

## **2-wire analogue voice band interfaces; Multiple line terminal equipment specific characteristics**

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**Postal address**

F-06921 Sophia Antipolis Cedex - FRANCE

---

**Office address**

650 Route des Lucioles - Sophia Antipolis  
Valbonne - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C  
Association à but non lucratif enregistrée à la  
Sous-Préfecture de Grasse (06) N° 7803/88

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**Internet**

[secretariat@etsi.fr](mailto:secretariat@etsi.fr)

<http://www.etsi.fr>

<http://www.etsi.org>

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## Foreword

This Technical Report (TR) has been produced by ETSI Project Analogue Terminals and Access (ATA).

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## Introduction

The present process of harmonization of the 2-wire analogue voice band switched interface (traditionally PSTN) with TBR 21 [1], left opened the possibility of harmonizing some particular TE facilities. Multi-Line (ML) facilities is such a facility.

The present document was initially a tentative harmonization in the area of Multi-Line facilities implemented in a TE. It was nevertheless noted that such a tentative harmonization could be extended to 2-wire analogue voice band non-switched interfaces (leased lines, TBR 15 [2] and TBR 17 [3]) without major technical difficulties.

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## 1 Scope

The present document specifies the technical characteristics to be provided by a single Terminal Equipment (TE) which is intended for connection to a network via more than one 2- and 4-wire analogue voice band interface (private or public, switched or leased line network), insofar as they are particular to the Multi-Line facility.

NOTE: The present document specifies some characteristics which may be or not be relevant in terms of essential requirements as stated in Article 5 in Directive 98/13/EC [5], but which nevertheless is appropriate to consider in the design of MLTE. Each clause includes an investigation on how far could the corresponding technical characteristic influence the fulfilment of these essential requirements.

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## 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, subsequent revisions do apply.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

- [1] TBR 21: "Terminal Equipment (TE); Attachment requirements for pan-European approval for connection to the analogue Public Switched Telephone Networks (PSTNs) of TE; (excluding TE supporting the voice telephony service) in which network addressing, if provided, is by means of Dual Tone Multi Frequency (DTMF) signalling".
- [2] TBR 15: "Business TeleCommunications (BTC); Ordinary and Special quality voice bandwidth 2-wire analogue leased lines (A20 and A2S); Attachment requirements for terminal equipment interface".
- [3] TBR 17: "Business TeleCommunications (BTC); Ordinary and Special quality voice bandwidth 4-wire analogue leased lines (A40 and A4S); Attachment requirements for terminal equipment interface".
- [4] 91/263/EEC: "Council Directive of 29 April 1991 on the approximation of the laws of the Member States concerning telecommunications terminal equipment, including the mutual recognition of their conformity".
- [5] 98/13/EC: "Directive of the European Parliament and of the Council of 12 February 1998 relating to telecommunications terminal equipment and satellite earth station equipment, including the mutual recognition of their conformity".
- [6] ES 201 168: "Corporate telecommunication Networks (CN); Transmission characteristics of digital Private Branch eXchanges (PBXs)".

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## 3 Definitions and abbreviations

### 3.1 Definitions

For the purposes of the present document, the following definitions apply:

**Loop state:** The state where the TE draws sufficient DC current to activate the exchange.

**Multi-Line TE (MLTE):** A TE connected to a network via two or more similar or different TCP's.

**Network Termination Point:** The physical point at the boundary of an analogue presented network intended to accept the connection of a TE.

**Reference impedance  $Z_R$ :** A complex impedance made up of 270  $\Omega$  in series with a parallel combination of 750  $\Omega$  and 150 nF.

**Terminal Connection Point:** The point of the TE intended to be connected to the NTP.

**Terminal Equipment:** Equipment intended to be connected to the public telecommunication network; i.e.:

- a) to be connected directly to the termination of a public telecommunication network; or
- b) to inter-work with a public telecommunication network being connected directly or indirectly to the termination of a public telecommunication network;

in order to send, process or receive information.

The system of connection may be wire, radio, optical or other electromagnetic system.

NOTE: This definition is copied from the Directive 91/263/EEC.

**Quiescent state:** The state where the TE draws insufficient DC current to activate the exchange.

### 3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

MLTE	Multi-Line TE
NTP	Network Termination Point
TCP	Terminal Connection Point
TE	Terminal Equipment, subscriber equipment

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## 4 Generally applicable technical recommendations

### 4.1 Physical characteristics of the connection to a network

The physical characteristics of the connection to a network are presently considered as an essential requirement in order to ensure interworking with the network. This seems not to be appropriate when considering a MLTE, particularly if there is a great number of TCP's.

A clear dispensation of specific plug or socket system should be stated for MLTE.

**Recommendation:** The terminal equipment should provide one or more of the following connection methods:

- a) a connector as described in TBR 21 [1], subclause 4.2;
- b) a connector as described in TBR 15 [2], subclause 4.1 or in TBR 17 [3], subclause 4.1;
- c) a set of connection contacts (e.g. an insulation displacement connector or screw terminal block to which solid conductors with diameters in the range 0,4 mm to 0,6 mm can be connected, or a multi-way pluggable connector).

## 4.2 Crosstalk

Crosstalk could, if it is too high, can disturb voice or data traffic.

It seems impossible to harm a network at a NTP with signals flowing in other NTP because such high levels of signal would be necessary.

Mandatory crosstalk requirements are therefore not justified for prevention of harm to the network.

To disturb interworking between TE and the network, significantly stronger signals than are normally encountered would need to occur.

