



## **Specification PTC 200**

# **Requirements for Connection of Customer Equipment to Analogue Lines**

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New Zealand

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**RELATED TELECOM DOCUMENTS**

PTC 100	Permit to Connect (Telepermit): General Conditions
PTC 107	Technical Requirements for PABX external ports
PTC 220	Technical Requirements for Private Voice Networks connected to the PSTN
TNA 102	Telecom PSTN Analogue Interface
TNA 118	Telecom DDI Interfaces
TNA 151	Telecom Telephone Network Transmission Plan

Australian Communications Authority (ACA)/Australian Communications Industry Forum (ACIF)  
Standards:-

S 001:1991	Safety Requirements for Customer Equipment (Applicable only until July 2004)
S 002:1996	Analogue Interworking & Non-interference Requirements for Customer Equipment Connected to the PSTN
S 003:1992	Customer Switching Systems Connected to the PSTN
S 004:1996	Voice Frequency Performance Requirements for Customer Equipment
AS/NZS 60950	Safety Requirements for Information Technology Equipment including business equipment
AS/NZS 3260:1993	Safety Requirements for Information Technology Equipment including business equipment (Applicable only until July 2004)
BS 6312:1985	Specification for plugs to be used with British Telecom line jack units

## FOREWORD

The purpose of this Specification is to ensure that all new analogue Customer Premises Equipment (CPE) intended for connection to the Telecom network is compatible with that network.

In particular, the telephony performance of the Telecom PSTN in terms of “ease and clarity of conversation” is highly dependent on the achievement of optimum Loudness Ratings for the connected CPE. In turn, the ITU-T Recommendations for overall performance of the international network are satisfied only when the CPE used at both ends of the call is designed to match the network to which it is connected.

This Specification covers the minimum technical requirements for the grant of Telepermits for such CPE. In addition, this Specification covers a broad range of recommended parameters to assist those manufacturers who wish to exceed the stated minimum requirements. This Specification makes a clear distinction between these “mandatory” and “voluntary” performance requirements.

The coverage of this Specification includes the full range of analogue connected products from basic telephones, modems, facsimile machines, etc., to high value specialised devices, such as video phones, computer peripherals, etc.

Requirements for more complex equipment having analogue connections, such as larger PABXs, multiplexers, etc, together with digital (ISDN) devices are all covered in separate related specifications.

Although most types of analogue CPE are covered, telephony requirements are still very significant in network design because of the wide range of closely related transmission and signalling parameters which are involved. This Specification includes the revised Loudness Rating requirements announced in 2002. These will help to provide reasonable expectation that an acceptable quality of conversation performance will be achieved for virtually all direct exchange line connections likely to be encountered in the Telecom PSTN. This is especially important while the PSTN is progressively being converted to Voice over IP (VoIP) operation. During this period, calls will be carried over “mixed” circuit-switched and packet-switched networks.

Non-voice devices work satisfactorily over most analogue connections, but Telecom cannot guarantee operation over lines where voice communication is near its limit but still satisfactory.

This Specification includes provisions for key aspects only to be tested. Other aspects affecting performance indirectly or in only a few network situations are not a part of the formal test requirement for the grant of a Telepermit. Nevertheless, for reliable operation under all circumstances, these additional aspects need to be complied with.

The Telepermit system requires that suppliers accept responsibility for the quality and reliability of their products. The granting of a Telepermit is not an acceptance of such responsibilities by Telecom, nor is it an endorsement of that product by Telecom. It is simply a public statement that the product concerned may be lawfully connected to the Telecom network. Under New Zealand consumer legislation, suppliers have legal responsibilities to ensure that their products are suitable for their intended purpose. As such, they are responsible for ensuring that any conditions relating to the grant of a Telepermit are made known to their customers.



**TELECOM DISCLAIMER**

Telecom makes no representation or warranty, express or implied, with respect to the sufficiency, accuracy, or utility of any information or opinion contained in this Specification. Telecom expressly advises that any use of or reliance on such information is at the risk of the person concerned.

Telecom shall not be liable for any loss (including consequential loss), damage or injury incurred by any person or organisation arising out of the sufficiency, accuracy, or utility of any such information or opinion.

The grant of a Telepermit for any item of terminal equipment indicates only that Telecom has accepted that the item complies with minimum conditions for connection to its network. It indicates no endorsement of the product by Telecom, nor does it provide any sort of warranty. Above all, it provides no assurance that any item will work correctly in all respects with another item of Telepermitted equipment of a different make or model, nor does it imply that any product is compatible with all of Telecom's network services.

## 1. SCOPE

### 1.1 Equipment types and associated Specifications

(1) This Specification covers the technical requirements for devices intended for connection to the Telecom analogue Public Switched Telephone Network (PSTN). This includes analogue Centrex devices. References are made to Technical Document TNA 102, which describes conditions applicable to all PSTN analogue lines. PTC 200 and TNA 102 complement one another.

(2) This 2004 edition incorporates all changes announced in the Access Standards Newsletters since the publication of the 1996 edition.

(3) The requirements of this Specification cover the following types of equipment:-

Type of device	Category
Telephony devices (including those with monitoring or loud speaking facilities)	PTC 202
Cordless telephony devices (see also sub-clause (4) below)	PTC 206
Small PABXs/KTS (see also sub-clause (5) below)	PTC 207
Headsets and handsets (when marketed individually)	PTC 208
Miscellaneous and series-connected devices	PTC 210
Non-voice devices (fax machines, modems, etc)	PTC 211
Voice auto-answering calling & recording devices (answering machines, etc)	PTC 212
Payphones (see also sub-clause (4) below)	PTC 213
Conference terminals (excluding conference bridges)	PTC 216
Other devices which incorporate one or more of the above functions	as appropriate

• *Telepermits will be granted under the PTC 2xx/- series categories shown in the above table and used since 1988, even though this Specification replaces the individual Specifications that were originally used. This makes it easier to identify the functional grouping of products.*

(4) For some types of equipment, it is necessary to refer to other Specifications or standards in addition to this Specification, as indicated below. In each case, the documents referred to shall be read in conjunction with this Specification:-

- (a) For all equipment which intentionally uses radio frequencies, the applicable standards are defined by the Radio Spectrum Management Group of the Ministry of Economic Development. Frequency allocations and a list of the applicable standards are published on-line at [www.med.govt.nz/rsm](http://www.med.govt.nz/rsm)
- (b) For all devices with payphone facilities, Specification PTC 213 shall be read in conjunction with this Specification.

(5) *For PABXs, and any device designed for use in conjunction with PABXs, particularly when such a device is 'system dependent', then this Specification shall be read in conjunction with Specifications PTC 107, 9, or PTC 220, as applicable.*

• *Many PABXs and Key Telephone Systems provide extension ports designed for use with PSTN devices compliant with this Specification. However, compliance with the requirements of this Specification is no guarantee that a device will work satisfactorily with all PABXs and Key Telephone Systems.*

- (a) This Specification covers most types of analogue devices intended for connection to the Telecom PSTN or to PABX systems in customers'

premises. It also includes coverage of the most significant aspects of more simple PABX/KTS systems categorised as "Type 2".

- (b) For "Type 1" PABX/KTS systems, this Specification covers the basic requirements of trunk interfaces for connection to PSTN lines. All further PABX requirements are covered separately by the Specifications PTC 220, and PTC 107.

• See Section 3 for definitions of "Type 1" and "Type 2" PABX/KTS systems.

## 1.2 Electromagnetic interference (EMI)

### 1.2.1 Radiated energy requirements

(1) All equipment used in New Zealand shall comply with the Radio Communications Act 1989, the Radiocommunications (Radio) Regulations 2001 and any subsequent Gazetted Notices, as regards radiated energy. These requirements are administered by the Ministry of Economic Development and responsibility for such compliance rests with the Telepermit applicant under a supplier self-declaration scheme. This applies to all telecommunications CPE.

• *In particular, any microprocessor-based equipment is likely to give rise to unwanted radiation and it is necessary that EMC compliance is confirmed by a formal test process before any equipment is released onto the New Zealand market.*

(2) Ministry of Economic Development EMC compliance requirements are not part of Telecom's requirements and, as such, are not pre-requisites for the grant of a Telepermit. However, compliance is required by law. This includes the appropriate "C-tick" labelling of all products introduced to the Australian and New Zealand markets since 1 May 2003 and the need for importers to hold a Supplier Code Number.

