
British Standard Specification for
**General requirements for apparatus for
connection to the British Telecommunications
public switched telephone network**

Foreword

This British Standard has been prepared under the direction of the Telecommunications Standards Committee. It forms one of a series of British Standards that are being produced following the commencement of liberalization in October 1981 of the supply of certain telecommunications apparatus within the United Kingdom.

This series of standards will include product standards giving particular requirements for individual items of apparatus together with standards covering general requirements for the connection of apparatus to the various networks of British Telecommunications. At the present time, these networks include the public switched telephone network, the telex network, the packet switching service and private circuits leased from British Telecommunications.

The requirements specified in the standards are intended to ensure that apparatus complying with them, when connected to British Telecommunications networks, will not adversely affect the network nor interfere with the service available to other users. The standards include safety requirements only for the protection of personnel operating the network and for the protection of users from hazards that arise from the connection of the apparatus to the network.

This standard specifies general requirements, part or all of which may be applicable to any apparatus for connection to the British Telecommunications public switched telephone network. It is not intended, however, to be used in isolation, and it should be used only in conjunction with the appropriate product standard. The product standard is expected to make reference to this standard together with any additional requirements that may be relevant only to that particular product. In exceptional cases, the general requirements of this standard may be varied in some respect by the requirements of the product standard. It is not expected however that any such variation should result in any adverse effect on the network or interference with the service available to other users to a greater extent than could occur by adherence to the requirements of this standard.

Attention is drawn to the fact that in December 1986 the requirements for transient voltages in 4.4.3.4 (b) will be withdrawn. In December 1987, the requirements for impedance of speech apparatus in 4.3.2.1 (b) and the requirements for impedance of non-speech apparatus in 4.3.2.2 (c) will be withdrawn.

In approving the standard, the Secretary of State may, at his discretion, stipulate variations of, or additions to, the requirements of this standard and may also set conditions that have to be complied with as regards the apparatus, or its connection, or use. A copy of the Secretary of State's approval will be included, when available, with all copies of this standard. Any further information on details of approval of this standard may be obtained from the Department of Trade and Industry, Room 510, 1-19 Victoria Street, London SW1H 0ET.

Some apparatus may incorporate facilities for which a mandatory standard is necessary, but for which no standard has yet been approved by the Secretary of State. Other apparatus may incorporate innovative features not foreseen when the relevant standard was written and approved and for which that standard is not fully appropriate. The BABS can sometimes deal with these cases by writing a 'Special investigation test schedule' (SITS) which has the effect of stating requirements where there is no approved British Standard or of supplementing or varying the requirements in the application of the approved British Standard. Information on any relevant SITS may be obtained from the Director, BABS.

Where this course is not possible, BT may nevertheless approve apparatus for connection to its networks and should be consulted directly as to its requirements.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Designation under section 22(6) of a Standard Specifying General Requirements for Apparatus for Connection to Certain Telecommunication Systems

DESIGNATION NO 84/003 S/R2

The Secretary of State hereby withdraws the Approval No 82/003 S/R1 dated 14 June 1983 given under section 16(1)(a) of the British Telecommunications Act 1981 which had effect as if it were a designation given under section 22(6) of the Telecommunications Act 1984 (hereinafter called "the Act") and designates the following as the standard to which apparatus defined in paragraph 2(iii) of this designation as "terminal apparatus" must conform if it is to be approved for connection to any of the following telecommunication systems (hereinafter called the "specified systems"):

- (i) any public telecommunication system run by British Telecommunications plc;
- (ii) any public telecommunication system run by Kingston-upon-Hull City Council;
- (iii) any Branch Telecommunication System;

and in paragraph 4 hereof specifies conditions which must be complied with in relation to the said terminal apparatus if it is to be regarded as conforming to the standard hereby designated.

