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Attachment requirements for terminal equipment interface**

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Foreword

This Technical Basis for Regulation (TBR) has been produced by the Business Telecommunications (BTC) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This TBR resulted from a mandate from the Commission of the European Community (CEC) to provide harmonized standards for the support of the Terminal Equipment Directive (91/263/EEC).

This TBR is based on information from ITU-T Recommendations and ETSI publications and the relevant documents are quoted where appropriate.

Introduction

The Council Directive on the application of Open Network Provision (ONP) to leased lines (92/44/EEC), concerns the harmonization of conditions for open and efficient access to, and use of, the leased lines provided over public telecommunications networks and the availability throughout the European Union (EU) of a minimum set of leased lines with harmonized technical characteristics.

The consequence of the Directive is that telecommunications organizations within the (EU) shall make available a set of leased lines between points in these countries with specified connection characteristics and specified interfaces.

Two classes of standard will be used for the interfaces of terminal equipment designed for connection to the ONP leased lines. European Telecommunication Standards (ETSS), which are voluntary, give the full technical specifications for these interfaces, whereas Technical Basis for Regulations (TBRs) give the essential requirements under the Second Phase Directive (91/263/EEC) for attachment to the leased lines. This TBR is a subset of the corresponding ETS 300 453.

CCITT Recommendations M.1020 (1988) and M.1040 (1988) are used as the basis for the leased line standards to which this terminal attachment requirement TBR relates.

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1 Scope

This Technical Basis for Regulation (TBR) specifies the attachment requirements and corresponding test principles for a terminal equipment interface intended for connection to the network termination points of Open Network Provision (ONP) ordinary quality or special quality voice bandwidth 4-wire analogue leased lines defined by ETS 300 451 and ETS 300 452.

The term "attachment requirements" in the context of this TBR describes the essential requirements for access which have to be fulfilled under articles 4(c) to 4(f) of the Second Phase Directive (91/263/EEC). Conformance to these requirements does not guarantee end-to-end interoperability.

This TBR is applicable to all interfaces designed for connection to the ONP ordinary quality or special quality voice bandwidth 4-wire analogue leased lines. It covers the essential requirements for the physical and electrical characteristics of the terminal equipment interface.

Customer premises wiring and installation between the terminal equipment and the Network Termination Point (NTP) are outside the scope of this TBR.

2 Normative references

This TBR incorporates by dated and undated reference, provisions from other publications. These normative 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 TBR only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- [1] EN 28877 (1989): "Information processing systems - Interface connector and contact assignments for ISDN basic access interface located at reference points S and T".
- [2] ITU-T Recommendation P.56 (1993): "Objective measurement of active speech level".
- [3] ITU-T Recommendation P.64 (1993): "Determination of sensitivity/ frequency characteristics of local telephone systems to permit calculation of their loudness ratings".

NOTE: This TBR also contains a number of informative references which have been included to indicate the sources from which material has been derived, hence they do not have an associated normative reference number. Details of these publications are given in annex C. In some cases the same publication may have been referenced in both a normative and an informative manner.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this TBR, the following definitions apply:

leased lines: The telecommunications facilities provided by a public telecommunication network that provide defined transmission characteristics between network termination points and that do not include switching functions that the user can control, (e.g. on-demand switching).

Network Termination Point (NTP): All physical connections and their technical access specifications which form part of the public telecommunication network and are necessary for access to and efficient communication through that public network.

reference impedance Z_R : This is 600 Ω . See also subclause A.1.3.

terminal equipment : Equipment intended to be connected to the public telecommunication network; i.e.:

- to be connected directly to the termination of a public telecommunication network; or
- to interwork 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.

voice bandwidth: the band of frequencies over the range 300 Hz to 3 400 Hz.

3.2 Abbreviations

For the purposes of this TBR, the following abbreviations apply:

ac	alternating current
dc	direct current
DTMF	Dual Tone Multi-Frequency
EMC	ElectroMagnetic Compatibility
NTP	Network Termination Point
ONP	Open Network Provision
P_m	Sound pressure at the mouth reference point (used in the calculation of SLR)
rms	root mean square
RX	Receive is a signal input at either the terminal equipment or the test equipment
SLR	Sending Loudness Rating
S_{mJ}	Sending sensitivity (used in the calculation of SLR)
S_{mJn}	Sending sensitivity at frequency f_n (used in the calculation of SLR)
TNV	Telecommunications Network Voltage (see EN 60950 subclause 3.4)
TX	Transmit is a signal output at either the terminal equipment or the test equipment
W_{sn}	Sending weighting factor (used in the calculation of SLR)
Z_R	Reference impedance
Z_T	Terminating impedance

4 Requirements

4.1 Physical characteristics

Justification: Without a means of connection, it is impossible for the terminal equipment to connect to the network, therefore this is included in order for the terminal equipment to interwork with the network (article 4f).

Requirement: The terminal equipment shall provide one or more of the following connection methods:

- a) an 8-contact plug of the type specified in EN 28877 [1] with contact assignments as specified in table 1;
- b) 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 may be connected;
- c) a wiring arrangement connected by any means to the terminal equipment, with unterminated solid wire conductors with diameters in the range 0,4 mm to 0,6 mm at the distant end from the terminal equipment.

Where a) and c) are provided, these may be detachable by the user such that only one is connected to the terminal equipment at any one time.

NOTE: The normal presentation of the leased line is by means of a socket.

Table 1: Contact assignment

Contact number	Terminal equipment
1	Unused
2	Unused
3 & 6	Transmit pair (Output port)
4 & 5	Receive pair (Input port)
7	Unused
8	Unused

NOTE: The transmit pair is the output from the terminal equipment. The receive pair is the input to the terminal equipment as shown in figure 1. Where the terms "output" and "input" are used without qualification in this standard, they refer to the terminal equipment interface.