• *New Zealand requirements for EMC are now closely aligned with those of Australia under the Trans-Tasman electromagnetic compatibility (EMC) regulatory arrangements. These EMC arrangements have the same legal standing in both Australia and New Zealand and compliance in one country is recognised in the other.*

### 1.2.2 Immunity from radiated energy

Although compliance is not mandated by the Ministry of Economic Development, it is strongly recommended that all devices satisfy the requirements for immunity to radiated electromagnetic energy as stated in the relevant joint Australian and New Zealand standard, such as AS/NZS 4252.

• *The acceptable equivalent European standard is CENELEC/CEN 50082-1:1992.*

## 1.3 Legal requirements

Section 106 of the Telecommunications Act 2001 requires that nothing shall be connected to a telecommunications network without the agreement of the network operator. For connection to the Telecom network, any device shall comply with Telecom's PTC specifications and display a label as evidence that a Telepermit has been granted.

• *The display of a Telepermit label clearly indicates to customers that the device may lawfully be connected to the network (ref. Specification PTC 100).*

• *The only exceptions are those devices supplied by Telecom or NZ Post Office prior to 1 May 1988, and those classes of product listed as exceptions in Specification PTC 100.*

## 1.4 Exclusions

Devices designed to be acoustically coupled to telephony devices are excluded from coverage by a Telepermit. Telecom accepts no responsibility for the quality of signals transmitted or received via any acoustically coupled device.

## 1.5 Compliance with International standards

(1) As far as is practicable, Telecom complies with ITU-T Recommendations in the design of its network and the requirements of its PTC Specifications. Reference is frequently made to specific Recommendations throughout this Specification, Such references indicate the Recommendation current at the date of issue of this specification.

(2) Also, wherever possible Telecom endeavours to harmonise Telepermit requirements with equivalent overseas specifications. This particularly applies to Australian Communications Industry Forum (ACIF) requirements.

*• The original issues of PTC Specifications were harmonised with British Standards as far as possible, owing to the fact that the Telecom network design was originally close to that of British Telecom. It is now New Zealand Government policy to align Australian and New Zealand Standards wherever possible. Complete alignment, however, is not practicable due to fundamental network differences. As a result, it is not possible for Access Standards to accept test reports to ACIF specifications without the differences in the standards being fully addressed.*

## 1.6 Temporary relaxations

The requirements of this Specification apply from the date of publication. All earlier relaxations in Specifications PTC 202, PTC 211 and PTC 212 have now expired, including those given for telephones in the draft Issue 2 of Specification PTC 202.

## 1.7 Mandatory requirements

(1) All mandatory requirements of this Specification are denoted by use of the word "shall" and are highlighted by shading for ease of identification.

(2) The requirements of such clauses are also included in the test schedule detailed in Appendix 3. These requirements will, in general, be regarded as the minimum requirements for the grant of a Telepermit.

*• Appendix 3 also includes some tests of requirements which, although not mandatory, are required for information and comparison purposes.*

## 1.8 Exemptions from full compliance

(1) Notwithstanding the statement in clause 1.7 above, Access Standards reserves the right to grant exemptions to any mandatory requirements of this Specification where considered appropriate. Most such exemptions will be in the category of "professional equipment" or equipment designed for users with special needs. Other typical examples are:-

- (a) 'Closed' systems where one or more dialling devices call special answering equipment. Such equipment is usually connected to unlisted numbers or in such a way that it does not interfere with normal telephone operation or impact on other users.

*• A typical example is equipment which initiates but does not receive calls.*

- (b) Equipment which is used infrequently or under restricted conditions for purposes other than normal voice or data communication. Such equipment is generally installed professionally.

- *An example is an alarm system which makes outgoing calls only in the event of emergencies.*

(c) Equipment not offered for sale in retail stores to the general public.

- *These three categories will generally apply to low volume specialised or high value products where the area of non-compliance is considered to have minimal impact on that product's primary functions.*

(2) It is not possible to publish a list or to quantify the exemptions that may be granted. The nature of professional equipment is such that every case has to be treated on its individual merits.

(3) Where a Telepermit is granted for such equipment which is not fully compliant with every mandatory requirement, the approach used will be based on an overall assessment taking into consideration all other mandatory and voluntary requirements.

(4) If a product, considered by the applicant to fall into the "professional equipment" category, fails a test carried out by a Testing Authority, then the applicant should:-

- (a) Discuss the matter with that Testing Authority to establish whether or not to proceed with the Telepermit application, and,
- (b) Where there is apparent justification for an exemption, the matter should be addressed to Access Standards for consideration.

### **1.9 Warning to Suppliers**

(1) Compatibility between the Telecom network and any type of equipment covered by this Specification is necessary for satisfactory operation. To ensure that the maximum degree of compatibility is achieved, the equipment should fully comply with this Specification.

(2) It is not possible to guarantee compatibility in every conceivable situation and, similarly, it is not possible or practicable for Telepermit testing to cover every situation. Nevertheless, the majority of operating conditions are covered by the testing requirements defined in Appendix 3.

(3) Suppliers should note that:-

- (a) equipment which is not fully compliant with this Specification may suffer a higher proportion of service problems than that which complies in all respects. The cost of dealing with such problems will normally be borne by the customers involved.

- *Suppliers should also note that under the Fair Trading Act 1986 and Consumer Guarantees Act 1993, customers may have the right to pass on this cost to the supplier.*

- (b) Should problems result from use of a product that has granted a Telepermit as the result of limited compliance testing, Telecom (Access Standards) reserves the right to amend the test criteria in the light of actual service experience.

- *Such an amendment would not necessarily affect the stated requirements of this Specification. Normally, only the testing requirements of Appendix 3 would be affected.*

### **1.10 Non-compliance aspects**

All applicants for Telepermits covered by this Specification shall investigate those

areas indicated by the Testing Authority as being non-compliant. The Telepermit application shall incorporate either:-

- (a) evidence that the product has been suitably modified to fully comply with this Specification, together with an explanation of the arrangements made to ensure that these modifications will be carried out on all future production units, or
- (b) an explanation giving justification for non-compliance, together with a statement of the applicant's intentions regarding the product's future compliance.

### 1.11 Warning notices

(1) There are many instances where the applicant is required to insert a warning notice in the User Manual for the product. This usually applies when devices are not fully compliant with recommendations or provide features which are not supported by the Telecom network. In such cases, the grant of a Telepermit is conditional on the warning notices being inserted. The Telepermit holder shall ensure that all such warnings are included in the relevant product user manual and brought to the attention of any prospective purchaser or user.

• *For convenience, a complete list of warning notices is given in Section 13. Each notice is referenced to the relevant clause in the text.*

(2) To fail to pass on this information may be in breach of the Consumer Guarantees Act 1993, and may result in the Telepermit holder being liable to compensate the user for any Telecom call-out charges.

(3) It is recommended that all warning notices in the User Manual be incorporated either in one place or, preferably, at the appropriate places within the text. This reduces the risk of the information being overlooked.

• *These warnings assist both the supplier and the user, as they explain what is required or what restrictions apply to the product in service. As such, they inform the user and are also likely to protect the supplier under the Consumer Guarantees Act.*

### 1.12 Product and service compatibility

(1) This Specification deals with Telecom's requirements for ensuring compatibility with the basic functions of its network. As such, the granting of a Telepermit does not necessarily imply that a product is compatible with all of Telecom's supplementary services. Similarly, any two products which have been granted Telepermits are not necessarily fully compatible with one another.

• *As at January 2004, some 8000 items have been granted Telepermits and these cover a wide range of products. Similarly, the range and number of Telecom's network services are being progressively increased.*

(2) Some common potential CPE incompatibility aspects are dealt with in this Specification. Typical examples are ringing loading and sensitivity, and D.C. characteristics. Similarly, some potential problem areas are covered by notes or recommendations. Nevertheless, it is not practicable to guarantee inter-compatibility for the vast number of potential CPE combinations connected on any line.

### 1.13 Ongoing compliance

Where modifications are necessary for products under test to comply with Telepermit

requirements (ref. clause 12.3), the modifications shall be applied to all items supplied to the market. For ongoing compliance, such modifications shall be applied to all future batches of the product supplied.

