the line termination in series as accessory equipment.

This clause is split in three main subclauses which deal firstly with the sensitivity and the selectivity of the detector, secondly with the pulse timing and thirdly with the attenuation of the series connected TE so as, on the one hand, to insure the reliability of the detection and on the other hand, to prevent the in-band (300 Hz - 3 400 Hz) disturbance of data transmission and speech.

Comments

It is believed that the requirement as stated is overcomplicated and could be simplified. The meter pulsing on the line presents two kind of problems, the first one calls for the reliability of the pulse detection which is a meter TE concern, and the second one deals with the disturbance of the in-band signals such as speech or data transmission which is an end to end transmission quality matter.

The 12 kHz or 16 kHz meter pulsing is a more modern system than the 50 Hz meter pulsing, and presents greater operational flexibility and less problems due to transmission perturbations, but the major factor is the ability to cover the connections where the attenuation of the signal is high, especially for the long line.

The effect of attenuation is more significant in some exchanges where the 12 kHz or 16 kHz generator is feeding several subscriber interfaces and where the output impedance is high with respect to the low impedance load.

The improvement of the long distance capability of such equipment has been a constant effort from the administration and the manufacturers, by increasing the voltage of the signal generators or increasing the sensitivity of the meter detectors.

A too high detector sensitivity, induces a worse reliability for the pulse detection and increasing the generator level in the exchange requires more efficient filters in the TE so as to prevent the acoustical and data transmission disturbances, and also in the exchange interface towards the called subscriber so as to prevent any disturbance or unintended detection by the called party.

Looking at the meter pulse sensitivity/selectivity mask, it seems possible to detect either of the frequencies 12 kHz or 16 kHz with a double notch filter, but considering the various sensitivities it appears obviously that it is impossible to find a common area between the detection and non-detection area where some non-detection levels are higher than other detection levels.

The country (**F**) declares several immunity requirements with the associated test arrangements such as discharge of capacitors, decadic dialling (loop pulsing), breaks of the feeding current, battery reversal, and ringing signals.

The country (**E**) declares also some immunity requirements with the values of level, frequency, and time-outs of the valid values and also for the speech frequencies.

These immunity requirements seem to be more terminal specific, because they do not affect at all the PSTN interface, but they are intended to prevent unexpected pulse counts.

It is also impossible to harmonize so varied timing, mainly where some not-responding time durations (t6 ms) (**IS**[60 ms]**, IRL**[80 ms]**, S**[80 ms]), are longer than the minimal responding pulse durations (t3 ms) (**A**[20 ms]**, GR**[50 ms]**, E**[50 ms]**, CH**[50 ms]), where some signal interruptions (t7 ms) (**S**[40 ms]**, CY**[20 ms]**, F**[20 ms]**, IS**[20 ms]**, P**[20 ms]**, CH**[20 ms]**,**) are longer than or equal to the minimal responding pulse duration (t3 ms) (**A**[20 ms]).

In order to prevent the disturbances between the speech band (300 Hz to 4 000 Hz) and the pulse meter band (11 kHz to 17 kHz) the respective levels and impedance have to be de-coupled by selective filters. For this reason, series connected TE are called to present an attenuation at meter pulse frequencies to allow the use of TE without such filtering. Two countries (**D, CH**) do not require any attenuation at meter pulses frequencies for series connected TE, may be because this feature is implanted as standard in all the TE, for the reason that the pulses are provided on all the lines.

The meter pulsing is also an inconvenience for the user where the spectral components of the pulse disturb the listener especially when the frequency repetition of the pulses is high such as for a long-distance call.

For the above reasons the attenuation of the meter pulses effects have to be taken into account so as to prevent unacceptable speech quality effects or unrecoverable disturbances especially for the data transmissions. It seems difficult to harmonize the cases of countries (**D,CH**) which do not require any attenuation for the series connected TE. For the remaining countries it is possible to find a reasonable value for the harmonization between 17 dB to 53 dB, say around 35 to 40 dB.

The input impedance of the TE expressed as return loss with respect to a resistive reference at the pulse metering frequency is close to the line impedance at those frequencies for the majority of the countries (200 ohms to 240 ohms) with a return loss spread from 9 dB to 25 dB. (Generally 200 ohms is the load definition for the sensitivity). Other countries specify higher impedance (600 ohms to 1 200ohms, +35 °C to -70 °C) (**CH**) or only the modulus without an angle (100 ohms to 500 ohms)(**F**). The specification of (**S**) is unclear where a complex impedance (900 ohms // 60 nF) is specified in the speech band but not in the pulse metering band.

Because of the high attenuation of the signal in the case of long line and the difficulties to cover the longest lines it should be necessary to take care about load impedance which affects the signal level, so as to optimise the energy transfer. The impedance of the load equal to the cable impedance might not be the optimal solution considering the above aspect, consequently the conjugate impedance could be a more appropriate solution. Further study is necessary for this point.

National inputs

There is no requirement at all in (**GB**) and (**DK**) declares the requirements to be not-mandatory. **(NL)** does not provide either 12 kHz or 16 kHz pulses.

Luxembourg and Malta have made no input.

The high out-of speech band pulse metering (12 kHz or 16 kHz) are split into two main categories:

1. the 12 kHz pulse metering for the following countries (**A, F, IS, IRL, I, P, E, S, CH,**)

2. The 16 kHz pulse metering for the following countries (**B, CY, SF, D, GR, N,**).

(**GB**) declares to have a high frequency private meter pulse currently under development.

The minimum sensitivity (**e min**) is spread mainly from 45 mV for (**S**) to 210 mV for (**E**), but (**S**) requires an exceptional high sensitivity in two sets (5,5 mV and 17,4 mV).

The maximum sensitivity (**e max.**) is spread mainly from 2 V for (**N**) to 10 V for (**CH**), but (**S**) require an exceptional low maximum level (447 mV).

For the 12 kHz pulse metering the minimum frequency of the detection area is spread from 11 880 Hz for (**F, IS, IRL, P, E, CH**) to 11 928 Hz for (**A**) and the maximum frequency of the detection area (ZONE I) is spread from 12 072 Hz for (**A**) to 12 120 Hz for (**F, IS, IRL, P, E, CH**), giving a maximum selectivity (narrowest band) of F/deltaF = 12 000/144 = around **83** for (**A**) and a minimum of selectivity (widest band) of F/deltaF = 12 000/240 = **50** for (**F, IS, IRL, P, E, CH**) which is the more common value to which also (**S**) is very close.

For the 16 kHz pulse metering the minimum frequency of the detection area is spread from 15 840 Hz for (**B, CY, GR, N**) to 15 950 Hz for (**SF**) and the maximum frequency of the detection area (ZONE I)is spread from 16 050 Hz for (**SF**) to 16 160 Hz for (**B, CY, GR, N**), giving a maximum selectivity (narrowest band) of F/deltaF = 16000/100 = **160** for (**SF**) and a minimum of selectivity (widest band) of F/deltaF = 16000/320 = **50** for (**F, IS, IRL, P, E, CH**) which is the more common value, whereas (**D**) exhibits an intermediate value of F/deltaF = 16 000/160 = **100**.

The more common value of the detection area selectivity for both the 12 kHz and 16 kHz pulse metering is equal to **F/deltaF = 50** for the majority of the countries (**F, IS, IRL, P, E, CH, B, CY, GR, N**), which gives a frequency band of F ± 1%, and which seems reasonable.

The pictorial situation of the non-detection area (ZONE II) is shown for both 12 kHz and 16 kHz on the two graphs annexed. **"12 KHz meter pulse sensitivity/selectivity (ten countries superimposed)"** and **"16 KHz meter pulse sensitivity/selectivity (six countries superimposed)**".

It is shown that some countries permit a **very large** uncertain-detection areas (**S, SF**), some other authorise a **large** uncertain-detection area (**IRL, CY, IS, N**), some other require a narrow uncertain-detection area (**I, E**). The remainder exhibit a reasonable medium uncertain-area (**A, B, F, P, CH**) where the uncertain area is the values situated between the detection area (ZONE I) and the non-detection area (ZONE II).

(**S**) defines a non-detection area with a very low level which is consistent with the high sensitivity in the detection area.

(**IRL**) declares a non-detection area with a very low level which is not consistent with the medium sensitivity in the detection area.

(**GR**) defines a non-detection area only for the low voltage which seems an incomplete specification.

(**D**) does not define any non-detection area and declares it not-mandatory, which seems an insufficient specification.

In case of series connected pulse meters the impedance ZL (which combines the impedance and the dc characteristic of the simulated-TE connected on the same line as the series-TEUT) are mainly two distinct values. 200 ohms for the countries (**B, SF, D, GR, IS, IRL, N, P, S**) and 600 ohms for the countries (**A, CY, F, CH**) except for (**I**) which distinguishes the impedance ZL= 400 ohms and the dc path with Rloop = 200ohms, and (**E**) which declares 300 ohms for only the dc path does not mention separately the ac impedance.

The ZG impedance of the generator is for the most countries (**A, B, CY, F, GR, IS, IRL, N, P, E, S, CH**) equal to 200 ohms which is an impedance close to the image impedance of the line at such frequencies (12 kHz and 16 kHz), except for the following countries which declare (**I**) 240 ohms, (**D**) 0 ohms and (**SF**).which does not specify it.

For the countries (**A, B, CY, SF, D, GR, IRL, N, P,**) the pulse detection is made only in the loop condition and for the remainder (**F, IS, I, E, S, CH**) the pulse detection is made in both conditions, loop and quiescent, to account for the last pulse at the end of the last pay-period where the caller has released the line.

For the feeding conditions of the requirement, one country group (**A, B, F, GR, IS, IRL,**) specifies the feeding voltage (**Vf**) and the range of the feeding current (**If**) and the other country group specifies (**CY, SF, D, I, N, P, E, CH**) the feeding voltage (**Vf**) and the range of the feeding resistance (**Rf**) and one country refers to the specification in Chapter 1.5.2 where only the range of current **Imin** to **Imax** is specified according to the minimal and maximal feeding conditions. (**F**) specifies feeding condition as the second group, in the case of a terminating unit.

In addition to the common requirements, the countries (**F**, **CH, A**) require the detection during a minimum time after the release of the line (respectively 2 s, 600 ms, 500 ms) and for (**F**) only, during a register recall pulse.

(**F**) requires some pulse detection immunity conditions against: high voltage capacitor discharge; decadic dialling pulses; random short break of the loop; battery reversal signalling; ringing signal; and "off hook" during the ringing period.

(**E**) declares in the remarks its own requirements instead the common requirement which is not expressed in the common format, although some values are included into the common table. It is not clear if the requirements in the remarks are additional to the common requirement or if only the requirements in the remarks have to be applied instead of the common requirement.

The minimum time duration of the valid pulses (**t3**) are spread from 20 ms for (**A**) to 120 ms for (**N, P**).

The maximum time duration of the valid pulses (**t4**) are spread from 50 ms for (**E**) to 365 ms for (**D**).

The minimum pause duration between pulses (**t5**) are spread from 50 ms for (**A**) to 400 ms for (**CY, IRL**).

The maximum time duration of the non-responding pulses (**t6**) are spread from 15 ms for (**A**) to 80 ms for (**IRL, S**). This requirement is not applicable for (**SF, D**).

The maximum time duration of the interruptions during pulses (**t7**) are spread from 5 ms for (**N, D**) to 40 ms for (**S**). This requirement is only applicable for the following countries (**A, CY, F, D, IS, I, N, P, S, CH**).

Although the countries (**IRL, P**) use the 12 kHz pulse meters, they do not have any requirement about the attenuation at meter pulse frequencies for series connected TE.

The countries (**D, CH**) do not require the meter pulses frequencies to be attenuated by series connected TE, where the attenuation must be lower than 0,5 dB.

The minimum attenuation values at meter pulse frequencies for series connected TE, are spread from 17 dB for (**B**) to 53 dB for (**S**), from the minimum to the maximum frequency of the detection area, except for the country (**SF, S**) for which the attenuation is specified for the nominal frequency, respectively 16 kHz and 12 kHz.

The minimum and maximum levels of the EMF (open circuit voltage) of the frequency generators have mainly the same values as the maximum sensitivity of the pulse detector, although the value of the maximum level received at the input of the meter apparatus is 6 dB lower because of the generator output impedance (ZG = 200 ohms) and the meter input impedance.(ZL= 200 ohms).

For the country (**CH**), the feeding condition requirement, is different for the attenuation requirement than the sensitivity and selectivity requirement, for no evident reason.

Although the meter input impedance is an important parameter which determines the input level as a function of the source impedance, the following countries declare that is not mandatory (**B, CY, SF, D, IRL, P,**).

For the other countries (**A, IS, I, N, E, S,**) the input impedance is expressed as a return Loss with respect to a real impedance (which is mainly 200 ohms) except for the country (**I**) for which the value is 240 ohms.