2 In this designation:

- (i) "Branch Telecommunication System" means any telecommunication system which
 - (a) is not a public telecommunication system; and
 - (b) is run under a licence granted or having effect as if granted under section 7 of the Act which requires apparatus connected to, or comprised in it to be approved under section 22(1) of the Act; and
 - (c) is connected to a public telecommunication system run by British Telecommunications plc or by Kingston-upon-Hull City Council;
- (ii) "risk" means any factor arising out of the connection to any of the specified systems or the use of terminal apparatus which can reasonably be foreseen as being likely to cause:
 - (a) death, or personal injury to any person, or damage to the property of the person running any telecommunication system to which the apparatus is connected; or
 - (b) material impairment of the quality of any telecommunication service provided by means of any telecommunication system;
- (iii) "terminal apparatus" means apparatus for which the Secretary of State, or the Director General of Telecommunications in accordance with a consent or authorisation given by the Secretary of State, has designated a standard other than the standard designated in this designation or in designation number 84/002 S/R1 (or any variation thereof) made under section 22(6) of the Act but excludes:
 - (a) apparatus that has been, or is of a type that has been, approved or treated as being approved under section 22(1) of the Act before 1 February 1985; or
 - (b) apparatus connected at a particular place specified in the approval thereof to any specified system for test or development purposes in accordance with the terms of an approval under section 22(1) of the Act given by the British Approvals Board for Telecommunications, British Telecommunications plc, Kingston-upon-Hull City Council, the Secretary of State or the Director General of Telecommunications.

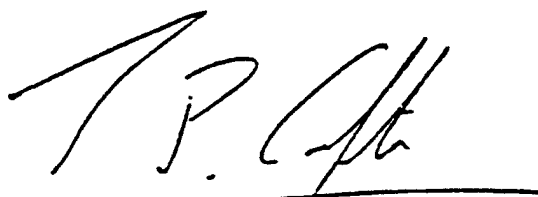
3 Without prejudice to any standard designated under section 22(6) of the Act to which any particular terminal apparatus must conform if it is to be approved, British Standard 6305: 1982 as published on 31 July 1982 as amended by Amendment Number 1 (published on 30 April 1984), and Amendment Number 2 (published on 31 August 1984) is hereby designated as a standard to which terminal apparatus must conform if it is to be approved, to the extent that:

- (a) the requirements of the standard referred to above form part of another standard designated by the Secretary of State under section 22(6) of the Act for that particular terminal apparatus; and
- (b) any deviation from compliance with the standard hereby designated does not give rise to a risk.

4 Terminal apparatus shall only be regarded as conforming to the standard hereby designated if the following conditions are complied with as regards that apparatus:

- (i) in the case of terminal apparatus which is required, under an Order made or having effect as if made under section 28 of the Act, to be marked to show whether or not it is apparatus approved under section 22(1) of the Act it conforms to a level of safety consistent with the United Kingdom's obligations under the European Communities' Council Directive No 73/23/EEC on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits;
- (ii) it is not used as extension apparatus to a payphone.

5 This designation will come into effect on 1 February 1985.



Date: 1 February 1985

J P COMPTON

An Assistant Secretary in the Department of Trade and Industry

The following note does not form part of this designation.

NOTE: British Telecommunications plc and Kingston-upon-Hull City Council require any person who connects any apparatus or systems to any public telecommunication system that they run to comply with the terms and conditions relating to the attachment of apparatus under which they provide service.