## 2 GENERAL

### 2.1 Mode of presentation

(1) The requirements of this Specification are printed in plain type with each paragraph formally numbered. Informal comments, recommendations and explanations which are added only as indications of the means of compliance with this specification are shown in italics. Smaller type is used and each paragraph is preceded with a "\*" symbol instead of a clause number.

(2) Mandatory requirements are indicated by use of the verb form "shall" and clauses including such requirements are highlighted as demonstrated here.

(3) Voluntary and preferred requirements or recommendations are indicated by use of the verb forms "should" or "may".

(4) While the clause numbering basic format used in this Specification generally follows that used in the 1997 edition, some changes have been made where it is desirable to associate related requirements in one area.

### 2.2 Related Specifications

(1) For any Telepermit application to be successful, the equipment concerned shall comply with the requirements of the following specifications:-

AS/NZS 60950	Electrical Safety Requirements (see also clause 2.8).
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TNA 102	Analogue PSTN Line Interface Conditions.
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(2) All Telepermit applications and ongoing product marketing shall comply with the requirements of Specification PTC 100.

(3) As outlined in Specification PTC 100, where any conflict arises between its requirements and those of this Specification, the requirements of this Specification shall take precedence.

### 2.3 Marketing features

Some equipment features or characteristics are regarded as purely marketing issues and their requirements are therefore not necessarily dealt with in this Specification. However, in cases where clarification is considered desirable, explanatory notes are provided.

*• Although regarded as marketing features, it is a requirement that they be included in the features list referred to in clause 2.4(5) below.*

### 2.4 Specialised services & features

(1) Some products incorporate one or more special features which interact with the Telecom network and which may affect the mandatory requirements of this Specification.

(2) In addition, some products using specialised services have features which are not included in the Sections of this Specification covering the main functional requirements.

(3) Section 11 of this Specification covers the additional requirements for products described in (1) and (2) above. However, due to the potential range of such features and also the continuing developments in technology, it is always possible for features

not to be specifically covered. In such cases, Access Standards will state the necessary requirements.

(4) Use of certain products or features described above may, in some situations, give rise to incompatibilities with other services and/or customer products. In such cases, special conditions may need to be set for the grant of a Telepermit.

• *There are many cases where an individual product satisfies Telepermit requirements for connection to a PSTN line when no other products are connected, but fails to operated correctly when another Telepermitted item is also connected to the same line.*

(5) It is a mandatory requirement for all Telepermit applications that a complete list of functions/features for the product concerned be included. This may be part of a test report or as a separate list associated with the application form.

## 2.5 Variants of the same basic design

(1) Where the same basic design (particularly any electro-acoustic aspects) is common to a number of variants of a product, the required sample of units may be selected from the range of models offered. As a result, a number of variants may qualify for individual Telepermits based on the one series of tests.

• *To be regarded as the "same electro-acoustic design", the variants of any telephony device concerned shall use the same types of transducers (microphone and receiver), the same handset geometry and construction, and the same associated transmission and signalling circuitry. For other categories of product, the same line interface circuitry should be common to all variants.*

(2) This also applies where two or more versions of equipment are marketed and the only difference is in the quantity of identical modules used.

(3) In assessing the test results the Testing Authority shall be satisfied that the same basic design is used and that all variants meet the requirements of this Specification.

(4) A separate Telepermit will usually be issued for each functionally different model so that the general conditions of the Telepermit system can be applied independent of the performance of other models.

## 2.6 Disabling of prohibited features

(1) Some devices originally manufactured for overseas applications incorporate features which are either prohibited or incompatible with the Telecom network.

(2) User Instructions for such devices shall either completely omit reference to the facilities in question or clearly explain that they are not available on products intended for connection to the Telecom network.

(3) It is strongly recommended that such features are permanently disabled. Depending on the type of product and feature concerned, Telecom reserves the right to insist on such disabling as a condition of a Telepermit grant. Disabling may be carried out in one or more of the following ways:-

(a) An internal hardware modification.

(b) Internal switching or strapping inaccessible to the normal user.

(c) Ensuring that the prohibited features can only be enabled by external programming, the information for which is not available to the user.

(4) In all cases where the disabling of a function is mandatory for the grant of a Telepermit, the following conditions shall apply:-

(a) No software-based disabling arrangements which are 'lost' when the device is unplugged from the line, disconnected from a.c. mains, or during replacement of an internal battery, shall be used.

(b) No prohibited feature shall be automatically enabled after any disruptions of the type described in (a) above.

(5) Some parameters are configurable by either the user or service personnel, and can affect compliance with PTC Specifications. The correct settings for such equipment shall be noted as part of the test results for the parameter(s) concerned and shall be included in the User Instructions.

• *Parameters which are set up by DIP switches, strapping fields or non-volatile memory are applicable. Typical parameters are transmitted levels, signalling options, etc.*

## 2.7 Naive users

(1) The concept of a "naive user" was introduced by Telecom to cover any member of the general public who does not have specialised terminal equipment or knowledge.

• *Reference British Standard 6789: 1987: Section 3.2.*

(2) This Specification is intended to provide a degree of protection for such naive users, so that they may purchase with reasonable confidence any equipment which has been granted a "Telepermit" by Telecom.

(3) Naive users should not be misled or disadvantaged by equipment which is connected to the Telecom network by other persons. Such problems would occur in the event that inadequate operating procedures or other design deficiencies lead to users being charged for ineffective calls.

(4) Calls from ordinary customers having only telephone facilities may be inadvertently routed to automatic non-voice answering equipment. This may result in a chargeable but ineffective call.

• *To minimise this problem, voice messaging back-up is recommended.*

(5) The correct operation of non-voice communications requires that both calling and called parties have compatible terminal equipment. As such neither is regarded as a "naive user" for this class of call. Nevertheless, calls from customers having only telephone facilities may be inadvertently routed to automatic answering non-voice equipment or such equipment may call an ordinary customer (or naive user) in error. In such cases, it is important that such customers are not subjected to nuisance calls.

(6) Customers equipped with the necessary specialized non-voice equipment may require special protocols or procedures to guard against unauthorized access by "hackers". Any such procedures are permissible provided they do not constitute a nuisance to naive callers and they comply with the signal level and frequency requirements of this Specification.

## 2.8 Electrical safety

### 2.8.1 General

All equipment intended for connection to the Telecom network, including plug-in cards and modules, shall conform to the safety requirements of the joint Australian and New Zealand standard, AS/NZS 60950 including AS/NZS 3260:1993 (or later version).

- *For the purposes of equipment testing, ELV is defined in AS/NZS 60950 and AS/NZS 3260:1993 as voltages below 42.4 Vac peak and 60 Vdc.*
- *This should not be confused with the definition of ELV applicable to electrical wiring covered by the New Zealand Electricity Regulations, where it is defined as 32 Vac rms and 115 V dc.*
- *A considerable proportion of telecommunications equipment available is manufactured for the North American and Japanese markets, where the mains voltage is only 100-110 V. Such overseas equipment may be compliant with the North American local requirements of AS/NZS 60950, but designed with inadequate internal clearances between its components to meet New Zealand requirements, which are based on 230 V operation.*

### 2.8.2 External power supplies

(1) Where the equipment is to be used with a separate external power supply, the combination of equipment plus power supply shall comply with the requirements of AS/NZS 60950 and AS/NZS 3260:1993.

- *Compliance testing to AS/NZS 60950, may only be undertaken by an IANZ registered laboratory, one which has been accredited by an IANZ affiliated laboratory registration authority, or one which is recognised by the Operations and Risk Management Division of the Ministry of Economic Development.*

(2) Where the equipment is to be used with a separate external power supply and a non-proprietary power supply is used, the operating voltage and current rating (and preferably the polarity of the connector) should be marked on the case adjacent to the socket concerned.

- *This recommendation avoids the risk of an unsuitable power supply being connected via a standard or commonly used type of connector.*

(3) Where a battery charger is used and this can be connected to the equipment while the equipment is simultaneously connected to the Telecom PSTN line, such chargers shall comply with the requirements of AS/NZS 60950 and AS/NZS 3260:1993.