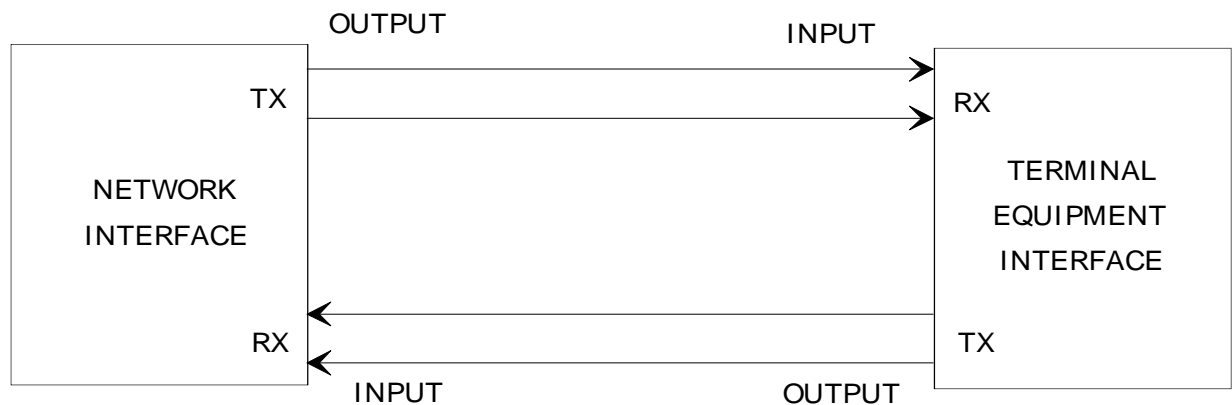


Figure 1: Leased line configuration conventions

Test: There shall be a visual inspection that one or more of the connection methods are provided. The contact assignments and connection methods are tested indirectly through the tests in annex A.

4.2 Electrical characteristics

The requirements of subclause 4.2 apply only in the intended operating state of the terminal equipment.

4.2.1 Longitudinal conversion loss

Justification: Certain networks may have high longitudinal signal levels (e.g. 65 volts rms). A longitudinal conversion loss is specified in order to prevent these longitudinal signals being converted into transverse signals which may cause harm to the network, article 4(d).

Requirement: The longitudinal conversion loss of the input and output ports of the terminal equipment interface shall be greater than or equal to the values given in table 2 and figure 2.

NOTE: The longitudinal conversion loss specifies the unwanted signal detected by the terminal equipment when a signal is applied equally to the terminals of the interface.

Table 2: Longitudinal conversion loss, minimum values

Frequency range	Minimum value
300 Hz to 600 Hz	40 dB
600 Hz to 3 400 Hz	46 dB

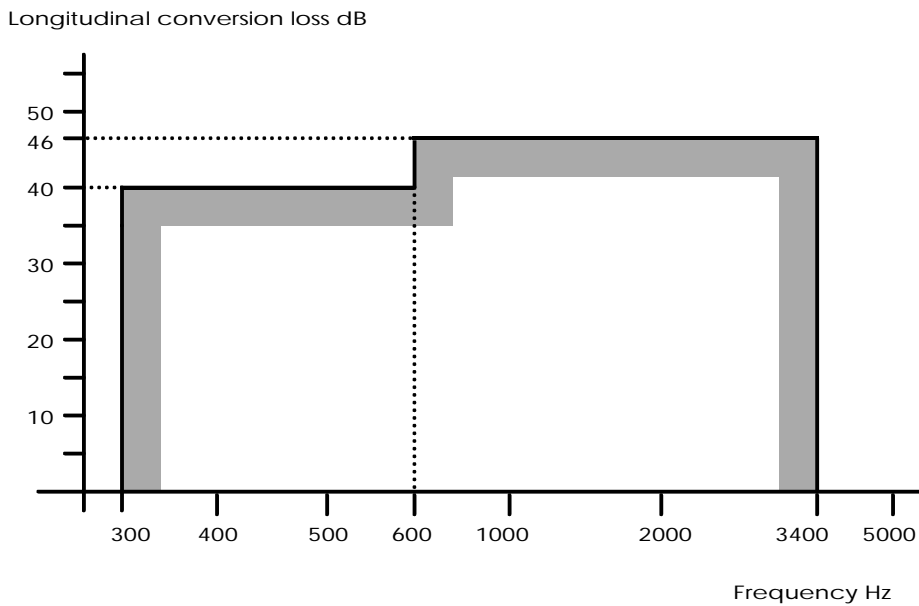


Figure 2: Longitudinal conversion loss, minimum values

Test: The tests shall be conducted according to subclause A.2.1.

4.2.2 Transmission signals

The source and nature of the output signal from the terminal equipment interface can be classified in several different ways thus dividing the terminal equipments into several, non-exclusive categories. One type of terminal equipment may therefore need to be treated as a member of more than one of the categories. The general categories requiring identification are defined as follows:

- a) any terminal equipment where an output signal is derived in real time from an integral acoustic interface. See subclause 4.2.2.1;
- b) any terminal equipment where the output signal is generated electrically within the terminal equipment. See subclause 4.2.2.2;
- c) any through connecting terminal equipment where the output signal is derived from another electrical interface. See subclause 4.2.2.3.

NOTE: Terminal equipments may belong to more than one category. A telephone may be in both category a) for telephony and category b) for the generation of Dual Tone Multi-Frequency (DTMF) tones. A function for generating synthetic or recorded speech or music, such as is found in answering machines or voice mail, is included in category b).

Justification: The public network may use equipment such as frequency division multiplexing equipment that may be affected by signals of excessive amplitude that cause line amplifiers that carry multiplexed signals to operate in a non-linear region resulting in major distortion to channels allocated to other users; the Sending Loudness Rating (SLR) (subclause 4.2.2.1.1), mean power (subclause 4.2.2.2.1) and instantaneous power (subclause 4.2.2.2.2) are therefore limited to prevent this distortion and harm to the network, article 4(d). The requirement to limit power in a 10 Hz bandwidth (subclause 4.2.2.2.3) is needed to prevent single tone interference to other connections. Such interference may arise through crosstalk in cables or through inter modulation effects in frequency division multiplexing equipment. Additionally, signal levels below the voice band (subclause 4.2.2.2.3) are limited to prevent interference with carriers and gain control signals with frequency division multiplexing equipment. It is not practical to limit the level of signals that originate from another interface on the terminal equipment and therefore there is no requirement on this category of equipment within this TBR (subclause 4.2.2.3).