Contents

	Page		Page
Foreword	Inside front cover	6. Classification	9
Cooperating organizations	Back cover	7. Tolerances of components and physical quantities	10
Specification		Figures	
1. Scope	2	1. Simplified circuit of apparatus suitable for 3-wire connection	17
2. Abbreviations and definitions	2	2. Simplified circuit of apparatus suitable for 2-wire connection	17
3. Electrical network connection methods	2	3. Power spectral density limit above 3.4 kHz of the output signal from the apparatus	17
4. Electrical characteristics of apparatus	3	4. D.C. characteristics	18
5. Marking	8	5. Impedance reference network	19
6. Information to be provided by the supplier	8	6. Limits of power level in a 10 Hz bandwidth of the output signal from the apparatus	19
Appendices		7. D.C. excited test circuit	20
A. Methods of test	10	8. MF tone power levels	20
B. Physical network connection methods	13	9. Typical network connection points, showing BT wiring and jack sockets	21
C. Electrical characteristics of the network	13	10. Scheme of measurement circuit	21
D. Ringer equivalence number and ringing detector characteristics	16	11. Pulse detection circuits	21
Tables		12. Impedance balance test circuit	22
1. Coordinates of power spectral density limit curve	3	13. Reference source	22
2. Coordinates of d.c. characteristics upper limit curve	4	14. Artificial line segment, 0.1 km length	22
3. Coordinates of limit curves for power level in a 10 Hz bandwidth	6	15. Distribution of insertion loss	23
4. MF coding frequencies	7	16. Distribution of relative group delay	23
5. Coordinates of MF signalling tone power limits (area A)	7	17. REN test circuit	24
		18. Loop-disconnect timing diagram	24

British Standard Specification for

General requirements for apparatus for connection to the British Telecommunications public switched telephone network

1. Scope

This British Standard specifies general requirements for subscriber's apparatus for connection to the British Telecommunications public switched telephone network. This standard applies to apparatus for connection to exclusive lines. This standard applies to both speech and non-speech apparatus. This standard applies only to apparatus within the scope of a product standard approved by the Secretary of State under section 16(1) of the British Telecommunications Act (1981).

This standard specifies those requirements for the apparatus necessary for correct interworking with the network, in terms of the electrical characteristics of the apparatus and (in the main text and in appendices A and D) corresponding tests for compliance. This standard describes in appendix B the various methods available for physical connection of the apparatus to the network. This standard gives some guidance in appendix C on the conditions presented by the public switched telephone network for an exclusive line at its interface with the apparatus.

This standard applies to apparatus suitable for household, office and similar general indoor use. This standard does not apply to apparatus suitable as an extension to a payphone.

The tests described in this standard are type tests as defined in BS 4778 : 1979. The general conditions for the tests, both in the main text and in appendices A and D, are described in A.1.

NOTE. The titles of the publications referred to in this standard are listed on the inside back cover.

2. Abbreviations and definitions

2.1 For the purposes of this British Standard the abbreviations given in 2.2 apply, the definitions given in 2.3 apply and the notation given in 2.4 applies.

2.2 Abbreviations

2.2.1 BT. British Telecommunications.

2.2.2 PSTN. Public switched telephone network.

2.2.3 REN. Ringer equivalence number.

2.2.4 MF. Multi-frequency.

2.2.5 VA. Verbal announcement.

2.3 Definitions

2.3.1 **exclusive line.** An extension of the PSTN for application to apparatus that makes use of only one exchange connection, excluding shared service.

2.3.2 **basic network loop.** The two wires, designated 'A'

and 'B', that form the electrical extension from BT exchange equipment to the subscriber termination.

2.3.3 **reference instrument.** A BT telephone No. 8746 that is required to be used as part of some of the test circuits described in this standard and for which the relevant characteristics are specified in this standard.

2.3.4 **on-line.** The state of the apparatus where the subscriber termination has an electrical configuration that enables the current in the basic network loop to be at its maximum steady state value.

2.3.5 **off-line.** The state of the apparatus where the subscriber termination has an electrical configuration that enables the current in the basic network loop to be at its minimum steady state value.

2.3.6 **idle state.** A condition of the apparatus when it is off-line, that is, not in use, but excluding the ringing state.

2.3.7 **loop-disconnect signalling.** A form of signalling by the apparatus connected to the line, where the basic network loop is repeatedly interrupted by signalling pulses during which the current of the loop falls to a very low value.

2.3.8 **break period.** In loop-disconnect signalling, the period during which the current in the basic network loop falls to the lower of the two values used to represent signalling pulses.