### 2.8.3 Earth connections

(1) Where, for any reason, an earth connection is necessary for the correct operation of any equipment, the requirements of AS/NZS 60950 shall be complied with.

- *Suppliers should note that such telecommunications equipment is referenced to both the local earth and the remote telephone exchange earth. In the event of power faults or lightning strikes causing a rise in earth potential in the vicinity of the customer's premises, insulation breakdown is likely to result.*

(2) Details of any earth connections required and the most appropriate ways of providing them shall be incorporated within the 'User Instructions' supplied with the equipment concerned.

## 2.9 Protection from line interference

(1) Telecom's original standard 'Master' sockets incorporated a British Telecom Type 11A gas type surge suppressor, which provided some protection against line to line transients. This was regarded as the primary protection stage for many line-powered telephones.

- *Telecommunications administrations in most countries do not provide such suppression devices.*

(2) As a result of extensive network changes, Telecom has reviewed its customer premises wiring practices and has introduced “2-wiring” (see Section 10). With this arrangement, the BT Type 11A suppressor will no longer be fitted to new or re-wired installations. In view of this change, customer equipment is now required to satisfy the requirements of Section 6 of AS/NZS 3260:1993 without placing any reliance on the presence of surge suppressors.

- *A higher grade of surge protection will generally be installed in those areas with a known history of lightning damage or high risk of a rise in earth potential.*

(3) There is no mandatory requirement for customer equipment to remain fully operational following the application of high voltages to a Telecom line, or to changes in local earth potential. The only requirements are those of AS/NZS 3260:1993.

- *Any such additional protection is regarded as a marketing feature.*

## 2.10 Temperature

All products should be compliant with this Specification at all temperatures in the range -10°C to +40°C.

## 2.11 Compliance testing

### 2.11.1 Test procedures

(1) The sampling evaluation and test procedures required for granting a Telepermit for any product covered by this Specification are detailed in Appendices 1 and 2.

(2) The selection of tests applicable to the stated features of the product is the responsibility of the Testing Authority. For this reason it is important that details of all available features be supplied by the applicant. If the Testing Authority is not advised of all features and additional ones are discovered after a Telepermit has been granted, then it may be necessary for the product to be retested. Where there is any doubt, the matter should be discussed with Access Standards, preferably prior to commencement of testing.

- *A subsequent retest is likely to involve the applicant in greater cost than if all features were declared originally.*

(3) For some complex devices the Testing Authority may have difficulties performing the necessary tests. In such cases, the Applicant shall provide the necessary liaison to ensure that the Testing Authority has sufficient information to readily perform the tests. It is recommended that specific complexities be discussed with Access Standards in the first instance, particularly if the device incorporates any process such as adaptive self-adjustment of its parameters.

- *This applies particularly if the device is dependent upon host equipment for operation.*

(4) The Testing Authority may be able to modify the device temporarily to meet the Telepermit requirements, but is under no obligation to do so. Full details of such modifications shall be included with the test report and furnished as part of the application.

- *Such modifications are likely to increase the cost involved and the overall time taken for the testing process.*

(5) Tests and measurements are to be carried out with the equipment functioning normally, and the relevant requirements of this Specification shall be complied with under normal working conditions. Where appropriate, the following shall be made available to the Test Laboratory:-

(a) Information on the most suitable means of disabling any automatic facilities during the test programme.

• *Unless suitable procedures are provided by the supplier, it may be necessary for the Testing Authority to spend additional time defining suitable test methods. Such activity will normally result in additional cost to the Applicant.*

(b) Any equipment or software necessary for the initialisation of the device under test.

• *Some equipment is dependent on an external device (e.g. a computer) and time can be wasted attempting to set up or initialise a device before tests can be carried out.*

• *Equipment that complies only under non-operational conditions is not acceptable for the grant of a Telepermit.*

(6) The testing of any product shall include simple functional tests to ensure the following:-

(a) The equipment is operational to the extent that calls can be initiated, answered and terminated reliably as appropriate to the product concerned.

(b) The equipment is operational over a typical range of line conditions.

(c) The basic functions of the equipment are demonstrated.

(7) Any functional limitations revealed by these tests shall be covered by an appropriate warning notice (see 1.11 and Section 13) in the user instructions for the product.

• *Typical examples of functional limitations are 33.6 and 56 kbit/s modems, both of which are likely to be restricted to lower bit rates when connected to some PSTN implementations. It is important that customers are aware of such limitations if the supplier is to avoid breaching the Customer Guarantees Act. Telecom gives no guarantee that such devices will operate over the PSTN at their maximum design speed (see also clause 4.9.3).*

### 2.11.2 Test results

(1) Full test results in the form of a Test Report issued by the Testing Authority, which should include colour photographs, shall be provided in support of all Telepermit Applications.

(2) Such Test Reports shall be in a format as close as practicable to that given in the Test Schedule shown in Appendix 3 of this Specification. All tests shall be addressed, stating "NA" where a test is not applicable.

(3) Photocopies of original Test Reports shall be accompanied by either colour photographs or colour photocopies of the product.

(4) In cases where equipment has been previously tested on behalf of another Telecommunications Authority, the resultant test results may be submitted to Telecom as additional support for a Telepermit application. Such test results must be relevant to the appropriate PTC Specification requirements for them to be considered for the grant

of a Telepermit. In general, Authorities' compliance certificates alone are not sufficient for acceptance.

- *Test reports provided by overseas testing laboratories may provide more or less detail than is required by this Specification. Such reports are acceptable as supporting evidence, but additional tests to cover any Telecom requirements which differ from such standards may have to be carried out.*
- *A composite Test Report to the required format is to be supplied, but this may be prepared from several other separate reports.*

## 2.12 Multi-function and series connected equipment

### 2.12.1 Types of signal

(1) There are four main types of signal which are passed between customer equipment and the PSTN, the requirements for which are each covered separately in subsequent Sections of this Specification. These functions are summarised as follows:-

- *Signalling between the PSTN and PABXs is regarded as a special case for the purposes of this clause since it is more complex than the following indicates (ref. Specifications PTC 107, 108 and 109).*

- (a) D.C. loop                      unidirectional CPE to PSTN (ref. clause 6.4(1) and (2)).
- (b) Ringing                      unidirectional PSTN to CPE (ref. clause 7.7).
- (c) DTMF signalling          unidirectional CPE to PSTN (ref. Section 5).
- (d) Voice frequency transmission      primarily bi-directional between CPE and PSTN (ref. Section 4, and also clause 11. 4).

- *Clause 11.4 describes requirements for caller identification which is a unidirectional (PSTN to CPE) function. However, caller ID uses the on-hook data facility which has bi-directional capability and is described in Technical Document TNA 102, Section 10.*

(2) There are three basic functional categories of equipment described in the following clauses. These categories are dependent on various combinations of the above signalling functions and how they are used. Some equipment will fall into more than one category, and may change categories for some of the above functions at different stages of a call.

(3) All of the functional categories available on equipment shall be fully tested.

- *See also clause 2.4(5) which calls for list of functions as a mandatory requirement for all Telepermit applications.*

### 2.12.2 Terminating function

Devices with a terminating function are characterised by the application of a D.C. loop and transmission termination, either in response to incoming ringing or for the purpose of initiating a call.

### 2.12.3 Bridging function

(1) A bridging function involves no application of a D.C. loop signal and generally performs a monitoring role only. With the exception of devices designed specifically to monitor ringing or on-hook data signals, bridging equipment relies on other separate terminating devices to provide the D.C. loop.

(2) All customer equipment effectively performs a bridging function when in the on-

hook (idle) state, and shall be tested as such. The requirements are detailed as 'on-hook requirements' in subsequent Sections of this Specification.

#### 2.12.4 Series connected devices

(1) Series connected devices (interposed between the PSTN line and another CPE item) can operate under two separate functional modes as follows:-

(a) Terminating.

(b) Non-terminating.

##### (2) Terminating devices

Series connected equipment which has only a terminating function is characterised by the following:-

(a) The line port terminates the PSTN line.

(b) The terminal equipment port presents a 'network-like' interface to the terminal device.

(c) Signals are received on one port and similar signals (not necessarily identical) are reproduced on the other port (bi-directional).

• A common example of terminating series connected equipment is a PABX.