4.2.2.1 Equipment with an acoustic input

4.2.2.1.1 Sending Loudness Rating

Requirement: The minimum SLR of the terminal equipment, when terminated with the reference impedance Z_R , shall be greater than or equal to -1 dB.

NOTE: The minimum SLR refers to the actual measured value rather than the nominal value, i.e. there is no tolerance on the specified value.

Test: The test shall be conducted according to subclause A.2.2.

4.2.2.2 Equipment with internally generated electrical signals

4.2.2.2.1 Maximum mean power

Requirement: The mean power level in the frequency range 200 Hz to 3 800 Hz in any one minute period shall be not greater than -13 dBm when the terminal equipment interface is terminated with the reference impedance Z_R .

Test: The test shall be conducted according to subclause A.2.3.

4.2.2.2.2 Maximum instantaneous power (peak voltage)

The maximum instantaneous power is expressed in terms of the peak voltage.

Requirement: The peak voltage from the terminal equipment interface shall not be greater than 1,1 volts over the frequency range 200 Hz to 3 800 Hz when the terminal equipment interface is terminated with the reference impedance Z_R .

Test: The test shall be conducted according to subclause A.2.4.

4.2.2.2.3 Maximum power in a 10 Hz bandwidth

Requirement: The maximum power within a 10 Hz bandwidth centred at any frequency within the frequency band 0 Hz to 4 300 Hz, and wholly contained within that frequency band, shall not exceed the limits given in table 3 and figure 3 when the terminal equipment interface is terminated with the reference impedance Z_R .

Exceptionally, when sending DTMF tones, the maximum power in a 10 Hz bandwidth between the frequencies 1 200 Hz and 1 700 Hz shall not exceed -7 dBm.

NOTE: Generally, DTMF tones will have a duty cycle of 50 % or less.

Table 3: Maximum power in a 10 Hz bandwidth

Points (see fig. 2)	Frequency range kHz	Maximum sending power dBm
	0,0	-37
A	0,03	-37
B	0,1	-20
C	0,3	-10
D	3,4	-10
E	3,8	-19
F	4,3	-44
NOTE: Limits for intermediate frequencies are found by drawing a straight line between the break points in table 3 on a logarithmic(frequency) - linear (dB) scale.		

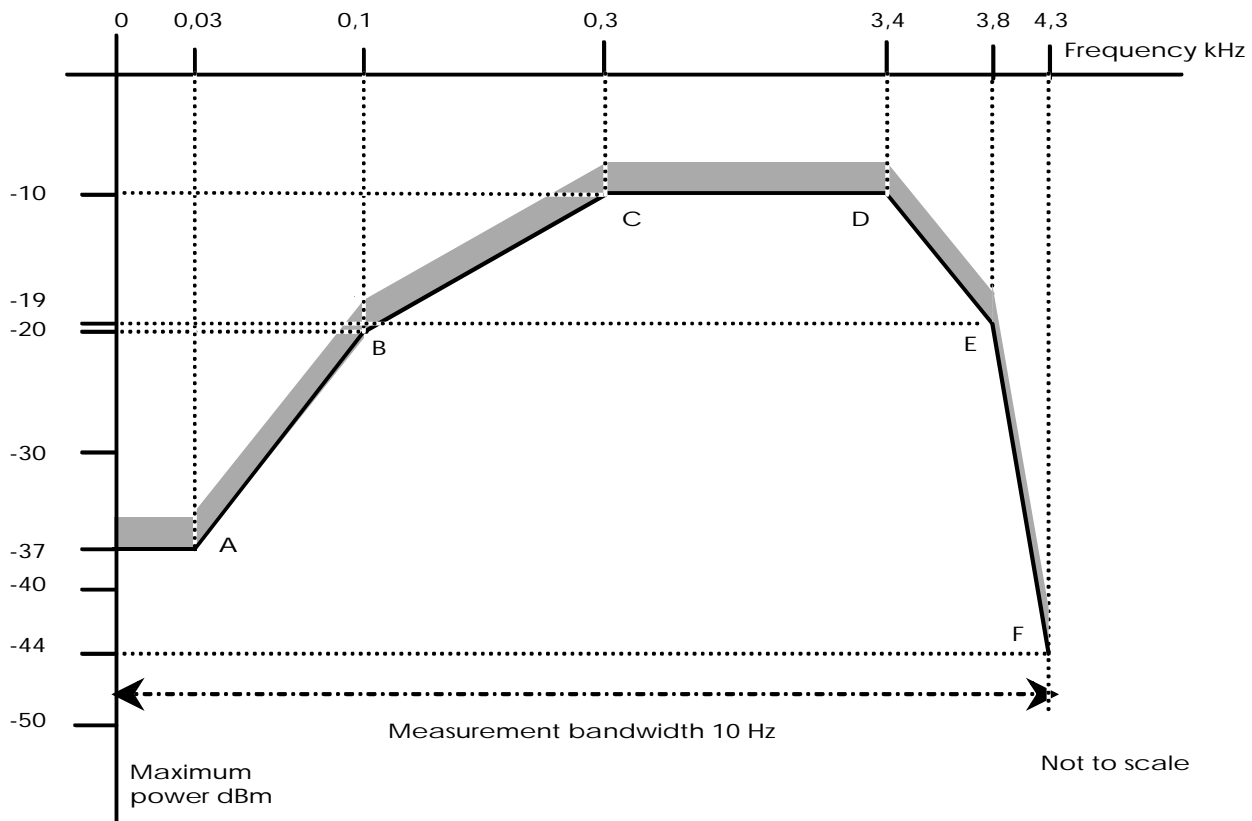


Figure 3: Maximum power in a 10 Hz bandwidth

Test: The test shall be conducted according to subclause A.2.5.