The other countries express the input meter impedance in other ways: (**F**) specifies only the modulus in the range 100 ohms to 500 ohms, (**S**) seems to declare a complex impedance reference (Zref = 900 ohms//60 nF) in the speech band, (**CH**) declares an input impedance with a modulus of 600 ohms to 1 200 ohms, with phase angle of 35 °C to -70 °C.

Testing feasibility

The testing method and topology needs further study.

For some equipment, such as pay-phones, it may be necessary to perform special actions to set them into the correct mode for the pulse detector to operate. It may also be difficult to determine directly the operation of the detector. Such problems are not dealt with in the test description.

The test circuit given for the return loss measurement makes automated testing difficult to perform.

Harmonization feasibility

Considering the various values declared by the countries it is not possible to harmonize the 12 kHz or 16 kHz meter pulsing. A harmonization could be possible only by a reasonable choice of common values between the countries, nevertheless further study is necessary to achieve that, taking into account the feasibility of the PSTN modifications with the least cost for the community.

In order to progress in the harmonization process it should be necessary to identify the constraints of the obsolescent PSTN equipment and to keep as a target the characteristics of the modern equipment.

For example, it should be possible to adopt a medium detector sensitivity, say 50 mV to 100 mV, to define the pulse timing according to the maximum pulse rate necessary for the highest communication price and lowest pulse value in Europe, taking into account the maximum signal interruption met in the worse case. The impedance adaptation should also be considered, related to the source impedance of the pulse generator and the statistic simultaneity of the pulses when several PSTN interfaces are connected to the same generator and also according to the cable impedance. The problems of high attenuation in the long line could be solve by using "meter pulse line extenders".

Cost benefit

Today the main pay-phone manufacturers, which already export in all the European countries have designed various interfaces to cover the specific case of each country and even a common programmable board adaptable for each different case. In fact for them, the harmonization of the pulse detection interfaces stays an insignificant matter, while the means of payment (coins, smart cards, credit card, optical card) are not harmonized, because for this last reason the pay-phones remain specific for each country.

The benefit of a harmonization could be more sensitive for the low cost TE but for the public pay-phone the extra-cost of a programmable board is small compared to the high cost of the global apparatus.

The harmonization cost for the operators could be significant but further study is necessary for the cost evaluation which is dependent upon the harmonization solutions.

9.2.2 50 Hz meter pulses

Interpretation

This requirement applies only to the specific TE which are able to detect the 50 Hz pulses in common mode with respect to earth, mainly for the pay-phone applications or for the meter pulses apparatus which are connected at the line termination in series as accessory equipment.

This clause is split in three main subclauses which deal firstly with the input longitudinal impedance, secondly with the sensitivity of the detector regarding the signal level at nominal frequency and pulse timing, and thirdly with the insensitivity of the detector regarding the signal level, the out-of band frequencies and pulse timing, so as to insure the reliability of the pulse detection.

Comments

The 50 Hz meter pulsing is the oldest tax meter system, which has several inconveniences:

1. it needs an earth connection in the TE premises to provide a return path;

2. a small unbalance about earth with respect to a high common mode voltage (30 V to 100 V), produce signals which disturb both data and speech transmission;

3. the high level 50 Hz signal and its harmonics produce interference and cross-talk on the adjacent lines;

4. the 50 Hz pulse meter is sensitive and could count unexpected pulses of the electromagnetic interferences 50 Hz electricity power supply caused by on/off switches on high current inductive apparatus.

Nevertheless the 50 Hz meter pulse system enables long distance pulse transmission which is not available using 12 kHz/16 kHz meter pulse system. This advantage is becoming less and less important as the length of the lines has a tendency to be reduced by using nearby connection units.

National inputs

No input from Malta.

Although Luxembourg uses the 50 Hz meter pulses, no input is available in this clause.

A few countries (**NL, GB, F, L, E**) use the 50 Hz meter pulsing but two of them use only this kind of system (**NL, GB**) and the others use 12 kHz / 16 kHz system as well.

Although (**GB**) uses the 50 Hz meter pulses, all the requirements are not mandatory.

(**E**) partially completes the common table but adds other requirements in the remark that is declared to be applied instead of the common requirement, which remains confusing because it is not clear which has to be applied.

The Input longitudinal minimum impedance at 50 Hz is only mandatory for (**F, NL, E**) all of which declare similar values, (respectively 8 kohms, 6,7 kohms, 7,5 kohms). In addition, (**F**) specifies a maximum value and describes the equivalent load impedance. (**NL**) also specifies the longitudinal impedance without meter pulse reception.

(**E**) has a simplified testing arrangement for the longitudinal Input impedance.

Strangely (**CY**) which never mentions any 50 Hz meter pulse requirement, declares a requirement only for the sensitivity of the 50 Hz meter pulse, which seems to be a typing mistake.

The sensitivity levels are spread from U min = 36 V for (**F**) to Umax = 100 V for (**E**).

The sensitivity pulse durations are spread from tmin = 50 ms for (**E**) to tmax = 400 ms for (**F**).

The minimal pause for the pulse separation is spread from 70 ms for (**E**) to 400 ms for (**CY**).

(**F**) refers to a different test arrangement which allows a test without feeding bridge.

(**F**) requires the detection of one pulse in quiescent condition within the 2 s after the release of the line.

(**NL**) provides insensitivity values as recommended but not mandatory.

The insensitivity related to the out-band signals is not required by any country.

The mandatory insensitivity related to the maximum U4 value are close: 25 V for (**E**) to 26 V for (**F**).

The mandatory insensitivity related to the short signal value are: 20 ms for (**E**) to 30 ms for (**F**).

Harmonization feasibility

The harmonization of the 50 Hz meter pulses seems not useful in the future for the reason that few countries use it and less of them declare it mandatory. It is suggested to keep the requirement as a national variation.

In that way no harmonization for the testing method is necessary, consequently the National testing method should be applied in each of the concerned countries.

Cost benefit

The benefit of such harmonization might be insignificant and the cost of the harmonization and the test could be high.

9.3 Disabling of echo control devices.

Introduction

The requirement is applied to TEs that have the ability to transmit signals for disabling network echo suppressors or cancellors.

Comments

The specification of this tone is in fact highly terminal specific and the requirements are linked and, therefore, should have been associated with those in subclause 9.6. Since this document is intended to be about network access, it should specify only those things which are generally applicable.

This requirement cannot even be said to apply only to non-voice devices, since even within a single TE a multi-mode modem can exist which in some modes wishes the echo suppressors/cancellors disabled and in others not. Conceivably, we could write down a list of modulation schemes based on CCITT V series Recommendations and indicate for which modes of these modulation schemes, echo suppressor/cancellor tone is required. Such an exercise has already been performed, when writing ETSs 300 002 [20], 300 114 [21] to 300 118 [22] and hence this information is duplicated.

Does the network care? We think not. The manufacturers of these devices know what is required, but in order to carve a niche in the market, it seems likely that, whilst supporting CCITT recommended modulation schemes TEs of this type will also provide proprietary modulation schemes as well. In these circumstances only the supplier knows whether it might or might not be beneficial to use or not use network echo cancellors or suppressors.

We can put in as much information as we like but we cannot guarantee data transmission over the PSTN. The PSTN itself is designed and optimised to carry speech. Its use to carry data is an added benefit to both the network operator and the user. There will always be circumstances, hopefully a minority, were the network will exhibit characteristics that preclude operation using a particular method of modulation, or in very rare cases, any form of modulation. A point that must not be overlooked is that whilst CCITT Recommendations given guidance on how to modulate signals they are not specifications in minute detail of how to design modems. The quality of the modem, like how sensitive it is, how well can it demodulate the incoming signals, are very much a part of the skill of the designer. In their quest for higher and higher data rates, modem suppliers will in the future, as they probably do already, have to recognise that it is not sensible commercially to attempt to design and manufacture a product that would work on every conceivable (European) PSTN connection.

The reference point at which the level of the signal is measured does not appear to be consistent, since all that is available to test is the TE, the signal level of this tone should be approximately equal to the normal data level. If the output level of the TE is adjustable then it can be expected that the level of this signal will vary accordingly.

As explained elsewhere, the output level of non-voice TEs is not normally a function of the line current and so there seems no purpose in checking this parameter over a range of currents. If it is deemed necessary, the maximum and minimum should suffice.

National inputs

For eight countries (**DK, SF, D, IRL, N, P, S & GB**) there are no mandatory requirements, Austria states that it is under study, and the entries of four countries are blank (**GR, L, M & NL**). The requirements are mandatory for seven countries (**B, CY, F, IS, I, E & CH**).

There are six national remarks (**B, F, P, E, CH & GB**).

Belgium specifies a further terminal specific application for when the call is not automatically answered.

France states that the ability to reduce the period of transmission of answer tone as a consequence of detecting calling tone is optional and the transmit level of answer tone is the same as the data signal.

Portugal states that other terminal standards or NETs (CTRs?) may make this mandatory.

Spain makes it clear that the network may or may not contain echo control devices. In other words, if you would like them, do not assume that the network will provide them. Much of the Spanish entry is a repetition, although in some cases clearer, of the common text. The requirements and associated text occupy 5 pages, with another 1,5 pages for the tests!

Switzerland, states in the common text that the requirement is mandatory and then in a its national remark goes on to state that the 1,8 s to 2,5 s of silence may not always be fulfilled and that the matter is under study. Where does this leave testing authorities?

Great Britain, for which the requirement is not mandatory, simply refers to subclause 4.4.2 in respect of the power level.

Harmonization feasibility

Harmonization is best achieved by removal. To the extent that harmonization is desirable it is already achieved. Regardless of whether such requirements are mandatory or not TE suppliers know what frequency to generate and do so when appropriate or suffer the consequences.

Cost benefit.

No action is required. There is no cost and no benefit.

9.4 Loop current detection

Interpretation

This is an introductory clause explaining that this section specifies requirements for loop current detectors contained in series equipment. Two classes of detector are envisaged, one in series with the loop (D1) and a second connected in parallel with the loop (D2). The second type of detector is connected to the line via a switch (with positions 1 and 2) which may (A) or may not (B) interrupt the connection to the second port of the series apparatus. All combinations are dealt with.

Comment

This section appears to be over-specified and overcomplicated. For simplicity, the discussion for the whole of 9.4 appears below, and a detailed analysis of the subclauses follow.

The whole of this section appears to be based on a particular terminal realisation associated with particular National installation practices and the requirements have a complicated structure. There appears to be no requirements for loop current detection in any equipment that is not series apparatus.

Although the operation of the loop current detector is specified there is no description of any resultant effect of such detection. Thus it is not clearly specified as to whether any such operation or non-operation is network affecting or not, and it is not clear how "a test is performed to check whether the detector is activated" or deactivated.

The whole of this section 9.4 is probably better placed in a terminal standard.

National inputs

There are only two inputs to this introductory clause, both from Germany. One requires the detector to ignore loop current interruptions caused by the network at the beginning of the call, that persist for less than one second. It is not clear how the source of the interruption is determined for the purposes of test.

The second German input appears to refer incorrectly to "another method of detecting the operational state of the TE connected to the second port." The equipment described seems to be similar to that specifically mentioned in subclause 9.4.1.2.1.

Harmonization feasibility

As most of these requirements are associated with National installation practices and there are so few countries with requirements, the whole of this section could best be harmonized by removal.

Cost benefit

As so few ountries have these requirements, there would be little benefit in harmonization and little cost.

9.4.1 Loop current detector D1

This clause is split into three main subclauses the first (9.4.1.1) dealing the dc operation with the switch in position 1 for both type A and B equipment, the second (9.4.1.2) dealing with the dc operation with the switch in position 2 (with subclauses for the two types of equipment), and the third (9.4.1.3) dealing with operation by ringing current for both switch positions and both types of equipment.

9.4.1.1 Series connected TE with switch S in position 1

Interpretation

This subclause describes four tests for apparatus of type A or B with the switch in position 1.

Tests are described for activation and non-activation when loop currents of given values flow for specified periods.

Tests are also given for deactivation and non-deactivation when other currents flow for other periods.

National inputs

Eleven countries (**B, CY, DK, SF, IS, IRL, N, P, E, S, GB**) declare this requirement to be non-mandatory, four (**GR, L, M, NL**) make no input and a sixteenth (**CH**) describes it as under study.

Austria and France only give requirements for minimum sensitivity (19 mA and 5mA respectively).

Germany and Italy give requirements for a maximum current together with a specified time required to operate, the same current together with a specified time not to operate, and a current below which the detector should cease to operate.

Italy in addition specifies the time for which the lower current should be applied to cause the detector to cease to operate and also a time for which the lower current should be applied which should not cause the detector to cease to operate.

Spain provides its regular helpful note.

Although Sweden describes this requirement as non-mandatory, a remark in the test section requires the detector to function over a given current range.

9.4.1.2 Series connected TE with switch S in position 2

9.4.1.2.1 Type A

Interpretation

This subclause describes four tests for apparatus of type A with the switch in position 2.

Tests are described for activation and non-activation when resistors of given values are connected to the second port for specified periods.

Tests are also given for deactivation and non-deactivation when other resistors are connected to the second port for other periods.