##### (3) Non-terminating devices

Series connected equipment which has only a non-terminating function is characterised by the following:-

(a) The line port does not terminate the PSTN line, but instead passes all signals directly between the two ports.

(b) The D.C. loop required for terminating or initiating a call is usually provided by separate equipment connected to the terminal equipment port.

(c) There is likely to be series and shunt impedances within non-terminating devices as shown in Fig. 2-1(b).

• A typical example of a non-terminating series connected device is call monitoring equipment.

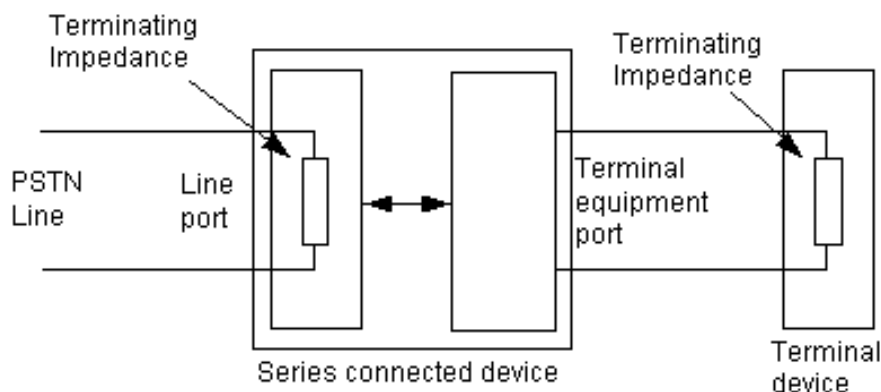
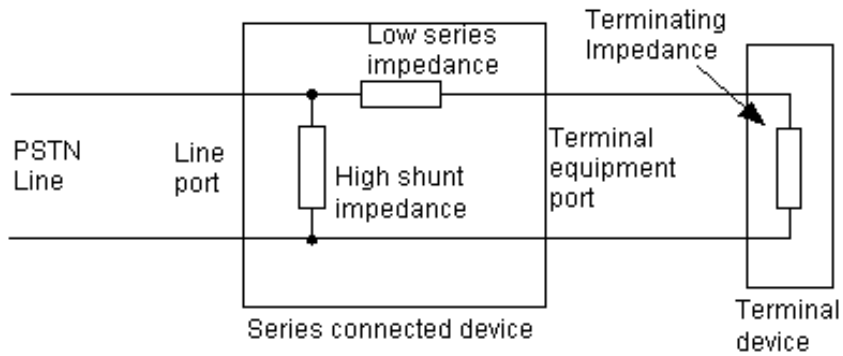


FIG. 2-1(a) SERIES CONNECTED DEVICE - TERMINATING MODE



**FIG. 2-1(b) SERIES CONNECTED DEVICE - NON-TERMINATING MODE**

**(4) Multi-function devices**

Use of the signal functions described in clause 2.12.1 varies on certain types of series connected devices. Such equipment may operate as a terminating device for some functions and a non-terminating device for others, or they may vary for different stages of a call. For this reason, the terms ‘terminating’ and ‘non-terminating’ shall, for the purposes of this Specification, be regarded primarily as function descriptions rather than equipment descriptions.

- An example of a multifunction device is a fax machine which responds to distinctive alert signals (i.e. Telecom’s “Faxability” service).

### 3 DEFINITIONS

#### 3.1 General

(1) In general, definitions set by the International Telecommunications Union and published in the ITU-T Recommendations apply throughout this Specification. Nevertheless, some ITU-T definitions are not particularly informative for those unfamiliar with telecommunications engineering. In the circumstances, the following definitions are supplemented by explanatory paragraphs which elaborate on the formal wording.

(2) Additional definitions are provided in Specifications PTC 100, AS/NZS 60950 and TNA 102. Nevertheless, some definitions are repeated in this Specification in order to explain aspects which directly relate to its requirements.

**Acoustic stability:** is the ability of a telephone device to prevent oscillations occurring when sound waves from the earpiece are fed back into the mouthpiece.

- *Such feedback can occur when a telephone handset is placed face down on a hard flat surface.*

**Answering machine:** is any form of automatic device, whether stand alone or integrated into some other class of equipment, which provides facilities to answer a call without human intervention.

- *Answering machines and telephone instruments are now often combined into a single integrated item of equipment. In such cases, the complete unit will be regarded as an answering machine.*

**Artificial ear:** is a measuring device, the input of which has an acoustic impedance equivalent to the acoustic impedance of the average human ear, and forms part of part of an "artificial head".

- *It comprises an acoustic network and a measurement microphone which permits calibration of earphones used in audiometry and telephony, and is used in the measurement of loudness rating.*
- *Reference ITU-T, Recommendations P. 57:1993 and P. 65:1993.*

**Artificial head:** is a purpose-designed jig which includes the artificial ear and mouth and ensures that they are in the correct relationship for measurement of the loudness rating of telephones.

- *The head also provides facilities to clamp a telephone handset in the designated speaking position.*
- *The equipment includes computer-controlled frequency generators and amplifiers, audio spectrum analyser, and other specialised electronic test equipment, all set up to provide rapid and accurate measurements of the various performance parameters.*

**Artificial mouth:** an electro-acoustic transducer used for the testing of microphones at close speaking distances, and forms part of an "artificial head".

- *Reference ITU-T, Recommendations P. 51:1993 and P. 65:1993.*

**Auto-answering:** is the procedure by which equipment automatically answers an incoming call on detection of the ringing voltage.

**Auto-answering mode:** is the mode in which the equipment is ready to automatically answer an incoming call.

- *Equipment can often be set to answer automatically or be set for manual answering while the user is present. Requirements for automatic answering apply only while the equipment is in the auto-answering mode.*

**Auto-calling:** is the function whereby equipment automatically initiates a call without deliberate human intervention.

- *"Auto-calling" does not include calls made by devices using functions such as memory dialling or "last number redial" which are initiated by manual operation of a key or similar action. Such functions are categorised as 'Auto-dialling'.*

**Auto-dialling:** is a function whereby equipment automatically dials a number following some form of manually initiation.

**Bridging equipment:** is high impedance equipment designed for connection in parallel with customer terminating equipment, but which does not provide any form of line termination.

- *Bridging equipment remains connected to the line whether the terminal equipment is on-hook or off-hook. It does not provide any line control function, but is used for such functions as monitoring, detecting, etc.*

**Call waiting:** is a network service provided by Telecom whereby a brief tone is applied repeatedly on a call already in progress to indicate that there is another incoming call waiting for the customer concerned.

**Caller Display:** is the Telecom service which, using the on-hook data transmission facility provides for the display of the calling telephone number on the called party's terminal equipment.

- *Otherwise known as "calling line identification".*

- *"On-hook data transmission" and "Analogue Calling Line Identification Presentation (Analogue CLIP)" are described in Technical Document TNA 102.*

**CNG Tone (calling tone):** Is an interrupted tone (1100 Hz) transmitted by automatic calling non-voice equipment.

- *Reference ITU-T Recommendation T. 30:1993.*

**dBmP:** is the absolute psophometric power level with respect to 1 mW, expressed in decibels. (See also the separate definition of 'psophometric'.)

- *Psophometric weighting for use on telephone-type circuits is as indicated in ITU-T Recommendation O.41.*

**dBm0P:** is the absolute psophometric power level expressed in decibels with reference to a point of zero relative level (i.e. 0 dBr point).

**dBPa:** is the absolute sound pressure level with respect to 1 Pa, expressed in decibels.

**dBr:** is the relative power level at a given point on a circuit with reference to a point of zero relative level (i.e. 0 dBr point).

- *Digital codecs used in the Telecom network are defined as 0 dBr points, ref. ITU-T Recommendation P. 66:1993, Clause 3.*

**dBV:** is the absolute voltage level with respect to 1 V, expressed in decibels.

**Distinctive Alerts (DA):** are the four different ringing cadences (DA1 to DA4) used on PSTN lines, and which may be used as a means of identifying particular items of CPE.

- *Typically used as a means of indicating a specific person or function required by the caller (e.g., facsimile, modem, telephone, etc), or the nature of the call (on Centrex). Separate numbers are allocated to individual cadences when this service is provided (see Technical Document TNA 102).*

- *This service may also be known as "Private Ringing".*

**Distinctive Alert decoders:** is a customer device which decodes the incoming DA code and applies ringing to the required item of CPE.