4.2.2.3 Equipment with an electrical input

There is no requirement on the level of the output signal in the frequency range 0 Hz to 4 300 Hz where the output signal is derived from another electrical interface (e.g. by through connection).

NOTE: It is not practical to limit the level of signals that originate from another interface on the terminal equipment and therefore there is no requirement on this category of equipment within this TBR. It is recommended that the equipment supplier should indicate allowed input signal levels at other ports to which through connection is allowed.

4.2.3 Maximum sending power above 4,3 kHz

This requirement applies to all terminal equipments. Where the output signal from the terminal equipment is derived from an acoustic interface or an electrical interface, these interfaces shall be in their quiescent states.

Justification: Under article 4(d), in order to prevent harm to the network, it is necessary to limit the sending power above 4,3 kHz since outband power may cause interference to other channels or services (e.g. FDM equipment). Furthermore, out of band crosstalk may be caused in neighbouring pairs in a cable and then out of band crosstalk may be converted into in band crosstalk through aliasing in an analogue to digital converter that does not have adequate input filtering; thus in band crosstalk may be caused in other channels.

Requirement: The maximum sending power above 4,3 kHz, in a bandwidth defined in table 4 and wholly contained within the frequency range 4,3 kHz to 2 MHz, arising from normal operation of the terminal equipment when terminated with 120 Ω , shall not exceed the limits shown in table 4 and figure 4.

Exceptionally, (e.g. during the sending of DTMF signals) the level of single frequency components in the output spectrum may exceed the limits given in table 4 and figure 3 but shall not exceed -35 dBm per component.

NOTE 1: The terminating impedance of 120 Ω is chosen for the outband requirement as this is a better approximation to the impedance seen by the terminal equipment at these frequencies.

NOTE 2: "Normal operation of the terminal equipment" is defined in the test, see subclause A.2.6.

Table 4: Maximum sending power above 4,3 kHz

Points (see fig 4)	Frequency range	Maximum sending power in a specified bandwidth	Measurement bandwidth
G to H	4,3 kHz to 5 kHz	-29 dBm decreasing to -36 dBm	300 Hz
H to I	5 kHz to 7 kHz	-36 dBm decreasing to -46 dBm	300 Hz
J to K	7 kHz to 200 kHz	-41 dBm	1 kHz
L to M	200 kHz to 2 000 kHz	-45 dBm	10 kHz

NOTE: Limits for intermediate frequencies are found by drawing a straight line between the break points in table 4 on a logarithmic(frequency) - linear(dB) scale.

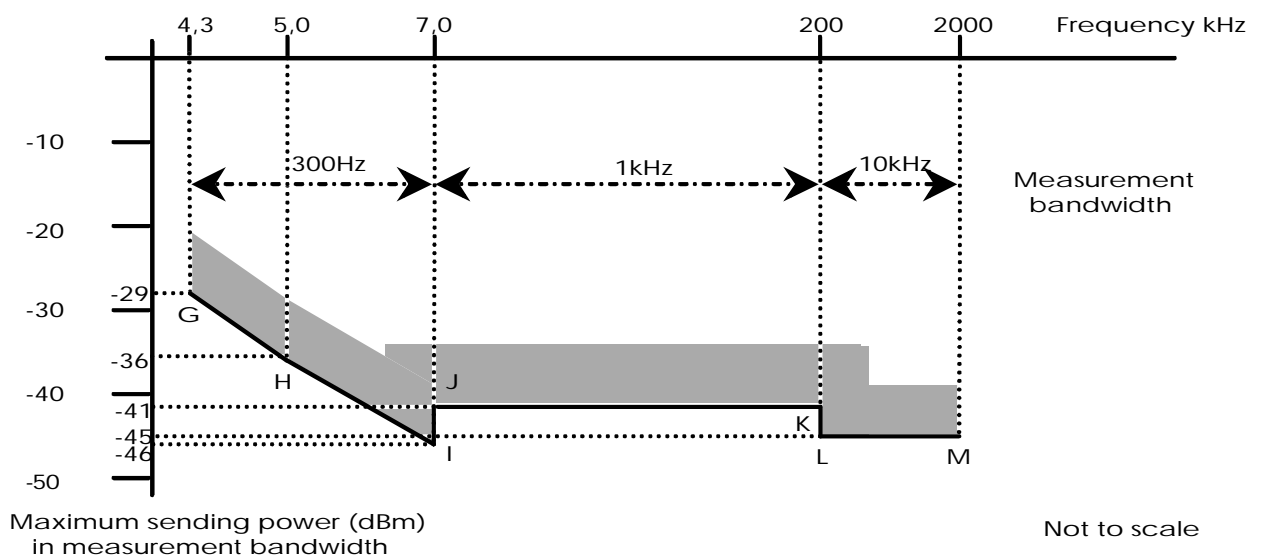


Figure 4: Maximum sending power above 4,3 kHz

Test: The test shall be conducted according to subclause A.2.6.

4.2.4 Power feeding

Justification: Power feeding is not allowed from the terminal equipment in order to prevent harm to the network, article 4(d).

Requirement: The terminal equipment interface shall not feed power to the network interface.

Test: The test shall be conducted according to subclause A.2.7.

4.3 Overvoltage protection

There are no overvoltage protection requirements under this TBR.

4.4 Safety

There are no safety requirements under this TBR.

NOTE: Safety requirements are imposed under the Low Voltage Directive (73/23/EEC) and articles 4a and 4b of the Second Phase Directive (91/263/EEC). Subclause 4.3 of ETS 300 453 defines the terminal equipment interface as a Telecommunications Network Voltage (TNV) circuit. Detailed requirements for TNV circuits are given in EN 60950.

4.5 ElectroMagnetic Compatibility (EMC)

There are no EMC requirements under this TBR.

NOTE: General EMC requirements are imposed under the EMC Directive (89/336/EEC). Requirements specific to terminal equipment will be added to this TBR when appropriate specifications become available.