Limits are also placed on the voltage of the internal voltage source and on its short circuit current.

National inputs

Eleven countries describe this requirement as non-mandatory, six make no input, one describes it as under study.

Austria quotes values for all four tests to be applied.

Germany does not test for deactivation and non-deactivation, and gives special requirements that do not fit within the common framework.

Spain gives its usual helpful note.

9.4.1.2.2 Type B

Interpretation

This clause describes four tests for apparatus of type B with the switch in position 2.

Tests are described for activation and non-activation when resistors of given values are connected to the second port for specified periods.

Tests are also given for deactivation and non-deactivation when other resistors are connected to the second port for other periods.

A lower limit is also given for the voltage across a resistor of given value connected to the second port.

National inputs

Ten countries describe this requirement as non-mandatory, seven make no input, one describes it as under study.

Austria quotes values for all four tests to be applied.

Germany does not test for deactivation and non-deactivation, and gives special requirements that do not fit within the common framework.

Spain gives its usual helpful note.

9.4.1.3 Series connected TE loop current detector immunity

Interpretation

This requirements calls for the TE which has loop current detection capability not to operate when ringing is applied and a resistor and capacitor of given value are connected in series across the second port.

National inputs

Thirteen countries describe the test as non-mandatory. One makes no input.

Five countries (**A, B, CY, GR, N**) give the same values for R and C, but all use differing ringing supplies for the test.

Spain gives its usual helpful note.

9.4.2 Loop current detector D2

Interpretation

This subclause describes four tests for apparatus of type A or B with the switch in position 2.

Tests are described for activation and non-activation when loop currents of given values flow for specified periods.

Tests are also given for deactivation and non-deactivation when other currents flow for other periods.

The requirements for type B apparatus have to be met when the second port is loaded with a resistor of given value.

National inputs

Only Austria asks for this requirement but it does not specify periods for the current to be applied to test for activation and deactivation. It strangely specifies that the requirement must also be met by apparatus with a hands-free function.

Spain has its usual helpful comment.

9.5 PSTN tone detection.

This subclause describes detection criteria for the following tones:

- Special dial tone;
- Busy tone;
- Congestion tone;
- Ringing tone;
- Special information tone.

It notes that detection of dial tone is considered in Chapter 5

In each case a "mask" is defined for the specified tone and a detector is required to be insensitive to any tones which fail to conform to the "mask". This analysis first sets out to deal with the concept of tone detection in general before passing comment on the detection of the specified tones

Introduction

In considering whether tone detection could be harmonized, it was found unhelpful only to deal with those countries which had entered values in the appropriate table. Tone detection requirements, whether mandatory or voluntary, need to consider all relevant tones. In consequence, the relevant information has been taken from subclause 1.7. An analysis of all the relevant tones that could be found appears in an annex.

Comments

From the entries in the tables, as for dial tone, it is not always clear what TE suppliers can expect to find in terms of tones. Some clarification might assist.

For many of the countries, these requirements are not mandatory. The national differences in call progress tones met during call establishment, in general means that any tone detection can only be effective on a national basis. For international calls, valid calls may be cleared because a foreign tone encountered is regarded as ineffective in the calling country.

As stated for the Dial tone detection in subclause 5.2, the strict imposition of a national "insensitivity" requirement precludes detectors from being able to detect similar tones from other nations. It is clear that the diversity of tones is such that tones may be detected inappropriately on some occasions.

The actual detection of tones may not be the only acceptable solution, in the cases of auto-calling and clearing. For instance, detection of a valid signal by a facsimile terminal after call establishment within a prescribed period and its disappearance during a call are alternatives to detecting tones which might indicate a call which is successful or has failed. The standard should not concern itself with the mechanism by which the TE achieves the requirement (i.e. clearing a failed or ineffective call) simply that it is achieved.

Except in the case of Special information tone, identification of the tone by automatic equipment is normally a matter of determining cadence rather than frequency.

It is know that some National networks have other tones (e.g. Call progress tone, number unobtainable tone, howler tone) that are not dealt with in this section.

National Inputs

Many of the entries in the tables are blank. We interpret this to mean that there is no requirement. In the case of all of these tones, except special dial tone which it links to subclause 5.2, Switzerland has a general note which when paraphrased states that the values they would wish to see adopted are those which enable sensible call control on a national and international bases. They refer to the subject as "under study".

Harmonization feasibility

Harmonization of the requirements for detection of tones may be beneficial, even if such requirements ultimately become voluntary. It might be cost effective to include the circuitry to detect a single set of tones, but certainly not the proliferation of different tones that currently exist across Europe.

In order to determine whether or not it is feasible to harmonize the tones, it is necessary to ensure that all tones are declared and specified accurately. The parameters that should be declared include the nominal values and tolerances of frequency content, levels, cadence information and timings. This information should be available for all tones, together with statements about whether any of them should be considered obsolescent.

In terms of Human Factors, one of the most annoying features of European Telephone networks is the abundance of different tones, all of which purport to have the same meaning. If it is confusing to the user then automatic terminals have perhaps one option to ignore them or face the prospect of clearing what might have been a successful call. Terminals built for the national market, which have tone detectors built in to satisfy mandatory requirements are likely to believe that the call has failed when faced with tones (for instance the French Connection in Progress Tone) which actually indicate please wait. Substantial improvements could be gained by harmonizing the tones.

It needs to be noted that any change would almost certainly cause short term confusion amongst users and might result in some terminals which have currently been approved to national standards failing to respond correctly.

Cost benefit.

This would probably incur some medium term cost to the Network Operators, but ultimately the cost would be recovered in a common perception of the European PSTN which would make it more user friendly and encourage calls to be made. The fact that such tones are standard would facilitate their more effective use by automatic calling apparatus.

Testing

For some types of equipment it may be necessary to perform special actions to set them into the correct mode for the tone detector to operate. It may also be difficult to determine directly the operation of the detector without modification to the apparatus or its software. Such problems, which are terminal specific, are not dealt with in the test description.

9.5.1 Dial tone

This subclause merely states that dial tone is dealt with in subclause 5.2 (see table 1, figure 1).

9.5.2 Special Dial tone (see table 2)

This seems to fall into two camps (see table 2):

- dial tones relating to international or other alternative networks;
- dial tones which might indicate that supplementary services have been activated.

Whilst the differences in tones are designed to convey different information to the user, they should not be so different as to require separate detectors for each tone in Automatic Equipment where the distinction may not be warranted.

Our analysis suggests that at the most seven countries (**A, B, F, I, N, P & CH**) consider this to be a mandatory requirement. The remainder are content for some alternative to apply.

9.5.3 Busy tone

This tone indicates that the number being called is already in use (see table 3).

With notably few exceptions, this tone is derived by cadencing national dial tone. For all countries the on to off ratio is the same (1:1), but the range of times varies from 200 ms up to 500 ms, with the average nearest to 400 ms. Ten countries (**A, B, SF, F, D, IRL, I, NL, N & P)** consider detection of this tone to be mandatory, the remainder are blank or state the requirement to be not mandatory. Of the ten countries name above only four countries (**B, F, I & NL**) attempt to ask for Insensitivity requirements and since values of time do not always appear it is not certain that these could be applied.

9.5.4 Congestion tone

This tone indicates that the telephone network lacks the equipment or lines to service the call request. The chances of this meeting tone can be expected to diminish in modern digital networks since alternative routes can quickly be tried. Exceptionally, however, there may be no other course than to return this tone (see table 4).

For nine countries (**A, B, CY, D, I, L, N, P & E**) this is a distinctive variation in the cadence of busy tone (i.e. it represents Network busy tone). For nine countries (**DK, SF, F, GR, IS, IRL, S, CH & GB**) the tone is the same as busy tone or the cadence is such that unless you were specifically aware of its existence you would have difficulty in distinguishing this from ordinary busy tone. That said, the frequency of the tones varies in the same way as dial tone.

Seven countries (**A, B, CY, I, NL, N & P**) have mandatory requirements for detection, whilst only three countries (**B, I & NL**) have mandatory requirements for insensitivity. For France the requirements for busy tone apply.

Ireland has confirmed separately that normal Busy tone is returned to users if they meet network congestion.

9.5.5 Ringing tone

This tone indicates that the called number is being rung.

Again this is based on the same frequency as dial tone, but cadenced. For most countries this is a simple tone on, tone off cadence with the on period being 1 000 ms to 1500 ms and the off period being 3 000 ms to 5 000 ms giving a cycle time of 5 000 ms to 6 000 ms. (**IRL**) and (**GB**) are different in having an on/off/on/off cadence. In the case of (**GB**) the total cycle time is 3 000 ms. Five countries (**A, B, F, D & I**) have mandatory requirements for detection, whilst only three countries (**B, F & I**) have mandatory requirements for insensitivity.

9.5.6 Special Information Tone

This tone should precede any voice announcements given by the network so as to enable automatic equipment to distinguish between the voice announcements and a user answering the call. In most circumstances it can be interpreted as call failure.

Special Information Tone (SIT) is substantially harmonized and derives from CCITT Recommendations. Few countries (**A, B & I**) seek to make detection mandatory. Mandatory or otherwise, since most countries either provide or expect to provide SIT, it would be sensible for automatic TEs to detect it.

Three countries (**A, B & I**) have mandatory requirements for detection, whilst only two countries (**B & I**) have mandatory requirements for insensitivity.

9.6 Detection of remote party signals

This subclause deals with the detection of signals sent by the remote party to the TE which may cause it to generate "other signals inside the TE destined to cause the TE to initiate or prevent it from initiating a certain subsequent action". The use of detected signals to control the loop condition is dealt with in subclause 6.4 and so this is apparently intended as a catch-all clause to control any other terminal action.

This subclause consists of four parts:

- 9.6.1 Answering tone detection;
- 9.6.2 Speech signal detection;
- 9.6.3 Data signal detection;
- 9.6.4 Remote activation tone detection.

Only the first part has any content (except for Spain) as the other requirements are said to be dealt with in subclause 6.4. It is apparently assumed that the other signals would only be used to control the loop condition. Spain inserts a comment additional to that contained in its input to subclause 6.4.

Sweden declares the whole part to be non-mandatory although it does have a requirement (which does not apply to speech) located in subclause 6.4.2.2 (Incoming speech or other non-data signal related control).

France has requirements in Chapter 10.9 for the end-to-end detection of DTMF signals.

This subclause is clearly intended as an end-to-end inter-operability requirement for data equipment and does not involve interaction with the network. As such it should be considered for insertion in the appropriate terminal standard.

9.6.1 Answering tone detection

Comment

Although this subclause is headed "Answering tone detection", a note says that it is intended to contain requirements for detecting echo suppressor disabling tone, grouped together here. An abstract from CCITT Recommendation V.25 [18]. is given on which this subclause is intended to be based.

9.6.1.1 Answering tone detector sensitivity

Interpretation

This subclause specifies a range of frequencies and a range of levels which when applied for a given period causes the answering tone detector to operate. It also requires the detection not to be disturbed by phase reversals applied to the tone, e.g. in order to disable echo cancellors.

Comment

The testing of this requirement may not be possible without modification to the equipment under test in order to determine "whether the detector indicates the presence of answering tone".

National inputs

Ten countries (**CY, DK, D, IS, IRL, N, P, E, S, GB**) describe the requirement as non-mandatory. Germany and Portugal point out that it may be mandatory through a terminal standard. Spain gives some notes that are intended to be helpful. Four (**SF, GR, L, M**) make no input.

Four of the six countries replying (**A, F, I, CH**) specify the answer tone as echo suppressor tone at 2 100 Hz although Austria quotes a 50 Hz tolerance compared to the 22 Hz tolerance quoted by France, Italy and Switzerland.

Belgium allows the manufacturer to specify his own answer tone frequency between 700 Hz and 3 000 Hz giving a tolerance of 20 Hz. The Netherlands quotes 1 575 Hz to 1 625 Hz.

Five countries (**A, B, F, I, CH**) specify a lower detection threshold of -43 dBm, whilst the Netherlands specifies -25,7 dBm.

The upper detection threshold varies from 0 dBm to -10 dBm with only two countries specifying the same value.

Four countries specify a period of application of the tone with values ranging from 300 ms to 2 600 ms. Austria and Switzerland give no value.

Four countries (**B, F, I, CH**) give phase reversal information. Austria and the Netherlands make no entry.

France gives a number of sets of test values covering testing with differing frequencies, levels and feed currents.

Harmonization feasibility

Although this is seen as an end-to-end inter-operability issue, there is little prospect of harmonizing the given values. Harmonization is best achieved by removal of the requirement from ETS 300 001 [3].

Cost benefit

There would be some benefit to suppliers by removal of this requirement. There would be no cost arising from this action.

9.6.1.2 Answering tone detector insensitivity

Interpretation

This clause requires the detector not to operate when presented with signals that are outside a specified band of frequencies, of low strength or are of too short duration.

Comment

It is not clear why a signal should be rejected if it is correct in frequency and duration, but low in level.

The testing of this requirement may not be possible without modification to the equipment under test in order to determine that the detector of answering tone is not activated.