- *There are two types of Distinctive Alert decoder, known as Types 1 and 2, which are described in the text of Section 11.*

**DTMF (Dual Tone Multi-Frequency or touch tone):** is the signalling method used both for call initiation and for the accessing of other services following connection of a call.

- *Two tones are sent simultaneously to line for each digit, hence the word "dual". The system provides high immunity from spurious signals such as speech and noise not intended to be recognised as signalling information.*

- *The system used in New Zealand is to the current world standard described in the ITU-T, Recommendation Q. 23: 1988.*

**Echo return loss:** is a weighted integral of the return loss/frequency function over the band 300 - 3400 Hz.

- *See also definition of 'return loss'.*

- *To calculate 'echo return loss' from the individual return loss measurements at given frequencies, the approximation formula for derivation of 'echo loss' given in ITU-T Rec. G. 122:1993, Annex B.4 is used.*

**Facsimile:** is a system for transmitting and receiving text and images. For the purposes of this Specification the medium over which the image information is carried is the Telecom Public Switched Telephone Network.

**Full current:** is the current drawn by any item of terminal equipment when connected directly to a 50 V, 400 ohms source in the off-hook condition.

- *"Full current" is used for test purposes and defines the maximum current that can be drawn under zero length line conditions.*

- *On some exchanges operated by Telecom, the line current 'limits' at 80 mA maximum.*

**Handover:** is the process of transferring a call, which is in progress, from one item of terminal equipment to another while maintaining the connection.

**Handset:** is a rigid combination of telephone microphone and telephone receiver in a form convenient for holding simultaneously to mouth and ear respectively.

- *The geometric relationships between the receiver and microphone positions for optimum transmission performance are given in ITU-T Recommendation P. 35: 1988.*

**Handsfree facility:** is the provision of a loudspeaker and amplifier within the telephone such that calls may be established without lifting the handset.

- *Call progress can be monitored and the handset only needs to be picked up for actual conversation when the called party answers. This facility should not be confused with the separately defined "Loudspeaking facility".*

- *With the handsfree facility, the only microphone provided is that within the handset and the loudspeaker is disabled whenever the handset is "off-hook".*

**Headset:** is an assembly comprising transmit and receive transducers, but without signalling, ringing, or full transmission circuitry, designed for fitting on the user's head in order to leave the hands free for other activities.

**Hold:** is any temporary condition applied to a line while a call is in progress to maintain that call and permit its subsequent retrieval.

**Hookswitch:** is the general term covering any switch or other device which is operated when the handset is returned to its normal rest position.

- *"Hookswitch" includes any control buttons used to initiate or terminate a call and also includes any switch feature of "one-piece" or novelty telephones which performs the ON/OFF function.*

- *See also definitions for "On-Hook" and "Off-Hook".*

**Hookswitch flash:** is the momentary operation by the user of the Hookswitch to perform a "re-call" or similar function.

- *This causes a brief interruption to the line current, but the duration is not long enough to be detected and interpreted as the completion of the call.*

**Informed user:** is a person who is familiar with the use of certain non-standard specialised equipment in order to initiate or receive calls.

- *This term includes users who are situated remote from the specialised terminal equipment concerned.*

- *Such equipment will often be automatic calling or answering devices.*

- *See also "Naive user".*

**Insertion loss:** is the ratio of the loss or gain through a network when a device is connected to that when the same device is not connected, normally expressed in dB.

**Inter-digital pause:** is the interval between successive DTMF tone bursts in a series of digits.

**Key Telephone System (KTS):** See definition of "PABX Type 2".

**Last number re-dial (LNR or LND):** is the process of sending DTMF signals. They are manually dialled and stored in the sending device during the previous call attempt, to establish a connection.

**Line grabbing:** is the facility whereby an item of equipment, whether under manual or automatic control, may disconnect any other terminal equipment from its line and seize that same line to either terminate or initiate a call.

**Loop current:** is the standing d.c. current drawn by any equipment in the off-hook condition.

- *The loop current is dependent upon the resistance of the equipment, the line length and any current*

*limiting by the feed voltage.*

**Loudness Rating (LR):** is a measure, expressed in decibels, for characterising the loudness performance of complete telephone connections, or parts thereof, such as the sending system, line, or receiving system.

- *Reference ITU-T Recommendations P. 64:1993 and P. 65:1993, and also ITU, Recommendation P. 76: 1988.*

- *Loudness rating is an internationally accepted method of objectively measuring the performance of telephones from the mouthpiece to a given point on the line, and vice versa to the earpiece. The approach enables computer-controlled measuring equipment to be used for making quick, accurate and, above all, repeatable tests.*

- *A loudness value is the result of a calculation based on fourteen separate measurements made at pre-determined frequencies within the normal telephony frequency range, each measurement being "weighted" according to its effect as perceived by the human ear when listening to normal spoken words.*

- *The loudness measurement value is actually the loss involved in the circuit under test, relative to an internationally accepted reference standard. Thus the higher the loudness value the quieter the perceived signal volume. A negative value occurs when the loss is less than that of the reference standard.*

- *Loudness is closely related with Sidetone in any assessment of telephone performance - see definition of "Sidetone".*

- *See also definitions for "Artificial ear" and "Artificial mouth".*

**Loudspeaking facility:** is a facility to permit several people to take part in a telephone conversation by incorporating a microphone usually, but not necessarily, separate from the one in the handset, which is designed to pick up speech in the near vicinity of the telephone set.

- *It incorporates an amplifier and a loudspeaker for the reception of incoming speech.*

**Message acceptance tone (beep):** is a brief tone or 'beep' signal to a caller that an automatic answering device is in the receive mode and is ready to accept and record a message.

**Message waiting:** is indicated by a 'blip' in dial tone to indicate to the customer that there is a message waiting on the "Call Minder" service.

**Modem:** is the signal conversion equipment which converts the digital signal output from a terminal (or computer) into analogue signals suitable for transmission over a Telecom line, and vice versa, by a process of modulation and demodulation.

- *'Modem' is a contraction of **m**odulator- **d**emodulator.*

**Monitoring:** is the detection of signals on a line (both supervisory and /or voice) without taking an active part in a communication over that line.

- *Monitoring equipment may be designed to detect specific line conditions such as whether the line has been seized or not, the presence of ringing, or it may monitor the actual communication itself.*

- *Equipment monitoring a line will usually, but not necessarily, be in the on-hook high impedance mode.*

- *The use of such equipment is subject to the Privacy Act 1993, the Telecommunications Act 1987 and the Crimes Act 1961.*

**Monitoring facility:** (in the context of recording equipment) is the provision of a device which monitors all signals present on a line while a call is in progress.

**Monitoring facility:** (in the context of automatic calling equipment) is the provision of a loudspeaker and amplifier for incoming signals such that call progress can be monitored.

**Mute:** the temporary suppression of any speech transmission facility provided by an item of terminal equipment.

- *Mute is used for security or confidentiality purposes, and to enhance received speech perception in noisy ambient conditions.*

**Naive user:** is a person with no special knowledge of the characteristics of a particular complex system and having no specialised equipment that may be necessary to deal with a call from such systems.

- *This concept is particularly applicable to equipment which has automatic calling or answering facilities.*

- *The concept of a "naive caller" is dealt with in British Standard BS 6789 and the definition has been amended for New Zealand applications to cover anyone who is not privy to the special requirements of an automatic system. A system can thus have special characteristics in order to provide some degree of security against unauthorised users or those who are accidentally connected to the system.*

- *Application of the naive user concept provides for particular Telepermit grant conditions to be negotiated in some special circumstances, especially where professional equipment is involved or where there is some need for additional security.*

**Noise:** is any unwanted electrical energy which can be measured psophometrically at the output of a device or line.

- *See also definition of "Psophometric".*

- *For the purposes of this Specification, 'noise' also includes unwanted electrical energy at frequencies outside the normal speech band of 300 Hz to 3400 Hz.*

**Non-terminating device:** is a series connected device which is not capable of originating or answering a call when connected to the PSTN, and is associated with a separate terminating device.