2.3.9 **make period.** In loop-disconnect signalling, the period during which the current in the basic network loop returns to the higher of the two values used to represent signalling pulses.

2.3.10 **total pulse period.** In loop-disconnect signalling, the sum of one break period and one make period.

2.3.11 **pulse train.** A series of consecutive pulse periods determining a digit signalled to the network.

2.3.12 **inter-digital pause.** The interval between successive pulse trains or tone bursts in a series of digits.

2.4 Notation

2.4.1 **dBm.** Absolute power level with respect to 1 mW, expressed in decibels.

2.4.2 **dBmp.** Absolute psophometric power level (weighted for telephony) with respect to 1 mW, expressed in decibels.

NOTE. The notations dBm and dBmp and the descriptions are derived from CCITT Recommendation B.12.

3. Electrical network connection methods

3.1 3-wire connection

NOTE. A simplified circuit of apparatus suitable for 3-wire connection is shown in figure 1.

3.1.1 For apparatus suitable for 3-wire connection, ringing detectors shall not operate during loop-disconnect dialling. A shunt shall be connected between the 'A' wire and 'shunt' wire during the dialling period but the shunt shall be removed when the apparatus is off-line.

Compliance shall be checked by the test of A.2.

During the test of A.2, bell tinkle shall not be detected.

NOTE. The shunt referred to is typically a resistance of approximately 100 Ω .

3.1.2 When the apparatus is in the off-line condition, the additional capacitance between the 'B' wire and 'shunt' wire shall be not greater than $(25 \times \text{REN}) \text{ nF}$ where REN is the value of REN determined as described in D.1.

Compliance shall be checked by the test of A.3.

3.2 2-wire connection

NOTE 1. A simplified circuit of apparatus suitable for 2-wire connection is shown in figure 2.

NOTE 2. Apparatus making use of only the basic network loop connection (wires 'A' and 'B') cannot electrically suppress the ringing detectors of parallel-connected instruments.

Apparatus with loop-disconnect signalling, suitable for 2-wire connection and for use in an installation allowing for the parallel connection of a number of items of apparatus, shall be designated as 'apparatus that may cause bell tinkle' in such a way as to be obvious to the prospective user, by marking as specified in clause 5 and by a statement in the instructions for use provided with the apparatus.

Compliance shall be checked by inspection.

NOTE 3. BT recommend that future design should be based on the requirements of 3.1, but 2-wire connected apparatus will continue to be acceptable.

4. Electrical characteristics of apparatus

NOTE. Except where stated, the characteristics specified refer to a single item of apparatus connected to the network.

Attention is drawn to 4.5 concerning polarity.

4.1 Apparatus off-line: idle state

4.1.1 Insulation resistance. For apparatus with earth terminals or leads, the resistance between these terminals or leads when connected together and each lead of the apparatus designated for connection to the basic network loop shall be not less than 5 M Ω .

Compliance shall be checked by measurement with a 100 V d.c. source applied.

4.1.2 Loop insulation resistance and bleed current.

The current drawn by the apparatus in the off-line state from the network shall be not greater than $(30 \times \text{REN}) \mu\text{A}$, where REN is the value of REN determined as described in D.1.

Compliance shall be checked by measurement of the current flowing between the two leads designated for connection to the basic network loop, with a 50 V d.c. source applied in series with a 1500 Ω resistor, the measurement being made with, where applicable, the idle state signalling conditions specified in 4.4.4 disabled.

NOTE. BT do not guarantee that it will be possible in all present or future circumstances to draw this current from the network.

4.1.3 Impedance. The impedance between the two leads

designated for connection to the basic network loop shall be not less than 10 k Ω in the frequency range 300 Hz to 3400 Hz.

For apparatus with earth terminals or leads, the impedance between these terminals or leads when connected together and each lead of the apparatus designated for connection to the basic network loop shall be not less than 30 k Ω in the frequency range 300 Hz to 3400 Hz.