National inputs

Eleven countries (**A, CY, DK, D, IS, IRL, N, P, E, S, & GB**) describe this requirement as non-mandatory. Three (**SF, L, & M**) make no input.

The Netherlands gives a value only for the test of weak signals of unspecified frequency and duration.

The requirements for France and Italy are broadly similar while the values given for Belgium differ.

Spain gives its usual helpful note.

Harmonization feasibility

This is seen as an end-to-end inter-operability issue, and, for the purpose of access, is best harmonized by removal.

Cost benefit

There would be some benefit to suppliers by removal of this requirement. There would be no cost arising from this action.

9.6.2 Speech signal detection

Interpretation

This subclause has no content except to say that the subject is described in subclause 6.4.2.2 and there is a Spanish note.

Harmonization feasibility

This requirement can be harmonized by removal.

9.6.3 Data signal detection

Interpretation

This subclause has no content except to say that the subject is described in subclause 6.4.2.1 and there is a Spanish note.

Harmonization feasibility

This requirement can be harmonized by removal.

9.6.4 Remote activation tone detection

Interpretation

This subclause has no content except to say that the subject is described in subclause 6.4.2.3 and there is a Spanish note.

Harmonization feasibility

This requirement can be harmonized by removal.

Table 2: Summary of the special dial tone characteristics

Special Dial Tone										
Country Name		**Frequency(ies)**				**Level / dBm**		**Cadence**		
		Frequ. 1	Frequ. 2	Average	Tolerance (±)	Maxi	Mini	(Y/N)	On / ms	Off / ms
Austria	A	382,5	425	403,8	21,3	-16	-26,0	N		
Belgium	B	420	455	437,5	17,5	0	-18,0	Y	1 000	250
Cyprus	CY							No info		
Denmark	DK	375	425	400,0	25,0	-6,5	-23,0	Y(see note 1)		
Finland	SF							No info		
France	F	330	440	385,0	55,0	-10	-27,0	N		
Germany	D							No info		
Greece	GR							No info		
Iceland	IS	425	425	425,0	25,0	Nominal	level -10	Y	400	40
Ireland	IRL							No info		
Italy	I	410	440	425,0	15,0	0	-25,0	N		
Luxembourg	L							No info		
Malta	M							No info		
The Netherlands	NL							No info		
Norway	N	425	470	447,5	22,5	0	-30,0	Alternating	400	400
Portugal	P	400	450	425,0	25,0	-5	-30,0	Y	1 000	200
Spain	E	425	425	425,0	15,0	-5	-20,0	Y(see note 2)	1 000	100
Sweden	S	425	425	425,0	±25	Nominal	level -10	Y	320	40
Switzerland	CH	340	425	382,5	42,5	-6,5	-18,0	Y(see note 3)	1 100	1 100
Great Britain	GB	350	440	395,0	45,0	0	-27,0	Y	500	500
Average		**392,3**	**437,1**							

NOTE 1: The frequency 375 Hz is cadenced, while the 425 Hz is continuous.

NOTE 2: The cadence can also be 320 ms ON / 20 ms OFF.

NOTE 3: Ordinary dial tone plus a frequency 340 Hz +/- 15 Hz which is cadenced as described in the table.

Table 3: Summary of the busy tone characteristics

Busy Tone									
Country Name		**Frequency(ies)**				**Level / dBm**		**Cadence / ms**	
		Frequ. 1	Frequ. 2	Average	Tolerance	Maxi	Mini	On	Off
Austria	A	400	500	450,0	± 50	-6,5	-26,0	400,0	400,0
Belgium	B	420	455	437,5	± 17,5	-4,0	-14,0	500,0	500,0
Cyprus	CY	425	425	425,0	± 25,0	-7,0	-22,0	500,0	500,0
Denmark	DK	350	450	400,0	± 50,0	-6,5	-26,0	450,0	450,0
Finland	SF	325	525	425,0	± 25,0	-6,0	-15,5	300,0	300,0
France	F	440	440	440,0	± 15,0	-10,0	-25,0	500,0	500,0
Germany	D	380	490	435,0	± 55,0	-4,0	-27,0	480,0	480,0
Greece	GR	400	475	437,5	± 37,5	-4,0	-25,0	300,0	300,0
Iceland	IS	400	450	425,0	± 25,0	-7,0	-30,0	250,0	250,0
Ireland	IRL	400	400	400,0	± 25,0	0,0	-16,0	500,0	500,0
Italy	I	410	440	425,0	± 15,0	0,0	-25,0	500,0	500,0
Luxembourg	L	380	490	435,0	± 55,0	-4,0	-27,0	480,0	480,0
Malta	M								
Netherlands	NL	340	550	445,0	± 115,0	-3,8	-25,7		
Norway	N	425	425	425,0	± 15,0	-10,0	-30,0	500,0	500,0
Portugal	P	300	450	375,0	± 75,0	-5,0	-30,0	500,0	500,0
Spain	E	410	440	425,0	± 15,0	-5,0	-20,0	200,0	200,0
Sweden	S	400	450	425,0	± 25,0	-10,0	-30,0	250,0	250,0
Switzerland	CH	400	450	425,0	± 25,0	-6,5	-18,0	500,0	500,0
Unit. Kingdom	GB	400	400	400,0	± 45,0	0,0	-27,0	375,0	375,0
Average		**390**	**458**			**-4,8**	**-24,2**	**410,3**	**410,3**

Table 4: Summary of the congestion tone characteristics

Congestion Tone														
Country Name		**Frequency(ies)**				**Level /dBm**		**Cadence / ms**						
		Frequ 1	Frequ 2	Average	Tolerance	Maxi	Mini	On 1	Off 1	On 2	Off 2	On 3	Off 3	Total time /cad.
Austria	A	400	450	425	± 25	-6	-26	200	200					400
Belgium	B	420	455	437.5	± 17,5	-4	-14	167	167					334
Cyprus	CY	400	455	427.5	± 27,5	-7	-22	250	250					500
Denmark	DK	350	450	400	± 50	-6	-26	450	450	250	250			1400
Finland	SF	325	525	425	± 25	-6	-15	225	225					450
France	F	425	455	440	± 15	-10	-25	500	500					1000
Germany	D	380	490	435	± 55	-4	-27	240	240					480
Greece	GR	400	475	437.5	± 37,5	-4	-25	300	300					600
Iceland	IS	400	450	425	± 25	-7	-30	250	250					500
Ireland	IRL													
Italy	I	410	440	425	± 15	0	-25	200	200					400
Luxembourg	L	380	490	435	± 55	-4	-27	240	240					480
Malta	M													
Netherlands	NL	340	550	445	± 115	-3	-25	255	255					510
Norway	N	410	440	425	± 15	-1	-30	200	200					400
Portugal	P	300	450	375	± 75	-5	-30	200	200					400
Spain	E	410	440	425	± 15	-5	-20	200	200	200	200	200	600	1600
Sweden	S	400	450	425	± 25	-10	-30	250	250					500
Switzerland	CH	400	450	425	± 25	-6	-18	500	500					1000
Unit. Kingd.	GB	320	480	400	± 80	0	-27	400	350	225	525			1500
Average		**361**	**441**			**-4,8**	**-23,3**	**279**	**276**					

6.10 Chapter 10

The contents of this Chapter in ETS 300 001 [3], are grouped into nine subclauses numbered 10.1 to 10.9 relating to the subject matter of Chapters 1 to 9.

In this Part of the ETR the subclauses have been dealt with in the reports of each relevant Chapter and so do not appear as separate items.

7 Findings

This clause presents, for the most part in greater detail than ETR 075-1 [1], the findings of Project Team 17V as agreed by TC-TE. In some cases it was recognised that nothing could be said which was additional to what had already been said in ETR 075-1 [1] and, in such circumstances, the text of ETR 075-1 [1] has been duplicated for the sake of completeness.

This clause sets out issues which affect the feasibility for harmonizing ETS 300 001 [3] and other related issues which will have an impact on the effectiveness of any further work to harmonize ETS 300 001 [3]. In some cases, the historical background or other details have been re-iterated for convenience and in support of the findings which then form the basis for the recommendations given in clause 8.

The analysis of ETS 300 001 [3] as a whole has revealed a number of issues which are not specific to a particular Chapter and, therefore, would not merit a mention when reviewing that Chapter. When considered in the context of the whole of the content of ETS 300 001 [3] these issues are considered to be of sufficient importance to deserve a mention in the findings if only to ensure that such matters are not carried forward into later issues of this ETS. On some occasions, the reader of this ETR may not be able to identify specific comments within the collection of reports in Clause 6 to support particular findings. In such cases, reference to ETS 300 001 [3] should provide adequate evidence to substantiate the comment.

Having reviewed the content of ETS 300 001 [3], the findings have been grouped into four sets, each of which has had or continues to have an impact on the harmonization feasibility of the contents of this ETS. The first three subclauses consider matters which have had and in some cases will continue to have an impact on the technical content of ETS 300 001 [3]. Thus the first subclause describes the way in which the document and its information are presented, the second is the context of ETS 300 001 [3] and the third are matters concerning the environment in which it was drafted and is to be used, its legal status and maintenance. Finally, the fourth subclause describes technical matters, which in themselves represent impediments to harmonization. The text which follows have been grouped according to the outline given above.

7.1 General presentation of the document

It is likely that the framework of the common text actually encouraged some administrations to provide values for requirements which may not in the past have been applied for national approvals. There is some evidence to substantiate this hypothesis, in that in a number of places administrations have stated values to be "under study", which clearly leads to the conclusion that such requirements could not have been applied in the past nor are they applied currently. There was, however, a more fundamental problem that was probably not apparent to those participating in the drafting of this document and this was that different administrations had different ideas about the purpose of a requirement and hence in some cases its meaning. Thus it is not clear whether any one requirement is in fact a single requirement or several due to the national differences expressed in that requirement.

Why did the national remarks exist? While it is clear that some exist because the design and therefore the physical parameters of the networks are different, many others attempt to clarify the purpose of the common text and to align it with the national understanding. This is justified in some cases since in those cases the common text is clearly ambiguous.

In other cases, the national remarks are perhaps a symptom of the state of confusion that some administrations experienced due to the lack of clarity about the relationship of ETS 300 001 [3] to other ETSI standards and the regulatory environment in which these standards would operate. In a few other cases it seems that the reasons are likely to be more perverse. The result is that many of the national remarks are inconsistent with the scope of the requirement they seek to modify. This leads to confusion which is further confounded by the complexity of many of the national references to Chapter 10.

The structure of the original document attempted to separate the requirements and tests. Whilst it is thought that this is generally desirable, in practice the authors and many of the contributing administrations have found this difficult to implement in a consistent manner. These matters are rarely binary decisions and sound reasons of a technical, editorial and regulatory nature can be proffered for varying where any particular parameter value is expressed (requirement or test).

Again the structure of the document is in some cases related to the measurement of certain physical properties (dc characteristics and ringing signal characteristics) and at other times to do with states or conditions of the Terminal Equipment (calling and answering functions (State?)). This structure is neither user nor test house friendly. For most purposes, it would be useful to be able to identify the complete set of requirements that apparatus might be expected to meet in any single state or condition. Such a change to the document, would not imply any technical change just re-ordering of the content into other logical groupings such as quiescent, loop, dialling, etc., conditions. It is however suggested that such changes await the first re-write.

It is now clear that role of ETS 300 001 [3] and its predecessors is to become regulatory documents. Each requirement contains a brief statement indicating how compliance of equipment to that requirement is to be determined, but in many cases this statement and the associated test description are so concise (for example see Chapter 7 of ETS 300 001 [3]) that the detail given would not permit test results to be repeated or for a supplier to perform tests in order to gain confidence that the apparatus about to be submitted for test might pass. It is also clear that if the tests are not described with sufficient rigour, differences in the way tests are performed nationally could lead to disputed results. Such matters are considered to be a matter for concern and should be rectified if or when harmonized tests are drafted.

Finally, the use of tables as part of the common text in which Administrations might declare values, applicability of a requirement or test, or testing conditions is irregular and sometimes perhaps unnecessary. It is not unusual to find tables which repeat, or appear to repeat, testing parameters in requirement tables and *vice versa*. Many tables have few entries or perhaps no entries at all, the terms "*no requirement*", "*not mandatory*", "*not specified*", etc., appear to be used as if they were synonymous but it is not clear whether the administrations had intended this to be so. With hindsight it is clear that it would have been more sensible to have defined the terms, so that contributors were clear about their meanings.

7.2 The context of ETS 300 001

If one forgets the initial attempt which produced the compendium referred to in subclause 7.1 above, it is true to say that this ETS was drafted with the intention of setting out in a common format, for all the participating administrations, the current type approval requirements for telecommunications terminal equipment wishing to connect to the PSTN. At no time was it the intention for the ETS to seek to alter the *status quo* in any of the contributing administrations. It is clear that each administration has attempted to be consistent in the rigour of its regulation and it is therefore reasonable to assume that this is in line with their existing type approval requirements. The rigour of regulation and type approval, however, varied and still varies substantially and thus the content, which varies from nation to nation, reflects these differences. Examples of this variability are evident throughout ETS 300 001 [3] in that some countries have inserted values whilst many other countries state the requirement to be "not mandatory". The requirements range from aspects which are highly terminal specific, such as detection of "carrier tones" to those which are network specific, such as 12 kHz metering pulses. Yet another dimension is illustrated where some countries seek an insulation resistance which is far higher in magnitude than could be justified in terms of safety or the needs of a practical network.