Annex A (normative): Test methods

A.1 General

This annex describes the test principles to determine the compliance of a terminal equipment against the requirements of this TBR.

It is outside the scope of this annex to identify the specific details of the implementation of the tests.

A terminal equipment may be designed for through-connecting and may fulfil the electrical requirements only if through-connected. In these cases, the requirements of this TBR are valid and the tests are carried out with the through-connection terminated as specified by the manufacturer.

Details of test equipment accuracy and the specification tolerance of the test devices are not included in all cases. Where such details are provided, they shall be complied with, but the way they are expressed shall not constrain the method of implementing the test.

NOTE: Attention is drawn to the issue of measurement uncertainty which may be addressed in future documents. Not all the required test results make allowance for spurious events during testing (e.g. errors due to EMC effects), which may make it necessary to repeat a test.

The test configurations given do not imply a specific realization of test equipment or test arrangement or the use of specific test devices for conformance testing. However, any test configuration used shall provide those test conditions specified under "interface state", "stimulus" and "monitor" for each individual test.

The test equipment shall be a device, or a group of devices, generating a stimulus signal conforming to this annex and capable of monitoring the signal received from the interface.

A.1.1 Equipment connection

The tests in this TBR shall be carried out using the connection method provided in accordance with subclause 4.1. Where more than one connection method is provided, the testing shall be performed using the connection method preferred by the equipment supplier.

A.1.2 Test environment

All tests shall be performed at:

- an ambient temperature in the range +19 °C to +25 °C;
- a relative humidity in the range 5 % to 75 %.

For terminal equipment which is not designed to operate within the environmental range specified above, all tests shall be performed within the operational range specified by the supplier.

For terminal equipment which is directly powered (either wholly or partly) from the mains supply, all tests shall be carried out at a point within $\pm 5\%$ of the rated nominal voltage of that supply. If the equipment is powered by other means and those means are not supplied as part of the apparatus (e.g. batteries, stabilized ac supplies, dc), all tests shall be carried out within the power supply limit declared by the supplier. If the power supply is ac, the test shall be conducted within $\pm 4\%$ of the nominal frequency of that supplier.

A.1.3 Reference impedance

Where the test defines the use of the reference impedance (Z_R), this shall be a non-reactive resistance of $600\ \Omega \pm 0,25\%$.

A.1.4 Non-reactive termination

Where the test defines the use of a termination impedance (Z_T) of 120Ω , this shall be a non-reactive resistance of $120 \Omega \pm 0,25 \%$.

A.2 Test methods

One test may cover more than one requirement. The scope of each test is defined under the heading "purpose".

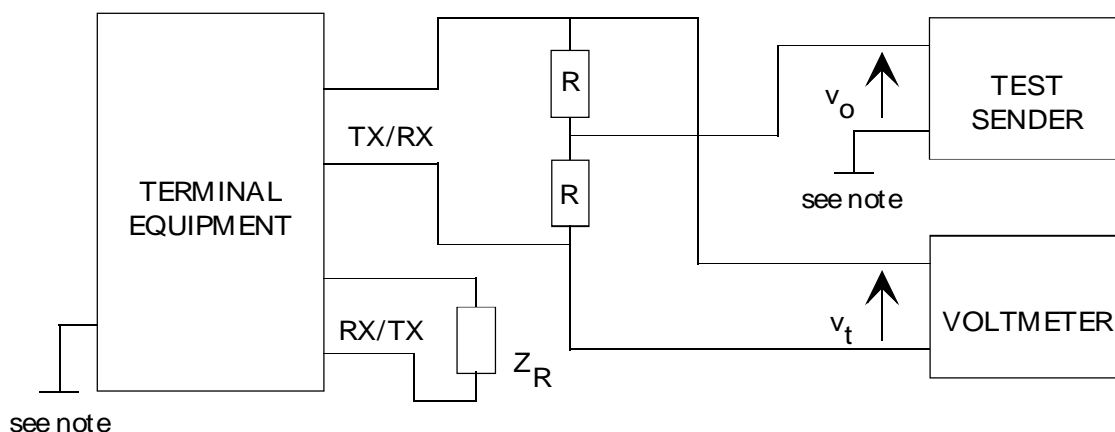
A.2.1 Longitudinal conversion loss

Requirement: See subclause 4.2.1.

Purpose: To measure the longitudinal conversion loss of both the input and output ports of the terminal equipment interface.

NOTE: The test is based on the method defined in CCITT Recommendation O.9.

Test configuration: Figure A.1.



The resistors R shall be $300 \Omega \pm 1 \%$ and matched to better than $0,1 \%$.
The test sender output impedance is not critical.

NOTE: This point shall be connected to the terminal equipment common reference point or test reference point. In the absence of such a connection point, this shall be a 1 m square copper plate upon which the terminal equipment shall rest.

Figure A.1: Longitudinal conversion loss

Interface state: Powered.

Stimulus: The test sender is swept through the specified frequency range with its output voltage V_o kept constant at 775 mV rms. Measurement of the longitudinal voltage V_t is performed with a suitable frequency selective level measuring instrument.

Monitor: The maximum value of V_t for both the input and output ports. These values are used to calculate the minimum value of longitudinal conversion loss from the equation:

$$\text{Longitudinal conversion loss} = 20 \log \left| \frac{V_o}{V_t} \right| \text{dB}$$

Result: The longitudinal conversion loss in dB of both the input and output ports shall be greater than or equal to the figures shown in table 2 and figure 2.

A.2.2 Sending Loudness Rating

Requirement: See subclause 4.2.2.1.1.

Purpose: To check the sending loudness rating of the terminal equipment. The test consists of the performance of a sending sensitivity test at various frequencies and calculating the SLR from the results of the test.

Test configuration: Figure A.2.