Compliance shall be checked by measurement, with a 1.0 V a.c. r.m.s. source applied.

4.1.4 Power level. The total idle state noise power level of the apparatus shall be not greater than -65 dBmp.

The power level of individual spectral components above 5 kHz shall be not greater than the limit given in table 1 and shown in figure 3.

The one minute mean power level in any 3 kHz bandwidth contained wholly above 5 kHz shall be not greater than the limit given in table 1 and shown in figure 3, for the centre frequency of the band.

The limit curve shall be determined by straight lines joining successive coordinates given in the table when power spectral density in dBm is plotted on a linear scale against frequency on a logarithmic scale.

Compliance shall be checked by measurement with the apparatus connected to a simulated network test circuit as described in A.6.

Table 1. Coordinates of power spectral density limit curve

Frequency	Power spectral density
kHz	dBm
3.4	-33
5.1	-40
8.9	-40
50	-70
10 000	-70

NOTE. The curve is shown in figure 3. The -70 dBm limit applies up to 10 MHz but is not shown on the graph.

4.2 Apparatus off-line: ringing state

4.2.1 Ringer equivalence number. The ringer equivalence number (REN) of the apparatus shall be not greater than the value marked on the apparatus.

Compliance shall be checked by determination of the REN of the apparatus as described in D.1.

NOTE 1. Where no REN is assigned as a result of the test, the apparatus does not meet the requirements of this subclause.

NOTE 2. The REN relates to the performance of the apparatus when used in combination with other items of apparatus. The REN is a customer guide indicating approximately the maximum number of items of apparatus that should be connected simultaneously to the line.

To determine the maximum number of items of apparatus that should be connected simultaneously to an exclusive line, the total REN obtained by summing the REN values of each of the items of apparatus connected to the exclusive line, should not exceed the maximum REN value of 4. This value includes any BT provided instrument each of which is assumed to have an REN value of 1.0 unless otherwise marked.

Because of the wide spread of ringing detector characteristics, a guarantee of successful operation in an installation of mixed types of ringing detectors may not be given by the supplier.

Typical ringing detector characteristics are described in D.2.

4.2.2 Restriction of signals sent to line. For speech apparatus, when a ringing detector is active the total power transmitted to line shall be not greater than -10 dBmp.

Compliance shall be checked by measurement as described in A.9.

4.3 Apparatus on-line: non-signalling state

4.3.1 D.C. characteristics. When the two leads designated for connection to the basic network loop are connected to a voltage source of 50 V d.c. in series with a 400 Ω resistor and a variable resistor, the steady state voltage measured at the terminals of the apparatus for values of current in the range 0 mA to 125 mA shall be not greater than the limit given in table 2 and shown in figure 4, and not less than zero.

NOTE 1. The duration of an undesignated interruption or random break in the d.c. path caused by the apparatus should not exceed 10 ms.

The limit curve shall be determined by straight lines joining successive coordinates given in the table.

Compliance shall be checked by measurement.

NOTE 2. For some kinds of apparatus, it may be appropriate for the lower limit of voltage to be greater than zero, in which case the values would be specified in the relevant product specification.

NOTE 3. Under the conditions specified, the values of voltage and current obtained are limited in practice by the 400 Ω load line.

Table 2. Coordinates of d.c. characteristics upper limit curve

Current	Voltage
mA	V
0	9
25	9
33.5	10
42	12.5
45	32
125	0

NOTE. The curve is shown in figure 4.

4.3.2 Impedance

4.3.2.1 For speech apparatus, the impedance shall meet one of the following requirements.

(a) For speech apparatus in impedance class (a), the return loss shall be not less than 12 dB, and the echo return loss shall be not less than 16 dB, both with respect to the network shown in figure 5, in the frequency range 200 Hz to 4000 Hz and in the apparatus current range described in the test of A.4.

Compliance shall be checked by determination of the return loss and echo return loss as described in A.4.