So why should this have occurred? Many myths have emerged concerning ETS 300 001 [3] and continued progress towards harmonization demands that such myths be dispelled. If they are not tackled then it is reasonable to assume that changes will be opposed, simply because those affected are unsure about the outcome. In particular, the question of ETS 300 001 [3] and its role in the general architecture of standards for connection to the PSTN needs to be stated. Can the requirements of this ETS be modified? If so, how? Can ETS 300 001 [3] (or NET 4) be used on its own to type approve terminal equipment or must another ETS form the basis of type approval, including ETS 300 001 [3] by reference. Such an example can be found in ETS 300 114 [21] (NET 20). Confusion clearly exists about which types of Terminal Equipment fall within the scope of ETS 300 001 [3]. Does it include any requirements for complex apparatus, speech, etc.? Still further confusion exists about what might be considered to be "essential requirements"? In the past it was assumed that for the purposes of purchasing most, if not all, it's equipment network operators would be constrained to using that which was contained in a "NET" or "ETS", we now have talk about "essential requirements". Clearly the requirements that might be "essential" for network connection might only be a subset, or a different set, to those deemed "essential" for purchasing. A clear statement about what might happen to the requirements that might be deemed in the future to be "non-essential" needs to be established, otherwise fears about what might happen to them will result in unnecessary opposition to change.

Assuming certain requirements address a fundamental network need, it is still clear that if these requirements are drafted to be highly specific to a particular type of TE, then either they will constrain innovation or they will need to be updated to reflect current technology, Even if as a result of further studies, such requirements were considered to be "not essential", there might still be merit in attempting harmonization because TEs may still need to meet these requirements albeit voluntarily in order to function efficiently.

7.3 Role of ETS 300 001

It is widely recognised that a standard intended for use as part of a legal procedure should be written with that application in mind from the outset. ETS 300 001 [3] has not and could not have benefited from such a procedure; the framework for its content was generated within CEPT by engineers skilled in drafting European technical recommendations and at a time when the full implications of writing and using regulatory standards would have been unknown to many of them As work progressed and some became more aware of the regulatory implications of their work, concern for how ETS 300 001 [3] might be used, what it might supersede, etc. produced some consternation, which in turn resulted in the wholesale transfer of national requirements regardless of their relevance to the perceived common aim. Referring again to the changes of perception that have occurred during the generation of ETS 300 001 [3], it is probably also true that each individuals expectations of what this document might achieve, and these vary according to an individuals perspective, have changed during its lifetime. Initially it was intended to make public the approval requirements in all the participating administrations. Later it was intended to harmonize the presentation, a most recently the requirements and their tests. It then follows that the document is less suited for the purpose it was expected to support than might otherwise be the case, and this reality formed a central theme amongst comments arising from its public enquiry period held during 1990. Some of these concerns, dealing with the regulatory role of the document, still remain unresolved.

The scope of the ETS identifies it as being applicable to a single TE. However the design of a TE such that it is able to coexist with other TEs on the same line, demands a reasonably detailed knowledge of the connection methods applicable to that national installation and other requirements which determine the maximum collective effect of other terminals. Whilst it might be said that these matters may be outside the standards-writing environment, it also needs to be said that a certain interaction is inevitable. There is clearly a conundrum in that the network itself neither knows nor cares whether the loading is a result of one terminal or a number of terminals so long as it does not exceed some limit (which might vary from network to network). If ETS 300 001 [3] was truly an access standard then it should reflect the maximum impediment the network can accept, but this would then make no provision for the possibility of multiple terminals. This issue needs to be addressed either in ETS 300 001 [3] or in another ETS to which makes reference to ETS 300 001 [3].

A number of such factors arise from the analysis of ETS 300 001 [3]; they are concerned in the main with the two aspects of network definition and legal application of the standard.

It has already been mentioned that the method of presentation of the network and a clear and consistent technical treatment of the installation which connects to that network presentation is a necessary pre-requisite to harmonization of technical requirements and tests to be set out and to be applied to terminal equipment. This matter encompasses, however, issues beyond physics. It is clear, for example, that a network 'end' is a point of service delivery which incorporates some guarantee of availability of that service; similarly, the provider of the service has good reason to expect that connection to its network end is likely to be safe and to be made in such a way as to allow the service to be delivered and used. Issues of liability are assumed by the parties either side of the network end or interface; rules of presentation and attachment needs to reflect the technical and legal precision implied.

Any standard is organic: it needs to alter and evolve alongside the development and change of the technology it describes. This reality does not sit comfortably in the lap of regulatory use of a standard; the rule of Law is of necessity reactive and relies on a certain delay to ensure stability. In that light, the methods of updating the content of the standard, some of which is the communal property of ETSI members (the common text) and much of which is Administration determined (the national parts) are crucial to an effective and symmetric application throughout Europe.

Many of these matters may be outside the locus of ETSI but related to its area of responsibility need to be addressed and to be resolved.

7.4 Technical issues

It first needs to be made clear that if harmonization requires substantial changes to the characteristics of the public network, then this implies significant if not astronomical costs. In such circumstances it is exceedingly unlikely that these costs will be recovered whatever the benefits. The best that can be hoped for is a planned migration over a period of time (decades rather than months or years) which requires for each network a strategy if the perceived level of performance of the terminal and the network is to be maintained.

The technical variation within ETS 300 001 [3], which, for the reasons explained above, frustrate attempts to harmonize the content. Of those identified probably the single most important issue concerns the manifestation of the PSTN within the customers premises, the way in which the apparatus is electrically connected to it and whether this supports the concurrent use of more than one terminal, albeit that the network operator gives no guarantee of satisfactory operation. Another important matter, concerns the difference in the dc conditions terminal equipment needs to exhibit, in order to correctly seize and signal the network. Other factors include certain variations in various ac (within the speech-band as well as out-of-band) parameters, and a host of protocols concerning terminals signalling to or receiving signals from the network and terminals exchanging information between themselves via an electrically transparent network path. These and other factors are discussed in further subclauses below.

7.4.1 DC characteristics

Technical variations of the terminal equipment, loop condition, dc voltage-current characteristics also present harmonization difficulties of a different kind. If one assumes the voltage-current characteristics declared by each Administration relate to a single terminal, certain common factors emerge. There remains, however, fundamental technical differences from network to network which are concerned with how that network delivers the energy (feeding characteristic, V_f, R_f) to the terminal and how the terminal inter-operates with that network dc characteristic (Voltage dropped across the TE as a function of the line current). The analysis (see ETR 075-3 [2]) illustrates that an impasse to harmonization exists because of the conflicting requirements of some countries. It is possible that given a willingness to change, study and investigation may be able to produce a harmonized solution. The following other issues should be noted:

1) the voltage available to TEs on the longest lines, is for some networks very low in order to permit seizure;

2) a potential conflict arises from the maximum current delivered by the network to a terminal. The current available on short lines from the network of one administration may well be an excessive current for a network in another administration. If harmonization is to occur, some means of limiting the amount of current available to a terminal needs to be considered. From a practical point of view and network costs it makes no sense to deliver more power than the TE requires. As a long term goal current limitation for the installation as a whole would appear to be the way forward as this could almost certainly obviate the need for the dc Overload Susceptibility.

When considering the effects of dc, do not overlook that for most telephony services the line current, or a derivative of it, is used to control the transmission levels in the terminal and/or to control the loss or gain at the exchange.

7.4.2 Network presentation and connection rules

It is in general the effect of the total installation on the network that matters and not that of a single TE. There is no technical reason why a single TE should not make use of all of the impediments that a network is prepared to accept or for a number of TEs collectively to exhibit the same impediment. Whether such things are possible is largely determined by the way in which a terminal is attached to the network which is then a function of the way (or perhaps ways) in which the network operator permits attachment to his network. As pointed out earlier, the requirements of ETS 300 001 [3], are addressed to a single terminal. Either the connection rules are such that the network can only ever discern a single terminal or there remains enshrined somewhere in national regulations a means of limiting the number of terminals connected to a line. Such a limitation is essential because if it does not exist then any number chosen for a quiescent condition parameter will be affected by the connection method and the number of terminals present and in the extreme would either result in the network failing to respond appropriately or degradation of for instance the signal quality at source such that it was no longer useful. ETS 300 001 [3] is perhaps understandably rather vague on this matter. It is however clear that if any progress is to be made on harmonization the method of connection and a method of constraining or sharing the effects of the installation as a whole will need to be addressed.

Perhaps the most significant parameter, however, is that of the ringing signal detector. Detectors can be connected multiply in parallel, excited by a a common voltage, or can be connected in series, excited by a common current. There is precious little commonality between such types of ringing detection circuits, and since the type of detector is related intimately to the electrical design of the installation, one finds a significant diversity across Administrations in this area.

If or when this matter is finally considered in a technical forum the participants should consider at least the following:

- the maximum number of TEs per installation;
- how the network is presented and how the ringing detectors are connected (Series/parallel);
- the minimum number of wires in any installation;
- when considering these rules it is necessary also to consider how many items of series equipment can be placed in series. Do the current rules of ETS 300 001 [3] apply to one TE or are a number permitted?
- what rules if any should be applied to the simultaneous use of more than one terminal on the same line?

When considering the above it should be noted that these will have ramifications for the vast majority, if not all, of the quiescent condition parameters.

7.4.3 AC characteristics

Impedance

The reference impedances against which the impedance of a TE seeking approval is measured, fall into two broad categories: 600 ohms and a complex impedance. Although currently the majority of nations (twelve out of nineteen) use 600 ohms as the only reference impedance, others (three) specify a complex impedance for speech applications (some may also permit it for non-speech) while others (four) specify only a complex impedance. Faced with these figures, it would seem that the way forward was to 600 ohms, however as with all things new they take time to penetrate and in fact given the choice complex impedances will grow and 600 ohms reduce. Work in ETSI STC/BT 2 has attempted to specify a single "harmonized" complex reference impedance for all TEs. This reference impedance is, however, generally the most reactive of all those specified and thus more difficult for some network operators to maintain their stability and echo limits. TC TE has suggested a harmonized complex impedance which is a reasonable compromise of the stated complex impedances and which permits a better management of the transition. There remains however some concern that the stated impedances cannot always be aligned with those that might be applicable for terminals in ITU-T Recommendation Q.552 [6] (further detail of the discussion can be found in subclause 6.4 and ETR 075- 3 [2]).

Unbalance about earth

This is a complex subject in which many parameters could be expressed (see CCITT Recommendation G 117 [7]), The only ones that affect the network operationally are those which cause a terminal to generate longitudinal signals. Those which cause a terminal to convert longitudinal signals into transverse signals and interfere with its own signals are considered to be a "quality" matter. The single biggest problem area is that of which types of apparatus should be subject to testing and the testing arrangement. Should apparatus which itself has no connection to earth or provision for earthing be subject to this test? Many countries specify that apparatus of whatever type should be placed on an earth plane. Depending on how stringent the requirements are the position of cords and in the case of telephones handset can cause apparatus to pass or fail (further detail of the discussion can be found in subclause 6.4 and ETR 075-3 [2]).

Series insertion loss

The prospect of harmonizing the requirement as a whole would have been high had it not been for the necessity to deal with national metering pulse frequencies. The best one could hope for is to harmonize into two groups one for 12 kHz and one for 16 kHz because it should not cause problems for countries which use neither of the above frequencies. However, it should not be overlooked that this may significantly increase the cost of producing terminals in those countries which do not use 12 kHz and 16 kHz meter pulses and in countries, which use 12 kHz or 16 kHz meter pulses, where either the lines do not have such pulses present or their are no terminals wishing to make use of the pulses.

Transmission levels

This set of clauses suffer significantly from ambiguity which arises from the structure and words used to exclude live speech telephony from the scope of these clauses. It is clearly desirable to exclude them from the scope of these clauses since if they are not large amounts of detail will need to be provided concerning the methods of measurement and the environment for measurement. All this is more properly suited to a standard on analogue telephony and this is currently being drafted within ETSI/STC TE 4. A simple statement in the scope or at the beginning of subclause 4.4.to say that "apparatus for use in conversational live speech is not subject to the requirements and tests of subclause 4.4" should suffice.

It is considered good practice to use CCITT methods of determining power levels wherever they are relevant. For "non-speech" apparatus, the methods suggested in CCITT Recommendation V.2 [9] are relevant and are embodied in the GB tests, while other apparatus (music on hold, answering machines, etc.) should use "mean speech power while active" as described in CCITT Recommendation P.56 [23], method B.