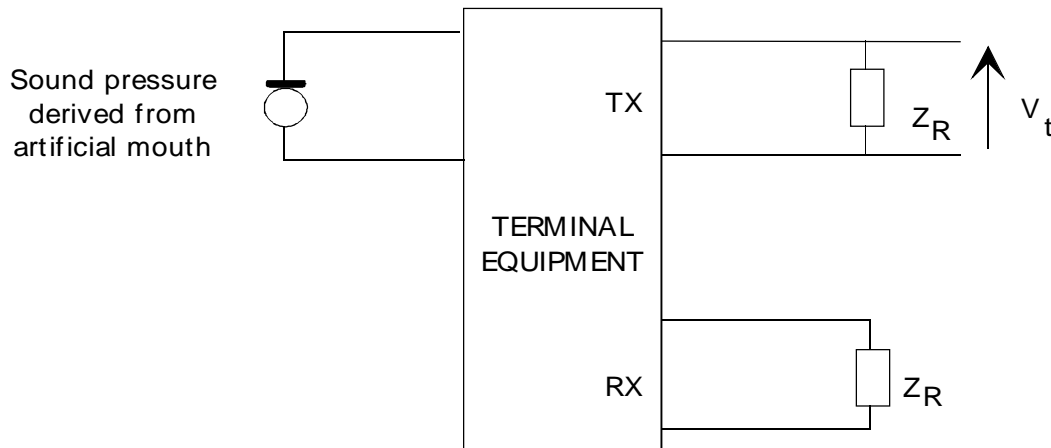


Figure A.2: Measurement of sending sensitivity

Interface state: Powered.

Stimulus: An acoustic signal at each of the frequencies shown in table A.1 and at a sound pressure level of -4,7 dBPa.

Monitor: The output voltage V_t measured at the fundamental frequency of the stimulus. The sending sensitivity S_{mJ} is determined using the method described in clause 9 of ITU-T Recommendation P.64 [3], and, where carbon microphones are involved, annex B of ITU-T Recommendation P.64 [3].

Result: The value of the SLR, derived as stated below, shall be in accordance with the requirement of subclause 4.2.2.1.1.

The sending sensitivity S_{mJ} at a specified frequency or in a narrow frequency band is expressed as follows:

$$S_{mJ} = 20 \log \frac{V_t}{p_m} \text{ dB, relative to 1 V/Pa}$$

where V_t is the voltage across the termination

and p_m is the sound pressure at the mouth reference point.

The SLR is derived from the measurements of S_{mJ} obtained at the 14 frequencies shown in table A.1 from the formula:

$$\text{SLR} = -\frac{10}{0,175} \log \sum_{n=1}^{14} 10^{0,0175(S_{mJn} - W_{sn})}$$

where W_{sn} is the sending weighting factor given in table A.1

and S_{mfn} is the measured sending sensitivity at frequency f_n .

Table A.1: Parameters required to calculate SLR

Item n	Frequency f_n Hz	Sending weighting factor W_{sn} dB
1	200	76,9
2	250	62,6
3	315	62,0
4	400	44,7
5	500	53,1
6	630	48,5
7	800	47,6
8	1 000	50,1
9	1 250	59,1
10	1 600	56,7
11	2 000	72,2
12	2 500	72,6
13	3 150	89,2
14	4 000	117,0

NOTE: The values of W_{sn} are taken from table 2 of ITU-T Recommendation P.79 and reduced by 0,3 dB to take into account the reduced measurement bandwidth.

A.2.3 Maximum mean power

Requirement: See subclause 4.2.2.2.1.

Purpose: To check the maximum mean power from terminal equipments where the output signal is generated internally within the terminal equipment.

Test configuration: Figure A.3.

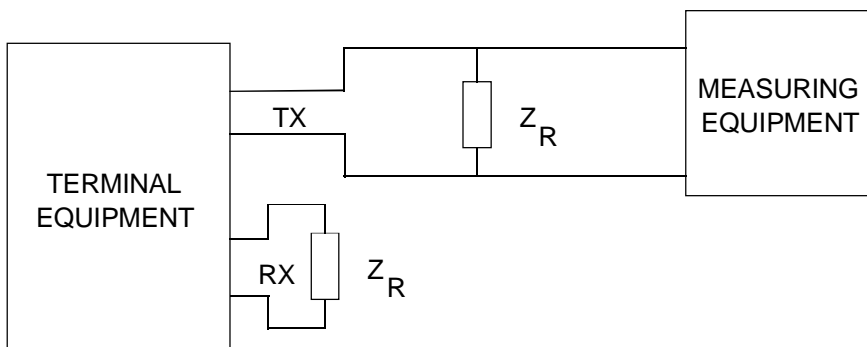


Figure A.3: Maximum mean power

Interface state: Powered.

Stimulus: Terminal equipment with adjustable output level is set up in accordance with the manufacturer's instructions for intended use, or, in the absence of instructions, is set to send at its maximum level. The terminal equipment is then operated in accordance with its intended use. For data equipment (e.g. modems), any output signal may be a test message consisting of a representative bit pattern or a scrambled signal.

For answering machines or similar equipment where the output is derived from recorded speech, any recorded signal shall have been prepared in accordance with the manufacturer's instructions for intended use.

Where a terminal equipment is transmitting DTMF tones, there shall be no more than 20 digits in each one minute period, with each digit being less than 500 ms duration and the digits separated by a period greater than 500 ms.

Monitor: The mean power level integrated over a one minute period. When measuring recorded or synthetic speech or music, the test shall be performed with a measuring instrument in accordance with ITU-T Recommendation P.56 [2], using method B.

Result: The maximum mean power in any one minute period shall not exceed the requirement defined in subclause 4.2.2.2.1.

A.2.4 Maximum instantaneous power (peak voltage)

Requirement: See subclause 4.2.2.2.2.

Purpose: To check the maximum instantaneous power, specified in terms of a peak voltage, from terminal equipments where the output signal is generated internally within the terminal equipment.

Test configuration: See figure A.4.