To disturb interworking between two TE via the network, significantly stronger signals than are normally encountered would need to occur.

It seems from the above not proportionate to include crosstalk requirements in a mandatory document.

NOTE 1: Crosstalk is depending not only from the TE, but also from the corresponding installation. For a MLTE itself, to create a set of conditions enabling the reproducibility of the tests, it is normally necessary to have the support from the manufacturer.

The following Recommendation applies only in the case where two or more TCP's can be used simultaneously for the transmission of independent signals. It is considered that a Recommendation is not necessary for other applications.

**Recommendation:** The crosstalk attenuation between two analogue TCP's, each terminated with the reference impedance  $Z_R$ , should be at least 64 dB when measured with a sinewave signal at 1 020 Hz applied to one of the TCPs at a level of 0 dBm or at a level 3 dB below the overload point of the MLTE as stated by the supplier whichever level is the lower. In the case of a 4-wire TCP the requirement is applicable between any Tx or Rx ports and any other Tx or Rx ports within any other TCP.

NOTE 2: During a voice band connection between two TCP's the present recommendation does not apply.

NOTE 3: ES 201 168 [6] give more detailed information on crosstalk performances.

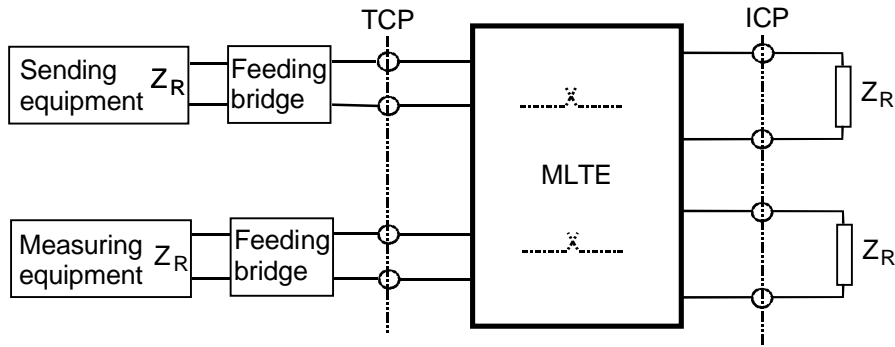
Non linear systems should present the same performance when tested with a stimuli specified by the manufacturer.

## 4.2A Test method

**Purpose:** To measure the crosstalk between two TCP's.

**TCP state:** The TCP's shall be in the loop state.

**Test configuration:** figure 1.



**Figure 1: Simplified measurement circuit for crosstalk between two TCP**

**DC feeding arrangement:** Feed voltage: 50 V, feed resistance: 2 050  $\Omega$ .

**Stimulus:** A sinusoidal test signal at the reference frequency of 1 020 Hz and at a level of 0 dBm shall be applied to one of the TCP's. The signal generator output impedance shall be  $Z_R$ .

**Monitor:** The power level at 1 020 Hz shall be measured at any other TCP with a suitable frequency selective level meter having an input impedance of  $Z_R$ .

**Verdict:** If the measured crosstalk attenuation is higher than 64 dB then Pass; else Fail.

**Guidance:** To limit the number of combinations which have to be measured to find the worst case of crosstalk it is necessary to examine the physical proximity and geographical relationship between all the interfaces.

## 4.3 Insulation between two TCP's

Excessive d.c. coupling between TCP's can adversely affect interworking functions such as seize and release, and can cause misoperation of functions such as remote line testing.

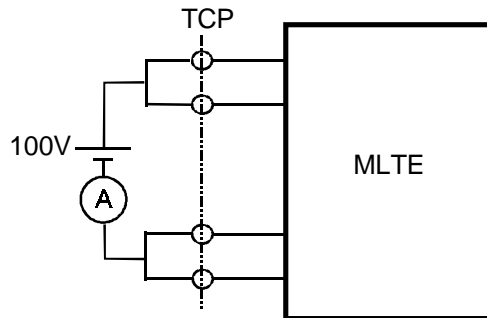
Control of the d.c. coupling is normally achieved by specifying the insulation resistance between two TCP's.

**Recommendation:** The resistance between any two TCP's should be equal or higher than 100 k $\Omega$  when tested with a d.c. voltage of 100 V. The output wires from each TCP should be short-circuit during the test. In the case of 4-wire TCP the recommendation is applicable between any Tx or Rx ports and any other Tx or Rx ports within the same or any other TCP.



### 4.3A Test method

- Purpose:** To measure the insulation between two TCP's.
- TCP state:** The TCP's shall be in the quiescent state.
- Test configuration:** figure 2.



**Figure 2: Measurement circuit for insulation between two TCP's**

- Preamble:** The output wires from the TCP's under test should be short-circuit during the test.
- Stimulus:** A d.c. voltage of  $U=100$  V shall be applied between two TCP's.
- Monitor:** Measure the current  $I$  and calculate the resulting resistance  $R=U/I$ .
- Verdict:** If the resistance is equal or higher than  $100\text{ k}\Omega$  then Pass; else Fail.

### 4.4 Traffic in switched lines

Degradation of the service supplied from the operator could occur if the amount of automatically generated traffic simultaneously to a large number of network lines is not considered.

This is nevertheless not to be handled by technical requirements or recommendations but should be solved in a case by case the contract between the operator and the service provider.

This should not be a mandatory requirement justified by any of the essential requirements as stated in Article 5 in Directive 98/13/EC [5].

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## History

<b>Document history</b>		
V1.1.1	August 1998	Publication