The present description of speech-band and out-of-band is not considered helpful since the speech-band for one country may not be the same as another. We would suggest that the ETS be amended to deal with levels in the band < 4 000 Hz and levels in the band > 4 000 Hz and a template (mask) provided for each range so that each country to describe its limits within that range.

Noise

Noise is specified in four clauses; two for the quiescent condition and two for the loop condition; for each condition the noise is specified as being in-band and out-of-band., it might be sensible again to split these in to < 4 000 Hz and > 4 000 Hz. Of these the loop condition "in-band" noise is considered to be a quality matter, and if it is required it should be dealt with in the terminal ETS otherwise the limit is as for normal signals. Assuming that all countries have the same purpose as that described in the relevant part of subclause 6.4, there seems no logical reason why the quiescent and loop condition requirements for above 4 000 Hz (out-of-band) should not be the same. This leaves the quiescent condition at less than 4 000 Hz (in band), there is some ambiguity in the expression of the requirement, however we believe its intent to be to limit the degradation of the signal to noise of a loop contribution TE by other quiescent state TEs connected to the same line. Whatever value is chosen clearly needs to reflect the lowest workable receive levels and the potential number of quiescent condition terminals.

Testing

Some aspects of harmonization of tests have already been discussed under the subjects of Unbalance about earth and transmission levels. It needs to be noted however that the choice of components which feed dc to the apparatus under test and isolate the testing apparatus from the dc can have a serious effect on the ability to accurately measure the actual parameters. A preliminary study has been performed and the findings detailed in ETR 075-3 [2].

7.4.4 Calling

Dial tone detection

The descriptions of the various dial tones are not particularly friendly. In general all tones should make it clear whether they are number of tones sent simultaneously or a single tone; whether they are cadenced and where the tone consists of more than one tone the relationship of one tone to another. For each tone sent the nominal frequency, the likely tolerance on the frequency received by the TE and the minimum level of that frequency need to be specified. Terminals will not only be connected to the public network but also to PABXs and hence perhaps to private networks, also when making calls internationally it is not unusual to encounter other (second) dial tones, when accessing the international network. It is clear that if any one administration specifies a tight tolerance for the insensitivity to detection of tones, then any terminal meeting those requirements making international calls or via private networks is increasingly less likely to be successful. There appears to be significant potential benefit in producing a harmonized set of tones which indicate unambiguously to the user, regardless of nationality how a call is progressing. Whilst doing this the needs of terminals which are dialling or answering automatically should not be overlooked.

Dialling

Two systems of sending network addresses to the PSTN are currently in common use. The first, decadic dialling, is highly dependent on type of exchange, is not particularly suited to sending information over an established call and is now considered by most countries to be obsolescent. The second, MFPB, has the advantage that it is capable of use to address services provided either internally or externally to the network, is fairly network independent and is capable of sending the information in substantially less time with the result that most calls are established fairly rapidly. Harmonization of decadic dialling is likely to require significant effort and such effort might also have a deleterious effect on the general availability of MFPB for use with "kiosk" and other services. For this reason and because we believe it will take far less effort, harmonization should be directed at MFPB.

The work on harmonizing MFPB should address its potential use as an end-to-end signalling system based on widely available "chip" technology, thus the collective levels and the levels with respect to each other will need to be considered and we recommend that #,*, 0-9 be the norm for keypads.

Switching after dialling

The requirement for switching after dialling in the current ETS is flawed, because there is no clear definition of when dialling is completed. It should be possible to harmonize this requirement using a time of 1 s -2 s in which case the instant of completing dialling is less crucial.

Auto calling

Auto-calling is a complex subject and this is over complicated in ETS 300 001 [3] because it attempts to deal with not only the auto establishment of calls but also to control their duration of a call, in some cases by specifying the circumstances in which the call should be cleared. It would be considerably simplified by having a separate Chapter or clause which defined the circumstances for clearing a call regardless of whether the terminal had been initiated the call or answered it.

ETS 300 001 [3] is further complicated because it attempts to deal with various different types of "automatic call". It is suggested that the ETS should be restructured so that the requirements for totally automatic, manual initiated, etc. are dealt with separately.

The values used for many of the parameters are there, for the most part, to reduce ineffective use of the network. As such, they are not directly related to the physical nature of the network, which should therefore permit sufficient latitude to negotiate harmonized values. The requirements dealing with call duration can generally be perceived as protecting the user from large bills due to calls remaining established (fail to clear) when no useful information is being sent, others might argue that it also protects the network operator since it is no benefit to be in dispute with your customer over a bill that they claim is wrong or they cannot pay. The earlier comments about latitude also apply to the timing and control of repeat call attempts, whose primary function is to constrain overload of network common equipment. Yet again, with goodwill, this should be harmonisable.

The control of the duration of a call is in most cases highly specific to one type of TE, as such seems inappropriate to an access standard, and requirements for clearing of the call are not as clear as perhaps they could have been. It is again suggested that call clearing is dealt with as a separate subject.

While it is obviously desirable that software which controls things like repeat attempts, time to answer, etc., should not be user adjustable, in practice such matters are difficult if not impossible to achieve. The users of telecommunications equipment will not generally adjust parameters where they have been set by suppliers unless instructions and facilities to do so are provided. There will, of course, always be the odd one that finds delight in breaking the code of software so as to change something. If this results in network harm, the network operator will soon identify this and take appropriate action.

7.4.5 Answering

Ringing signal reception

The requirements for ringing detector sensitivity also suffer from ambiguity, in that if interpreted literally the requirements only apply to apparatus which meets the requirements. It is far from clear why these requirements were not embodied in Chapter 3 along with the other requirements for the ringing signal.

The distinction between the different types of detector could be understood if some measurement of say acoustic output was implied, but otherwise there seems no logical basis for making any distinction. The ringing signals delivered by the network have fundamental frequencies of $16^{2/3}$ Hz, 25 Hz and 50Hz. If frequency remains as a parameter in the insensitivity there seems to be little prospect of harmonization, if however voltage is the main criteria (no specific frequency) then this will provide protection from induced and transient mains voltages, false operation as a result of network testing and perhaps decadic dialling of a parallel connected TE (bell tinkle).

One parameter which appears to have been overlooked is the linearity of the ringing detector which could result in distortion of transmitted voice band signals or a premature answer signal.

Auto-answering

The time to answering is currently expressed in seconds, it seems preferable to express such a requirement in terms of ringing cycles, since it should not be difficult for any terminal capable of auto-answering to count them. Our comments in subclause 7.4.2 about connection arrangements will generally have an effect on this clause and so the potential for any significant harmonization seems low until we have harmonized the connection method and "ringing detector".

From a human factors point of view, the answering signal produced by a TE should not replicate network tones or tones with a commonly recognised meaning.

Auto control of the loop condition.

For the most part these actually address situations under which a TE should clear. The requirements are expressed in such a way as to make them highly specific to a particular TE technology. It is not possible to specify a harmonized test because production of appropriate input signal and determining appropriate the results will be specific to one type of TE. We are of the opinion that the requirements could be re-written so as to address any network needs without being specific about the type of TE. Such requirements can then be applied to a TE initiating a call and a TE answering a call.

7.4.6 Power failure

The split of this paragraph appears to be far from logical. This is supported by most of the contributing nations who have simply repeated the information in both clauses. A more logical split is what happens when the power fails and what happens when it is restored. A problem remains however in the definition of "power failure". This Chapter also is a perfect example of a concise compliance statement and test that is unlikely to produce repeatable results.

7.4.7 Special functions

Register recall

The current test and, therefore, the values are believed to be based on national networks. As such this has an impact on the threshold currents which determine the start and finish of the timing. An alternative approach based on percentages or fixed values of currents could produce a harmonized solution. The current pre-break and post-break periods do not appear to have any purpose and so it would seem that they could be harmonized by deletion although a new different post-break requirement is probably necessary.

Meter pulses

The frequency and mode of application of such pulses is nationally specific. In some cases the meter pulses will only be provided on request while in others the provision is more widespread and can affect users whether they have need of them or not 12 kHz and 16 kHz seem to be the most common, with 50 Hz now tending to be obsolescent. There is a possibility, with goodwill, that the requirements and test for both 12 kHz and 16 kHz individually could be harmonized. There seems to be little point, however, in placing much effort in harnonising 50 Hz pulses.

Echo control

This is highly terminal specific, to the extent that even within the category of "non-speech terminals" or modems not all will wish to send such a tone. This is specified within the category II modem NETs and this should suffice. Harmonization by deletion is recommended.

Loop current detection

This applies to very few countries and appears to be used for two different purposes. The first is "privacy" so that two terminals cannot be in the loop condition on the same line simulataneously, and the second is to detect that a distant party has cleared by detecting a change of polarity or short loss of current. Clearly such disparate applications cannot be harmonized.

PSTN tone detection

The comments in subclause 7.4.4 regarding dial tone detection in general apply to all other tones. It would also be useful if the network provided a harmonized "release tone" when either party had cleared.

Detection of remote party signals

Again these signals are highly specific to certain types of TE and present considerable testing difficulties since many modern terminals will not continue sending for long unless they detect a compatible terminal at the other end of the connection. If the problems with clearing are addressed ,as suggested above, it seems possible that this requirement could be harmonized by deletion.

7.4.8 Testing

Many of the requirements and tests assume that discrete items will perform functions such as detection within terminal equipment. Such an approach is fraught with problems since for instance something within a terminal may detect a signal cause a flag to be set in software but never act on it. The terminal has, however, detected the signal and therefore should not fail the test. For all such requirements, the real criteria should be expressed in terms of some reaction to receipt of the signal which is observable outside the terminal normally at the line terminals. It is proposed that at least the clauses dealing with detection should be re-writen to reflect this. Special terminal software for test purpose should not be permitted.

It is clearly desirable that test methods should be harmonized as soon as possible, particularly to ensure a common understanding of the results expected and to give a common basis for setting requirement values. However, some people are unlikely to support change if they have already made significant investments in producing testers capable of testing to the current requirements.

It has come to our attention that CTS 5 is to start work (topic 1) on developing testing for ETS 300 001 [3]. There is concern that such work could in fact hinder further harmonization, since the proposals have longer timescales than the required ETSI work and CTS work on the current specification would tend to freeze existing methods.

There is a discussion on accuracy in ETR 075-3 [2], and this together with test uncertainty is probably more of a concern to ADLNB rather than ETSI. However, these subjects have significant impacts on the setting of requirement parameter values.

Further comments on the effects of the feeding bridge and the measurement of unbalance about earth along with a number of other issues can be found in ETR 075-3 [2].

The detail with which the tests are described need to permit testing by designers and suppliers using relatively unsophisticated apparatus to the extent that they can have a reasonable assurance that their apparatus complies with the relevant requirements before submitting it for approval.

7.4.9 Summary

Unclear requirement statements in the ETS have led to confused or incorrect answers from national administrations which as a result provide no clear basis for harmonization.

Community legislation is required to harmonize an operator's liability arising from faults on the network.

Some important clauses cannot be harmonized to any significant extent until National network differences are eliminated.

Many clauses cannot be substantially harmonized unless or until common connection rules are fixed by suitable regulation.

Any proposed harmonization needs to take into account the requirement to manage the transition from the current national requirements.

A common understanding of the scope of reserved speech services needs to be reached in order to determine the appropriateness of some requirements.

Test methods need to be harmonized before comparable requirement values can be determined.

The treatment of test uncertainty needs to be harmonized before common tolerance requirements can be determined.

Harmonization of test methods will cause significant costs to those many network operators that would need to generate these new requirement values.

Harmonization of test methods would be a valuable step forwards, greatly assisting the mutual recognition of test results.

Many requirements are terminal specific and should not be in ETS 300 001 [3].

8 Recommendations arising from the study

The recommendations below are a replication of those of ETR 075-1 [1] with the addition of some notes to provide further clarification. Where these recommendations are addressed to administrations, these should be considered as suggestions to the administrations as to how they might support the initiatives of the Commission in harmonizing the requirements for attachment to the PSTN. It is recognised that some administrations will consider that this ETR has exceeded its terms of reference in tackling some of these problems, but would ask them to recognise such suggestions for what they are, the identification of impediments to harmonization.

The development of a standard suitable for re-defining market entry rules and hence for regulatory use in a re-regulated European PSTN terminal equipment market hinges upon the resolution of a number of issues; this is not meant to imply that ETS 300 001 [3] as it stands cannot be used to sustain the existing (asymmetric) national terminal equipment markets. Tasks which might be undertaken to support market re-definition and to enable in part an orderly transition from the nationally-based markets of today to a single European-wide market environment concern the refinement of the presentation of ETS 300 001 [3], the resolution of certain technical dilemmas, and the definition of procedures relating to techno-regulatory aspects of its legal application. Recommendations for action are set out in that order.

8.1 Recommendations concerning the structure and format of ETS 300 001

The document as a whole needs restructuring and reconsideration of its requirement and test text alongside a harsh review of the use of tables, technical simplification of the common text, and transfer of requirements concerning terminal equipment specificity to other more relevant standards. This is, of course, collective work which is perhaps suited in the main to be undertaken by an ETSI Technical Committee. In detail, it is recommended that:

Rec.1 The content be re-defined to include only those network access requirements and tests which are determined to be essential as defined in Article 4 of Directive 91/263.