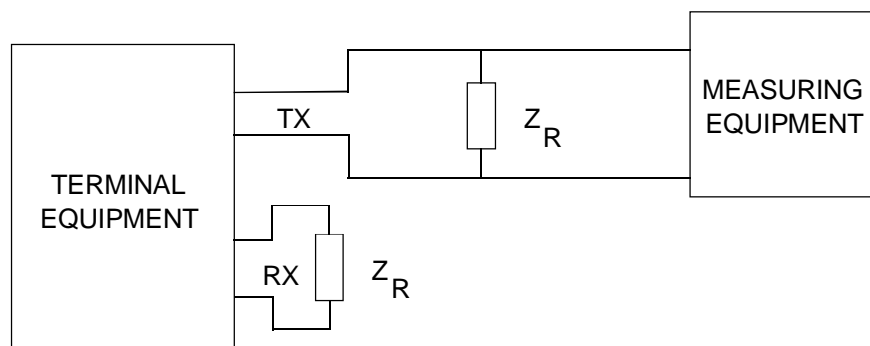


Figure A.4: Maximum instantaneous power (peak voltage)

Interface state: Powered.

Stimulus: Terminal equipment with adjustable output level is set up in accordance with the manufacturer's instructions for intended use, or, in the absence of instructions, is set to send at its maximum level. The terminal equipment is then operated in accordance with its intended use. For data equipment (e.g. modems), any output signal may be a test message consisting of a representative bit pattern or a scrambled signal.

For answering machines or similar equipment where the output is derived from recorded speech, any recorded signal shall have been prepared in accordance with the manufacturer's instructions for intended use.

Where a terminal equipment is transmitting DTMF tones, there shall be no more than 20 digits in each one minute period, with each digit being less than 500 ms duration and the digits separated by a period greater than 500 ms.

Monitor: The maximum instantaneous voltage level from the terminal equipment, using measuring equipment which has a rise time less than 50 μ s and a detection bandwidth of at least 200 Hz to 3 800 Hz.

Result: The maximum instantaneous voltage level shall not exceed the requirement defined in subclause 4.2.2.2.

A.2.5 Maximum power in a 10 Hz bandwidth

Requirement: See subclause 4.2.2.3.

Purpose: To check the maximum power in a 10 Hz bandwidth from terminal equipments where the output signal is generated internally within the terminal equipment.

Test configuration: See figure A.5.

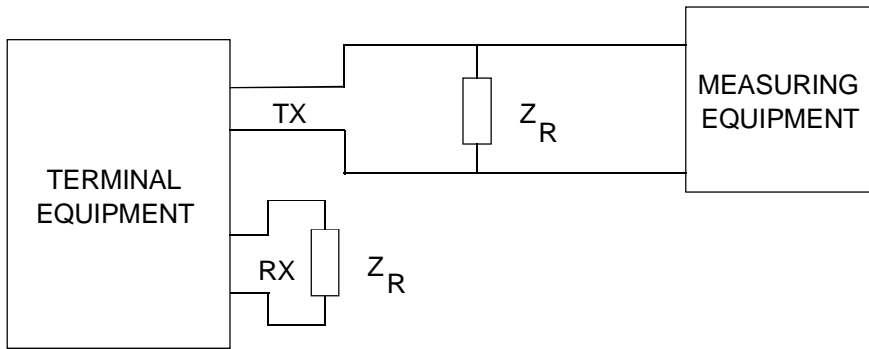


Figure A.5: Maximum power in a 10 Hz bandwidth

Interface state: Powered.

Stimulus: Terminal equipment with adjustable output level is set up in accordance with the manufacturer's instructions for intended use, or, in the absence of instructions, is set to send at its maximum level. The terminal equipment is then operated in accordance with its intended use. For data equipment (e.g. modems), any output signal may be a test message consisting of a representative bit pattern or a scrambled signal.

For answering machines or similar equipment where the output is derived from recorded speech, any recorded signal shall have been prepared in accordance with the manufacturer's instructions for intended use.

Where the terminal equipment is capable of sending DTMF tones, these tones shall be sent continuously where this is supported by the terminal equipment, otherwise DTMF digits shall be sent at the maximum rate allowed.

Monitor: The maximum power from the terminal equipment in a 10 Hz bandwidth at any frequency within the frequency band 25 Hz to 4 300 Hz and wholly contained within that frequency band. In the case of data equipment (e.g. modems), the maximum power shall only be measured during the data transfer phase.

Result: The maximum power in any 10 Hz bandwidth shall not exceed the requirements stated in table 3 and figure 3 of subclause 4.2.2.3. Exceptionally, when testing with DTMF tones, the maximum power in a 10 Hz bandwidth between the frequencies 1 200 Hz and 1 700 Hz shall not exceed -3 dBm.

A.2.6 Maximum sending power above 4,3 kHz

Requirement: See subclause 4.2.3.

Purpose: The test is used to measure the maximum sending power above 4,3 kHz, irrespective of where the output signal is derived from.

Test configuration: Figure A.6.

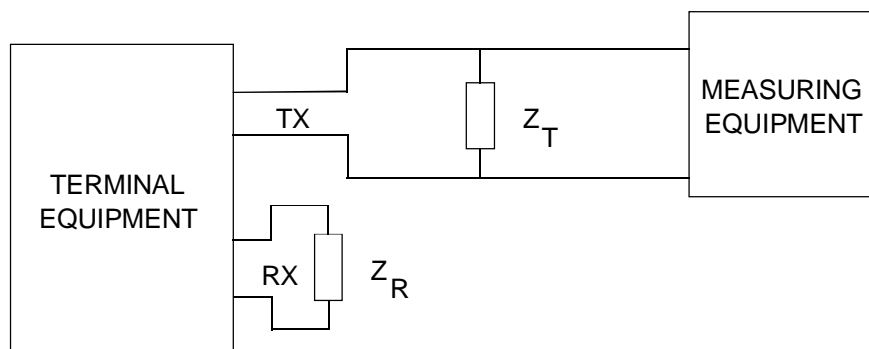


Figure A.6: Maximum sending power above 4,3 kHz

Interface state: Powered.

Stimulus: Terminal equipment with adjustable output level is set up in accordance with the manufacturer's instructions for intended use, or, in the absence of instructions, is set to send at its maximum level. The terminal equipment is then operated in accordance with its intended use. For data equipment (e.g. modems), any output signal may be a test message consisting of a representative bit pattern or a scrambled signal.