(b) For speech apparatus in impedance class (b), the return loss shall be not less than 12 dB, and the echo return loss shall be not less than 16 dB, both with respect to a resistance of 600 Ω , in the frequency range 300 Hz to 3400 Hz, and in the apparatus current range 25 mA up to and including 40 mA or the highest current value in the apparatus current range described in the test of A.4, whichever is the less.

The impedance of the apparatus shall have a resistive component in the range 140 Ω to 1000 Ω and a reactive component in the range -350 Ω to +350 Ω , in the frequency range 300 Hz to 3400 Hz and in the apparatus current range over 40 mA to the highest current value in the apparatus current range described in the test of A.4.

NOTE 1. This requirement does not apply where the highest current value in the apparatus current range described in the test of A.4 is less than or equal to 40 mA.

Compliance shall be checked by determination of the impedance, return loss and echo return loss as described in A.4.

NOTE 2. BT recommend that future design should be based on requirement (a).

NOTE 3. Requirement (b) will be withdrawn from this standard in December 1987.

NOTE 4. Selection of the appropriate impedance requirement (a) or (b), and the application of the corresponding compliance check on the part of the approval authority, is dependent upon the impedance classification determined by the supplier in accordance with the requirements of clause 6.

4.3.2.2 For non-speech apparatus, the impedance shall meet one of the following requirements.

(a) For non-speech apparatus in impedance class (a), the return loss shall be not less than 12 dB with respect to the network shown in figure 5, in the frequency range 200 Hz to 4000 Hz and in the apparatus current range described in the test of A.4.

Compliance shall be checked by measurement of the return loss as described in A.4.

(b) For non-speech apparatus in impedance class (b), the return loss shall be not less than 14 dB with respect to a 600 Ω resistive load, in the frequency range 200 Hz to 4000 Hz and in the apparatus current range described in the test of A.4.

The impedance of the apparatus shall have a reactive component not greater than +50 Ω , in the frequency range 200 Hz to 4000 Hz and in the apparatus current range described in the test of A.4.

Compliance shall be checked by measurement of the impedance and return loss as described in A.4.

(c) For non-speech apparatus in impedance class (c), the impedance of the apparatus shall have a resistive component in the range 400 Ω to 1000 Ω and a reactive component in the range -350 Ω to +350 Ω , in the frequency range 300 Hz to 3400 Hz and in the apparatus current range described in the test of A.4.

Compliance shall be checked by measurement of the impedance as described in A.4.

NOTE 1. Where a simple modem is used and where the apparatus is in impedance class (a), the return loss should be not less than 4 dB greater than the value specified in requirement (a) in order to minimize data errors. Similarly, where a simple modem is used and where the apparatus is in impedance class (b), the return loss should be not less than 4 dB greater than the value specified in requirement (b) in order to minimize data errors.

NOTE 2. Requirement (c) will be withdrawn from this standard in December 1987.

NOTE 3. Selection of the appropriate impedance requirement (a), (b) or (c), and the application of the corresponding compliance check on the part of the approval authority, is dependent upon the impedance classification determined by the supplier in accordance with the requirements of clause 6.

4.3.3 Earth impedance balance. For apparatus with an earth connection, the impedance balance about earth shall be not less than 46 dB in the frequency range 300 Hz to 3400 Hz.

Compliance shall be checked by measurement as described in A.5.

4.3.4 Signal balance about earth. For apparatus with an earth connection, signalling activities shall not cause excessive voltage unbalance.

Compliance shall be checked by the test of A.7.

The signal balance about earth, calculated from the test measurements, shall be not less than 46 dB.

4.3.5 Signal power presented to the network

(a) For fixed power level apparatus, the one minute mean power level shall be not greater than -9 dBm.

(b) For apparatus where the power level is adjustable, the one minute mean power level shall be not greater than 0 dBm. The range of adjustment shall include the value -13 dBm.