The determination of essential requirements was the subject of an ETSI work item which was published as ETR 098 [24].

Rec.2 Procedures are defined which are likely to ensure that a common technical understanding of the purpose of each requirement is achieved and that a common understanding of the regulatory implications exists across Administrations.

This work may require a Project Team which can visit each Administration to ensure that the commonality of the understanding is complete.

Rec.3 Relevant common text be re-worded and cast in a way which is likely to limit national variations to parameter values alone.

The work of Recommendation 2 above may greatly assist in this endeavour.

Rec.4 Clear rules concerning the allocation of technical content to a requirement or to a test be set out and applied to the content of the common text.

The generation of a separate test standard as suggested in Recommendation 12 may assist in the application of such rules.

8.2 Recommendations concerning the context of ETS 300 001

It has been explained that the perception of market re-definition considered in conjunction with the existing type approval procedures by each Administration sets a context within which the technical nature of an Administration's responses are generated. For a standard to support a pan-European market, a common understanding of how that market is defined and regulated needs to exist, and there is a clear need for procedures to be set out which develop that understanding. Specifically, it is recommended that:

Rec.5 Administrations take steps to ensure that compliance testing is re-structured where required to make use of a common or European test method.

Recommendation 12 suggests the generation of a set of common tests which could preferably be grouped into a separate test standard.

Rec.6 Administrations arrange locally for a re-appraisal of their technical requirements which will match the common test methods.

8.3 Recommendations concerning the techno-regulatory environment

Even the most harmonized of standards cannot be used to support a pan-European market unless that market has a consistent legal and regulatory structure. It is therefore recommended that:

Rec.7 A highly-specific and technically simple definition of the technical nature and physical presentation and location of a PSTN network end be determined.

This definition is required with the highest possible priority in order to allow the work on harmonization to proceed with the required urgency

Rec.8 A clear set of definitions of network-provided services and how and where they are delivered to terminal equipment installations is defined.

Rec.9 Issues of second- and third-party legal liability either side of the network interface are clarified.

This clarification is necessary to harmonize the requirements for overload and power to the network. It also has implications on safety standards.

Rec.10 The legal issues concerning privacy rights of a user who makes use of an installation which may include multiple terminal equipments are clarified.

This affects connection arrangements and at present precludes harmonization in this area.

Rec.11 A workable method of maintaining the standard (both within ETSI and within Administrations) is set out.

Ownership of any new document, and a means of giving regulatory force to an amended NET will be required.

8.4 Recommendations for specific technical work

It is clear that a number of technical issues previously considered from a national point of view need to be reviewed in light of the European dimension. This implies in certain cases collective collaboration and perhaps action by appropriate ETSI Technical Committees. A possible framework for this work is illustrated in annex C. It is recommended that:

Rec.12 Having reached a common understanding of the purpose of each requirement, a common test method needs to be derived which fits this purpose.

This work needs to be be undertaken with the highest priority as generation of common requirement values will be depedant on it. The gathering together of the tests into a separate test standard may be a preferred means of dealing with the tests. Such a standard would assist in other analogue standards work.

Rec.13 The technical nature and extent of an installation which might connect to a network end be defined, and in particular:

- **a a common method for connecting the TE and its ringing detector be established;**
- **b a common approach to multiple terminal connection be agreed.**

A study will probably be necessary to determine possible solutions to some of these problems.

Rec.14 Studies be initiated within and across Administrations to determine the extent to which network parameters are able to support the development of a common dc characteristic. In the case of those Administrations with clearly defined technical impediment, a migration strategy needs to be determined for adopting in the medium term that common dc characteristic.

This is currently one of the most important factors currently precluding harmonization of ETS 300 001 [3]. It also has an impact on ONP.

Rec.15 Studies be initiated on a basis similar to Rec.14 above to determine:

- **a a common requirement for signal balance;**
- **b a common technical target for a reference speech-band impedance;**
- **c a common set of requirements for MFPB (DTMF) signalling. Such requirements should also address the potential use of MFPB as an end-to-end signalling system;**
- **d a common approach to the measurement of noise and signal power.**

Rec.16 Efforts be undertaken to simplify and to realign requirements for terminal equipment inteworking with the network, considering in particular the principal components which include:

- **a procedures for automatic answering;**
- **b procedures for automatic calling;**
- **c procedures for automatic call clearing;**
- **d network tone detection.**

Rec.17 A study be undertaken to specify and to set out migration procedures for adopting a consistent European-wide tone plan.

In this work it will be important to take into account the operation of automatic tone detectors as well as human factors considerations.

Annex A: Terms of Reference and Guidelines

TERMS OF REFERENCE FOR PROJECT TEAM 17 V

1 Reasons for proposing a Project Team: to examine the current prETS 300 001 and to identify the possibilities for further harmonization of values taking into account the cost and benefit. This will involve also consideration of relevant testing methods.

2 Consequences if not agreed: lack of harmonization of parameters and testing methods of Terminal equipment for PSTN.

3 Detailed description:

3.1 Subject title: Feasibility of harmonization of PSTN attachment standards.

3.2 Reference TC: TE.

3.3 Other interested TC: NA, BT, TM.

3.4 Duration: 9 months.

3.5 Target date for start of work: July 1991.

3.6 Necessary manpower: 18 man-months.

3.7 Context of the study: examination of feasibility of further PSTN requirements harmonization as set out in relevant Mandate previously accepted by the Technical Assembly.

3.8 Related activities in other bodies and necessary coordination of schedules: TRAC: current elaboration of regulatory framework; ETSI: other work underway in connection with PSTN Mandate.

3.9 Scope of the Terms of Reference and relevant study items: To execute relevant tasks identified in ETSI PSTN workshop final report.

3.10 Reference specification(s) and existing documents including member contributions: prETS 300 001.

3.11 Part of the ETSI Work Programme (EWP) for which the PT is required: To be defined.

3.12 Deliverables: A report analysing the feasibility and cost and benefits of further harmonization of values in prETS 300 001 and its testing methods.

Report of ETSI workshop on PSTN attachment standards

(14 - 15 March 1991)

Summary

The workshop noted that according to a Euro-strategies report, the European market for terminals for attachment to PSTN is growing at 10 % and shows no sign of falling.

The representatives of industry emphasised the cost of the present fragmented regulatory arrangement which includes a different regime in each country containing discriminative regulations, complex administration and lack of visibility.

Whilst different technical requirements in each country cause some difficulties, the major restriction on trade is caused by unnecessarily complex procedures.

The European Commission stressed the importance of the PSTN market. A mandate given to ETSI provides an opportunity to develop a strategy to further harmonize the PSTN access standards. The non-technical problems are being dealt with by the Terminals Directive and the ONP Policy related to PSTN.

As result of extensive discussion and analysis during the two-day workshop, a number of technical problems were identified which must be solved before a satisfactory harmonization of national requirements can be achieved.

Six drafting groups prepared reports on the discussions and these reports as amended and approved by the workshop are attached.

It was generally agreed that pr ETS 300 001 (candidate NET 4) should be implemented forthwith in order to gain practical experience of the results achieved so far.

A programme of on-going studies was proposed to define an architectural model for PSTN attachment standards (noting that a regulary model is also necessary), to identify and to define the PSTN terminations appropriate for the attachment of terminals apparatus and to specify the essential requirements for protecting the network and its users form harm.

An interim procedure will be required to provide a more open market in the short term.

It was also agreed that an important objective should be to identify and to standardise relevant PSTN terminations and to harmonize the basic access requirements as a target CTR for implementation in the longer term bearing in mind the trend towards the universal use of digital local exchanges.

The workshop proposed that a Steering Group should be established to manage and co-ordinate this programme.

ETSI Workshop, PSTN Attachment Standards 14-15 March 1991, Annex 2, Temp. doc. 17

ANALOGUE NETWORK PRESENTATIONS

A ROUTE TO HARMONISED ACCESS

It is accepted that the analogue PSTN subscriber lines will continue to be used as an access method for still many years to come.

Consequently, the analogue PSTN attached terminal equipment will continue to have a significant market position until the year 2000 at least.

The mutual recognition of conformity required by the draft council directive is based upon the timely availability of Common Technical Regulations (CTRs).

Consequently, the available NETs will have to reviewed in the light of the requirements of the new directive.

The Commission's view of draft NET 4 gives rise to the following remarks:

- The definition and cost justification of "no harm to the network" is not in harmony amongst the participating Administrations/PNOs;
- Many requirements have unnecessarily extensive national details preventing harmonization;
- Many requirements or associated tests can be re-stated in a different technical manner for the purpose of producing increased harmonization and at the same time ensuring the safety of the network.

These are problems that need to be solved, particularly to satisfy the Commission's and Industry's need to create an open market as soon as possible.

During the meeting, the strategy shown in Fig. 1 was proposed and was accepted as a reasonable basis on which to start work.

The activities are discussed under their titles:

USE NET4 NOW

It was agreed that further effort should not be expended on prETS 300 001 to try and harmonize it further. It was essential to gain experience by using it as it is now, so as to determine what flaws existed in the standard, the test methods and the approval process.

IDENTIFY/AGREE ESSENTIAL REQUIREMENTS

It is suggested that this work is restricted to identifying no more than the clause headings necessary to satisfy the essential requirements set out in the draft Directive as follows:

ESSENTIAL REQUIREMENTS

- User safety (in so far as this is not covered by the low voltage directive)
- Safety of employees of the public telecommunications network operators;
- Protection of the public telecommunication network from harm;
- Electromagnetic compatibility requirements (in so far as it is particular to telecommunications terminal equipment);
- Interworking with the network;
- Interworking via the network (in justified cases);

- Effective use of the radio frequency spectrum.

Before this can be done it is necessary to decide what aspects of network harm are to be considered essential. Is it considered to be just physical damage or does it include operational harm, economic harm or prevention of fraud? If operational harm is included it must be noted that essential requirements will be different for voice or non-voice equipment.

Before it is possible to quantify essential requirements it will be necessary to decide where the end of the network is and how complicated the end is allowed to be (e.g. how many sets are allowed in series/parallel).

It is necessary to define the end of the network for both legal and technical reasons. Where does the network operators responsibility end? Is the cable inside or outside the network? Is the installation wiring inside or outside the network? Where is the terminal interface for test purposes?

It is suggested that at first, only the standard analogue interface is dealt with.

Consideration of other presentations would delay the work. They could for the present be dealt with by ensuring visibility of existing national standards.

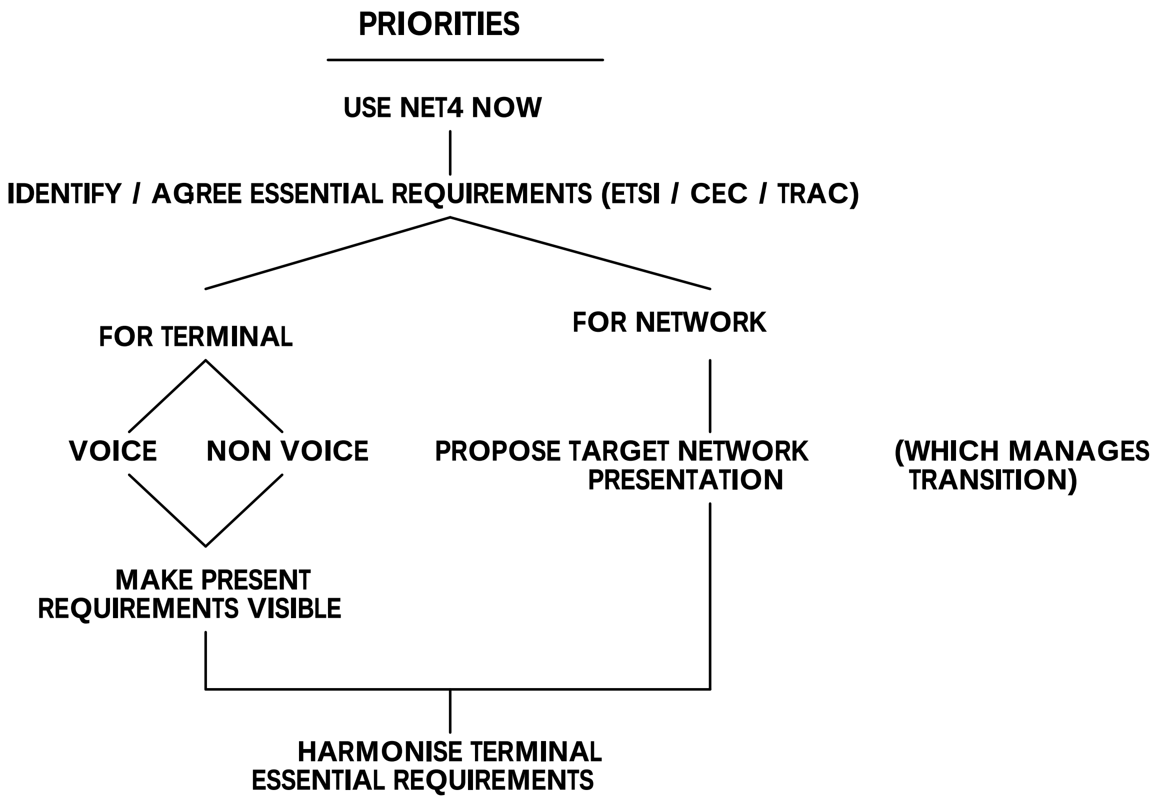
FOR TERMINAL, VOICE, NON VOICE

The next stage would be to define additional terminal specific requirements. This could be done by making those present requirements visible that are classified as essential.