- *See also definition of "series connected device".*

**Off-hook:** is the condition where the equipment is connected to line and is used to initiate or take part in a call (sometimes referred to as "on-line").

**On-hook:** is the condition where the equipment is connected to line in the idle state awaiting receipt of an incoming call or available to initiate a call (sometimes referred to as "off-line").

- *The above terms are derived from the term "hookswitch", which is used to describe any device which changes the status of the equipment from "on-hook" to "off-hook" or vice versa.*

**PABX:** is a form of telecommunications system designed for use in a customer's premises which provides full switching facilities between individual extension devices and the Telecom PSTN.

- *For the purposes of defining interface requirements a PABX system may be considered to provide a similar range of conditions to that of a public exchange line.*

- For the purposes of this and other PTC Specifications, and TNA documents, the term "PABX" embraces all Private Automatic Branch Exchange (PABX), Key Telephone System (KTS), Small Business Exchange (SBX) and other equipment intended for installation in a customer's premises to switch calls between separate telephone lines.
- For Telepermit purposes, it is necessary to divide PABXs & KTS's into two defined categories.

**PABX Type 1:** is a 4-wire switching device (digital or analogue) which, by its very nature, is designed to have an inherent 2 - 3 dB transmission loss between extension and 2-wire analogue trunk ports.

- Reference Specifications PTC 107, PTC 108 & PTC 109 for full details. Larger PABXs are normally Type 1 and may also have provision for digital trunks.

**PABX Type 2:** is a 2-wire analogue switching device without networking facilities or the capability for such facilities, which has a nominal 0 dB (=1 dB) transmission loss between extension and analogue trunk ports.

- Kts' can normally be categorised as Type 2.
- For Telepermit purposes, Type 2 can normally be tested against this Specification.

**Professional equipment:** is equipment of a special nature, not generally intended to be offered for sale to the general public.

- Professional equipment is required to be granted a Telepermit before it is connected to the Telecom network. However, because of its special nature, and the fact that the purchaser will usually have some formal performance agreement with the supplier, there may be variations in the conditions which are applied to the grant of a Telepermit.

**Proprietary interface:** is a company or industry interface that does not conform to national or international standards.

- A proprietary interface may conform to an industry standard not used by Telecom, but proprietary to a particular manufacturer. Such an interface may be acceptable for Telepermit purposes if it is not used for direct connection to an interface specified Telecom.

**Psophometric:** is the term used to describe a method of measuring noise within the speech band while weighting the value of each frequency component present in accordance with its relative effect on the human ear.

- Such measurements are made with a psophometer; which is a voltmeter fitted with a standardised frequency weighting network and calibrated to indicate noise power in psophometric units (dBmP).
- The weighting coefficients defined in ITU-T Recommendation O. 41: 1994 for telephone circuits and weighted to a reference tone of 800 Hz are used by Telecom for telephony purposes.

**PSTN:** is the Public Switched Telephone Network

- New Zealand's PSTN services may be provided by a number of different Network Operators; see also "Telecom PSTN".

**Quantity:** is any batch, order or shipment from which a sample is drawn.

- The word "Quantity" is used to avoid any confusion with the formal meaning of the word "batch" to quality assurance personnel.

**Recall:** is the procedure used to re-connect the register function of a switching system to enable additional features of that system to be used while a call is in progress.

**Repeat calling:** is the function whereby equipment will automatically make a second

or subsequent attempt to call a wanted number without intervention by a user.

• *Repeat calling does not include functions such as "Last Number re-dial (LNR)", which have to be initially keyed by the user before they are activated. However, any function which is automatically activated is included.*

**Return loss:** is a quantity associated with the degree of match between two impedances in a 2-wire speech path, expressed in decibels and given by the expression:-

$$\text{Return loss of } Z_1 \text{ versus } Z_2 = 20 \log_{10} \left| \frac{Z_1 + Z_2}{Z_1 - Z_2} \right| \text{ dB}$$

• *Reference ITU-T Recommendation G. 122:1993, Annex B1.*

**Ring trip:** is the process whereby the exchange ringing signal is automatically stopped when a suitable direct current path is connected across the line.

• *The capacitor in the on-hook termination blocks the path for any direct current, but allows alternating current to flow through the ringers. A d.c. path is provided when the call is answered and the current then flowing is referred to as the loop current.*

**Ringer (or ringing detector):** is any device which responds to the alternating voltage applied to a telephone to indicate an incoming call.

• *It should be noted that operation of a "ringing detector" does not indicate that an incoming call has been answered. It simply indicates the presence of an incoming call.*

**Ringer Approximate Loading (RAL):** is an arbitrary rating for a telephone ringer which represents, in numeric terms, the approximate current that it draws from a ringing signal.

• *The reference value for RAL is based on the on-hook admittance (reciprocal of the impedance) of a reference telephone. This has now been replaced by 'Ringing Number (RN)'.*

**Ringer loading:** is a rating for a ringing device, based on the ringing current drawn when that device is connected in parallel with other ringing devices on the same line.

**Ringing Number (RN):** is an arbitrary rating for a ringing device which represents, in numeric terms, a combination of its sensitivity and loading on the ringing supply.

• *The RN of a device is the greater of the numbers allocated for 'ringer sensitivity' and 'ringer loading'.*

• *RN supersedes RAL. It is intended to provide a Telecom customer with an effective means of assessing the maximum number of ringers that may be connected to the same line and still ensure a reliable ringing performance.*

**Ringer sensitivity:** is a rating number allocated to a ringing device indicating the sensitivity of its response to ringing current on a line.

**Sample:** Are a number of items, randomly selected from a larger quantity, for the purposes of statistical prediction of the characteristics of the whole quantity of items.

**Scrambler:** see "Voice privacy equipment".

**Series connected device:** is any customer premises equipment designed for connection between a PSTN line and another item of customer equipment.

• *The functions of a series connected device are auxiliary to those of the terminal device to which it is connected. Typical examples are distinctive alert decoders, fax switches, automatic diallers, caller display adjunct units, call monitoring equipment, etc. This term does not embrace items such as*

*jackpoints, wiring, etc.*

- *A series connected device may have either a terminating or non-terminating function, and may also include bridging equipment in some cases.*
- *Certain types of CPE incorporate a 2-wire/4-wire/2-wire process. Examples of this are some small key systems and also equipment which facilitates the extension of a PSTN line (foreign exchange) or PABX extension to a distant location. These examples provide for amplification on the 4-wire path of the equipment, but are connected 2-wire at both end interfaces and effectively fall within the above definition of 'series connected' equipment.*

**Sidetone:** is the reproduction in a telephone receiver of sounds picked up by the microphone of the same telephone.

- *For telephone evaluation purposes, sidetone is measured as the "Sidetone Masking Rating" (or "STMR"), which is part of the Loudness Rating concept. STMR is a measurement related to an ITU-T standard test system and it also takes into account the overall effect of what the speaker would hear of his own voice in normal conversation.*
- *Reference ITU-T Recommendations P.64:1993 and P. 65:1993.*

**Simple telephone:** is an apparatus for voice communication over the PSTN, for which both initiation and termination of the call is under manual control and involves the mechanical lifting of a part or the whole of the apparatus, and incorporating a key pad (or rotary dial) to provide signalling.

- *The term "simple telephone" relates to its basic operation, not to its facilities or features. Thus, a multi-button telephone with repertory dialling, clock calculator, etc., may be included within this definition.*
- *A simple telephone may be directly powered from a line, powered by internal batteries, or via power units connected to the public supply.*
- *For the purposes of this Specification, a simple telephone does not include any instrument capable of directly accessing two or more telephone lines.*

**Supervisory equipment:** is any equipment intended to monitor and/or detect some parameter and which is capable of initiating or terminating a call in order to pass the information over the Telecom line to some remote point.

**Supervisory system:** is the combination of some central control equipment, the Telecom network, and one or more items of supervisory equipment which, together, form a complete telemetry system.

- *Such equipment has generally been regarded as "professional" equipment in the past, but the growth of security, burglar and fire alarm systems for normal residential applications has led to such equipment being classified as a standard retail product.*

**System-dependent terminal (or device):** is an item of customer premises equipment specifically designed for use with, and dependent on, a particular type or make of customer switching system (or other customer equipment).