NOTE. For apparatus where the power level is adjustable, the level is set at the time of installation according to a procedure arranged with BT.

(c) For apparatus where the power level is adjustable, the means of adjustment shall meet one of the following requirements.

(1) For adjustable power level apparatus in adjustment class (1), the means of adjustment, whereby levels could be set above those set at the time of installation, shall be inaccessible without the use of a tool.

(2) For adjustable power level apparatus in adjustment class (2), the means of adjustment, whereby levels could be set above those set at the time of installation, shall be capable of being rendered inaccessible or inoperative by physical guards that are able to be released only by the use of a tool.

(3) For adjustable power level apparatus in adjustment class (3), the means of adjustment, whereby levels could be set above those set at the time of installation, shall be capable of being operated only after the release of software locks, the operation of which requires skill and detailed knowledge not available to the user of the apparatus by means of information provided by the supplier.

(d) The maximum power level in a 10 Hz bandwidth contained wholly within the frequency range 0 Hz to 3400 Hz shall be not greater than the upper limit given in table 3 and shown by the full line in figure 6, except for signals in area A and area C as given in table 3 and shown by additional dotted lines in figure 6, for which the following requirements apply.

Where a signal occurs in area A, it shall be accompanied by a signal or signals in area B, as given in table 3 and shown by additional dotted lines in figure 6, at a total power level not less than a level that is 12 dB below the power level of the signal in area A.

Where a signal occurs in area C, it shall be accompanied by a signal or signals in area B at a total power level not less than a level that is 12 dB below the power level of the signal in area C.

For apparatus where the power level is adjustable, the foregoing requirements for the maximum power level shall be determined with the power level adjusted for a one minute mean power level of -9 dBm, or the nearest lower value for which a setting is practicable.

Where there is no signal in area B, the total power in the frequency range 2220 Hz to 2340 Hz shall be not greater than -33 dBm.

The maximum value of instantaneous power shall be not greater than a level corresponding to that of a sine wave at 0 dBm.

The limit curves of table 3 shall be determined by straight lines joining successive coordinates given in the table.

(e) The power level of individual spectral components above 3400 Hz shall be not greater than the limit given in table 1 and shown in figure 3.

The one minute mean power level in any 3 kHz bandwidth contained wholly above 3.4 kHz shall be not greater than the limit given in table 1 and shown in figure 3, for the centre frequency of the band.

Compliance with the requirements of (a), (b), (d) and (e) shall be checked by measurement, with the apparatus connected to a simulated network test circuit as described in A.6. Compliance with the requirements of (c) shall be checked by inspection.

NOTE. The one-minute mean power level, the maximum power level, the maximum value of instantaneous power and the power level of individual spectral components referred to in this sub-clause, are determined by the methods of measurement described in A.6.

4.4 Apparatus on-line: signalling state

4.4.1 Repeat calls. The apparatus shall not be capable of making automatic repeat call attempts except where this is specified in the relevant product standard.

Compliance shall be checked by inspection.

4.4.2 Loop-disconnect signalling. For loop-disconnect signalling, the apparatus shall interrupt the basic network loop current so as to change it to a value not greater than 500 μ A in the following way.

(a) *Rate.* The rate of pulsing shall be 10 ± 1 pulses per second.

(b) *Ratio.* The break period shall be $67 +5, -4$ % of the total pulse period.

(c) *Overall timing*

NOTE 1. A loop-disconnect timing diagram is shown in figure 18.

(1) For a period of not less than 240 ms before the first break period of any pulse train, and not less than 28 ms after the last break period of any pulse train, the current drawn by the apparatus shall be either not less than the current normally in the basic network loop or not less than the current in the pulsing loop, whichever is the lower.

(2) For apparatus with an automatically controlled source of pulses, the effective inter-digital pause shall be not less than 720 ms.

NOTE 2. The effective inter-digital pause should not exceed 920 ms.

(3) For apparatus with a manually controlled rotary