For answering machines or similar equipment where the output is derived from recorded speech, any recorded signal shall have been prepared in accordance with the manufacturer's instructions for intended use.

Where the terminal equipment is capable of sending DTMF tones, these tones shall be sent continuously where this is supported by the terminal equipment, otherwise DTMF digits shall be sent at the maximum rate allowed.

For terminal equipment where the output signal is derived in real time from an acoustic interface, the input signal to the acoustic interface shall be in a quiescent state.

For through connecting terminal equipment where the output signal is derived from another electrical interface, the input signal to the electrical interface shall be in a quiescent state.

Monitor: The power over the frequency range 4,3 kHz to 2 000 kHz across the terminating impedance (Z_T) of 120 Ω , using a bandwidth as specified in table A.2 which shall be wholly contained within the specified frequency range.

Table A.2: Measurement bandwidth for maximum sending power above 4,3 kHz

Frequency range	Measurement bandwidth
4,3 kHz to 7 kHz	300 Hz
7 kHz to 200 kHz	1 kHz
200 kHz to 2 000 kHz	10 kHz

Result: The maximum sending power above 4,3 kHz shall not exceed the limits shown in table 4 and figure 3. Exceptionally, (e.g. during the sending of DTMF signals) the level of single frequency components in the output spectrum may exceed the limits given in table 4 and figure 4 but shall not exceed -35 dBm per component.

A.2.7 Power feeding

Requirement: See subclause 4.2.4.

Purpose: To verify that the terminal equipment is not designed for power feeding by measuring the output current from the terminal equipment into a resistance of 300 Ω .

Test configuration: See figure A.7.

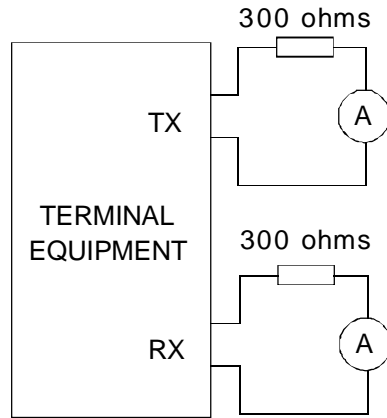


Figure A.7: Power feeding

Interface state: Powered.

Stimulus: None.

Monitor: The current through a resistance of 300 Ω connected to each pair.

Result: The current through 300 Ω shall be less than 1 mA.

Annex B (normative): TBR Requirements Table (TBR-RT)

Notwithstanding the provisions of the copyright clause related to the text of this TBR, ETSI grants that users of this TBR may freely reproduce the TBR-RT proforma in this annex so that it can be used for its intended purposes and may further publish the completed TBR-RT.

Table B.1: TBR-RT for attachment requirements for terminal equipment to 4-wire special and ordinary quality voice bandwidth leased lines (A4O and A4S)

TBR Reference		TBR 17		
Item	Reference	Requirement	Status (note 1)	Support (note 2)
1	4.1 (a)	8-contact plug to EN 28877 [1]	O.1	
2	4.1 (b)	Contacts for termination of solid wire conductors	O.1	
3	4.1 (c)	Unterminated solid wire conductors	O.1	
4	4.2.1	Longitudinal conversion loss	M	
5	4.2.2.1.1	Sending loudness rating	C1	
6	4.2.2.2.1	Maximum mean power	C2	
7	4.2.2.2.2	Maximum instantaneous power	C2	
8	4.2.2.2.3	Maximum power in a 10 Hz bandwidth	C2	
9	4.2.3	Maximum sending power above 4,3 kHz	M	
10	4.2.4	Power feeding	M	
NOTE 1: Status is "Mandatory", (M), "Optional", (O), or "Conditional", (Cx). For Conditional see table B.2. O.n indicates that one or more of the numbered options shall be provided from the set n.				
NOTE 2: The support column has been added to the requirements table so that the table may be used as an implementation conformance statement proforma. Support is Y (equipment claims to fully implement the requirement of the TBR) or N (equipment does not claim to conform to the requirement of the TBR).				

Table B.2: TBR conditions table

	Condition	Status	Support
C1	Does this interface transmit signals derived from an acoustic interface?	If YES then M else N	
C2	Does this interface transmit internally generated electrical signals?	If YES then M else N	

Annex C (informative): Bibliography

- 73/23/EEC: "Council Directive of 19 February 1973 on the harmonization of the laws of the Member States relating to electrical equipment designed for use within certain voltage limits". The Low Voltage Directive.
- 89/336/EEC: "Council Directive of 3 May 1989 on the approximation of the laws of Member States relating to electromagnetic compatibility".
- 91/263/EEC: "Council Directive of 29 April 1991 on the approximation of the laws of Member States concerning telecommunications terminal equipment, including the mutual recognition of their conformity".
- 92/44/EEC: "Council Directive of 5 June 1992 on the application of Open Network Provision to leased lines".
- CCITT Recommendation M.1020 (1988): "Characteristics of special quality international leased circuits with special bandwidth conditioning".
- CCITT Recommendation M.1040 (1988): "Characteristics of ordinary quality international leased circuits".
- CCITT Recommendation O.9 (1988): "Measuring arrangements to assess the degree of unbalance about earth".
- EN 60950 (1992): "Safety of information technology equipment including electrical business equipment".
- ITU-T Recommendation P.79 (1993): "Calculation of loudness ratings".
- ETS 300 451: "Business TeleCommunications (BTC); Ordinary quality voice bandwidth 4-wire analogue leased line (A4O); Connection characteristics and network interface presentation".
- ETS 300 452: "Business TeleCommunications (BTC); Special quality voice bandwidth 4-wire analogue leased line (A4S); Connection characteristics and network interface presentation".
- ETS 300 453: "Business TeleCommunications (BTC); Ordinary and special quality voice bandwidth 4-wire analogue leased lines (A4O and A4S); Terminal equipment interface".

History

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