This would provide working documents as rapidly as possible with the least possible effort.

HARMONISE TERMINAL ESSENTIAL REQUIREMENTS

This work can not be done until a harmonized network presentation is available. It is expected that a harmonized Target presentation can be derived by the parallel "for Network" activities shown in Figure 1.



Annex 1
PSTN FSG 1(91) 07

European Telecommunication
Standards Institute

Source: PSTN FSG

Title: Guidelines for PT 17V
(Mandate BC-T-167)

A. Task allocation

The project Team should, according to the expertise of its members, proceed through prETS 300 001 on a chapter-by-chapter basis, taking due note of relevant text in Chapter 10.

Priority should be given to the consideration of requirements in Chapters 2, 3, 4, 5, and 6, the content of Chapter 1 shall not be studied under this mandate.

The project Team shall consider each requirement and its associated test as a technical whole, and shall place as a priority the harmonization possibilities of tests and testing methods associated with each requirements.

B.

The core reference document for this project team's work is prETS 300001. Parts of TE(91)30 relevant to further harmonization should be taken into account. Tasks are set out to concern themselves with:

1. Out band access requirements (DC and signalling), chapters 2 and 3.
2 Pass-band access requirements, chapter 4.
3 Inter-operability requirements, chapters 5, 6, 7, and 9.

C.

In order to allow work to proceed without ambiguity, it is necessary clearly to define for the project team which technical content contained within prETS 300 001 is included in certain definitions. (This has significant bearing upon the extent to which harmonization might be studied and upon the related market-oriented cost-benefit analysis).

1. Network access: (out-band):

   For the purpose of this study, technical requirements included within the definition above are those which involve:

   a) Powering by the network of the TE(DC);
   b) use of the network-provided electrical excitation by the TE to signal to the network for loop seizure and clear only and to signal to the user an incoming call (DC, ac ringing).

2. Network inter-operability:

   For the purpose of this study, technical requirements included within the definition of "network inter-operability" are those which involve:

   a) use of network-provided electrical excitation by the TE:
      i) to signal to the network (network address required or invocation of special services)

      ii) to receive signals from the network and originating within the network other than out-band ac ringing (tax meter pulses, etc.)
   b) transmission to the network by the TE of pass-band signals for network addressing or invocation of special services.

3. Network access (pass-band):

   For the purpose of this study, technical requirements included within the definition above are those which involve:

   a) within the speech-band, the extraction of such energy (or power) from the network;
   b) within the speech-band, the application of such energy (or power) to the network.

D. Cost-benefit analysis:

The project team should approach this task incrementally (requirement to requirement) and set out briefly for each requirement the market consequences and network implications of:

1. removing the requirement form mandatory status;
2. further convergence of National variations;
3. leaving the requirement as it stands.

E. Network presentation (prETS 300 001 chapter 8):

The project team should not study the requirements concerned with the mechanical (plug/socket or fixed wiring) attachment of TE to the PSTN, and should not concern itself with adapters capable of providing a necessary and sufficient mechanical and electrical interface from each National network connection point to a common interface.

F. Deliverables:

Reports concerned with the implications of requirements convergence and harmonized testing methods should set out clearly:

1. The implications, Administration by Administration, of the above (tables or lists could be used);
2. Where appropriate, proposed common requirements;
3. Outlines of the technical studies and evaluations required to implement requirement convergence. Interim reports are expected, chapter by chapter, as the work proceeds (the findings of one chapter's work may have a bearing upon subsequent work).

Annex B: Cost benefit analysis

COST-BENEFIT ANALYSIS

1.0 GENERAL

PT17V has been given the task to examine the current text of prETS 300 001 for technical content in order to determine whether there is scope for more harmonization Whilst making this examination, the project team has been requested to make an analysis to determine the costs and benefits resulting from restating and restructuring the requirements and associated tests in a more harmonized form.

The document currently contains a statement from each Administration of those requirements it considers that terminal equipment should meet in order to attach to its national analogue interface together with a physical description of the presentation of that interface. It does not characterise directly the network itself.

2.0 COSTS AND BENEFITS

Changing presently stated terminal equipment requirements and the tests to determine whether they are met, has an effect on all members of the Telecommunications resource triangle of supplier, provider, and user. There will be costs to weigh against benefits. The relationship may not be linear. There are a number of second and higher-order effects which are or may be prominent.

The cost-benefit analysis of any one requirement is different for virtually every interest. Moreover, it is not possible to identify a particular cost-benefit analysis which cover all the parties involved. One is reduced to attempting to determine the various components contributing to the cost-benefit. It is not possible to quantify the total effect on the market of these separate components

Since the harmonization of standards is but one (perhaps minor) factor determining the overall effect of re-structuring the market, any cost-benefit analysis taking into account only that aspect is certainly not comprehensive and is likely to be at the least incomplete if not misleading.

3.0 BALANCES

There are a number of factors to be taken into account when determining on which side the balance falls when weighing the cost to any party against his benefit. The overall balance of the differing net cost-benefits to Supplier, Network Operator and User is probably impossible to quantify. It is necessary to recognise the complexity of the problem so as to avoid statements such as on the one hand "there is no point in harmonizing history", or on the other hand, "all harmonization must increase the market opportunity and hence be beneficial".

A list below gives examples of some of the more notable factors that affect the cost benefit analysis of the harmonization of the access requirements for telecommunications terminal equipment.

It should be noted that some of the entries in the columns may be difficult to quantify and some may be considered controversial depending on the perspective of the interest concerned.

COSTS	BENEFITS
<u>To Suppliers</u>	
Cost of writing standard	Benefit to those not taking part
Initial cost of change	Benefit of standard design
Likely increase in extra-European competition	
Possibility of insignificant saving	
<u>To Network Operators</u>	
Cost of network change	Possibly cheaper equipment
Loss of profit due to increased competition	Possibly increased business
Cost of writing standards	
Possible loss of national suppliers	
<u>To Users</u>	
Cost of scrapping obsolete equipment	Cheaper equipment
Possible loss of equipment quality	Possibly more facilities
Possible loss of national facilities	Portability throughout Europe
Possible loss of flexibility	
No perceived improvement in service	

4.0 CONCLUSIONS

The view of PT17V is that the assessment of the cost-benefit ratio arising from the factors above, and what that ratio might be for any number of market participants, requires resources and detailed knowledge that are not available to the Project Team.

It has therefore been decided, with the endorsement of STC TE5, to do no more than identify the most important factors that affect who benefits or loses, together with vague indications of the magnitude of their costs and benefits.

Whenever a clearer picture of a net monetary cost or benefit is required, then it is the belief of the Project Team that it would be more appropriate to seek information from those directly affected. This net effect cannot be deduced by the project team, and , it could be argued, should not be so deduced.

Annex C: A framework for further work

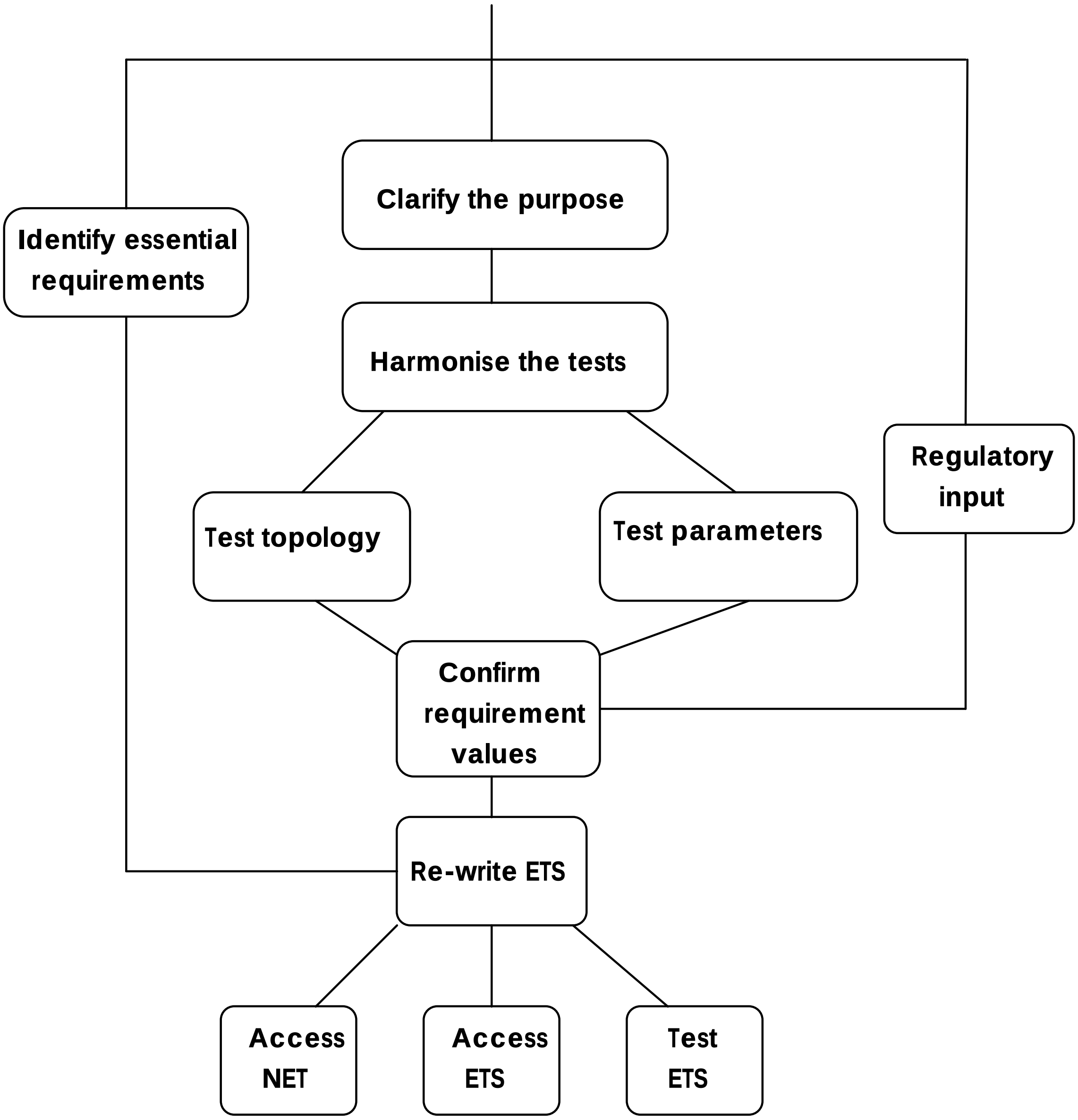


Figure C.1: Proposed framework for further work

Annex D: Manpower estimates

This annex contains an estimate of resource required

The work set out in annex C to produce a revised Access NET containing only essential requirements, a new ETS containing the voluntary requirements and a test standard.

If the work is undertaken by a similar method to ETS 300 001, and taking account of the lessons to be learned we may estimate the following effort will be required:

1 Clarifying the Purpose of the tests

Visiting 20 Countries, 10 man-days per visit (including travelling) would require 40 man-weeks of Project Team work

2 Rewriting of the common text of the NET:

2 meetings per Chapter (7) of 5 days each (including travelling) with 40 experts participating (on average) = 2800 man-days, ie approximately 13 man years of TE 5 effort.

If we assume 8 meetings per year then the elapsed time would be two years.

3 Harmonizing test requirements:

2 meetings per Chapter (7) of 5 days each (including travelling) with 20 experts participating (on average) = 1400 man-days, ie approximately 6 man-yearsof TE 5 effort .

If we assume 8 meetings per year then the elapsed time would be two years.

This work would need support from a Project Team to derive suitable test methods and provide draft input.

The effort required would be 2 man-weeks /test with 100 tests = 200 man-weeks.

4 Drafting work to support TE 5:

A Project Team for the drafting work on the output documents would require about 50 man-weeks.

5 Confirming requirement values:

The analysis and review in each country of the harmonized test proposals and the work of deriving new requirement values would probably require about two man/weeks per test. With approximately 100 tests and 20 Countries this would require about 90 man/years of National effort.

A Project Management Team to collect the results and chase the values would reqire approximately 30 man-weeks.

Totals

TE5 effort	Project Team	National
19 man-years	**220 man-weeks**	**90 man-years**

History

Document history	
December 1994	First Edition
March 1996	Converted into Adobe Acrobat Portable Document Format (PDF)