- *System dependent devices are not considered suitable for direct connection to a standard Telecom PSTN without the 'mother' system. They usually incorporate a proprietary interface.*
- *Customer switching systems normally take the form of PABXs or key telephone systems.*

**Telecom PSTN:** is the Public Switched Telephone Network provided and operated by Telecom New Zealand Ltd.

- *The PSTN also includes the connection to other switching systems (e.g. PABXs) which may be installed in private premises, but which are directly connected to the PSTN. It does not include the interconnection of private switching systems via leased lines.*

- *Telephones suitable for the Telecom PSTN are also often suitable for use with PABX and Key Telephone Systems. Some systems however require special purpose-designed telephone instruments, described as 'system dependent' instruments, to provide their particular features.*

**Telephony device:** is any device having the ability to convert acoustic signals into electrical signals, or vice versa, for the purposes of transmission over a telephone network.

- *Such facilities are normally known as 'electro-acoustic' facilities.*

**Terminal equipment port:** is any port on a series connected device to which a terminating device can be connected.

**Terminating device:** is any device designed to terminate a PSTN line for the purpose of either initiating or answering calls over the network.

- *See also "Series connected device", which can also be a terminating device.*

- *Certain products are capable of functioning as a "terminating device" or a "non-terminating device" depending on the circumstances. An example is a fax switch which answers a call, and then extends the call to another terminating device.*

**Three-wire connection:** refers to the plug and jack wiring arrangement used for connection of devices to the Telecom network using three wires, the third 'shunt' wire being used for ringer connection.

- *This arrangement using a 'BT' socket and plug to BS 6312:1985 was the standard method used between 1983 and 1996 for connection to the Telecom PSTN. It involves the 3-wire connection of premises wiring between a master jack and a series of secondary jacks such that all devices connected are in a 3-wire parallel arrangement.*

**Through return loss:** is the degree of match between a reference impedance and the impedance of the line port of a series connected device, when the terminal device port of the same device is terminated with an equivalent reference impedance.

- *See also definitions of "series connected device" and "return loss".*

- *The reference impedance referred to is normally "BT3".*

**Timed break recall (TBR):** is a manually initiated break of a pre-set duration in the holding loop of a telephone when in the "off-hook" condition, for extending a recall signal to the exchange.

**Two-wire connection:** refers to the arrangement which provides for connection of 2-wire devices such that the ringing current is taken directly from the 2-wire line.

- *2-wire devices can also be connected to 3-wire customer premises wiring.*

**Voice privacy equipment:** is equipment designed to provide for the security of voice communications by means of two or more matched devices which encode voice signals sent to line, and reconstitute received coded signals into intelligible voice signals.

- *Privacy equipment is sometimes known as "voice scramblers".*

**Volume unit (VU):** is a unit of measurement used for determining the level of speech signals transmitted over a transmission line.

- *On CPE, VUs are used as a means of assessing the performance of voice recordings on answering*

*machines, voice mail equipment, etc.*

- *There are a number of variations around the world of the types of VU meter, and also in the definition of VUs. Comparisons between different types of volume meters are given in ITU-T Rec. P. 52:1993.*

## 4 TRANSMISSION REQUIREMENTS

### 4.1 General

(1) Due to the fact that this Specification embraces a wide range of product types and complexities, some of the differences are addressed as follows:-

(a) Telephony devices fitted with user-controlled receive volume control shall comply with all mandatory requirements over the whole range of adjustment settings.

• *Due to inherent noise and possible crosstalk on analogue lines, it is undesirable for the range of receive gain to be excessive. The typical range for gain is 6-10 dB.*

(b) Any telephony device equipped with loudspeaking or 'handsfree' facilities in addition to a handset shall comply with this Specification. However, only the handset function is normally required to be tested.

• *Loudspeaking or handsfree functions are normally treated as market features. Telephony products without handset facilities will each be treated on their individual merits and requirements should be discussed with Access Standards.*

(c) Where Telephony devices are equipped with inductive couplers which comply with ITU-T Rec P.370, it is strongly recommended that they be marked with the standard graphic symbol ref. NZS 4121:1985, AS 1428.2:1992 and ITU-T Rec. E.121.

• *The capability to operate with inductive couplers and other such devices is regarded as a marketing feature and is not a mandatory requirement.*

(d) For cordless devices, the allocation of radio frequencies is administered by the Radio Operations Division of the Ministry of Economic Development (ref. clause 1.1(4)).

(e) Any non-voice equipment capable of multiple speeds and modulations, such as a modem, shall comply with the requirements of this Section. The device shall be tested at each combination of transmit bit rate and type of modulation available. Where the transmit rate is continuously variable, the highest bit rate shall be used.

(2) For a series connected device providing a proprietary interface for a terminal device, the combination of terminal and series connected devices shall comply with the applicable requirements of this Section.

• *A typical example is a PABX with a system dependent extension phone.*

(3) Except where otherwise stated, the test set up for transmission testing shall be as indicated in Fig. 4-1.

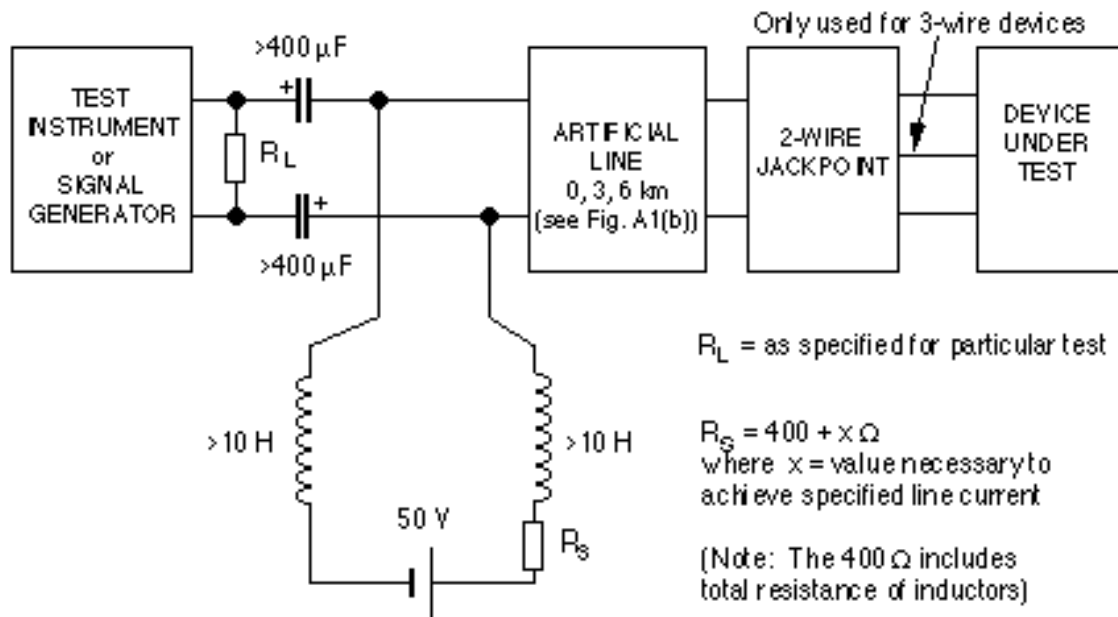


FIG. 4-1(a) TEST SET-UP FOR TRANSMISSION TESTS

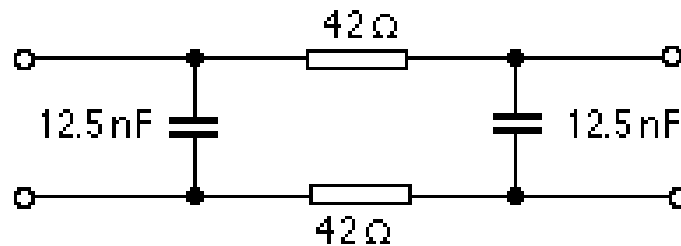


FIG. 4-1(b) ARTIFICIAL LINE SEGMENT (0.5 km Line Length)

#### 4.2 Transmitted power limitations

(1) Signals transmitted to line from any device shall not exceed the following limits:-

(a) Signals of more than 5 seconds duration shall not exceed a level of -9 dBm when averaged over 1 minute.

• Special consideration may be given for a relaxation of this limit to a level between -4 dBm and -9 dBm for signals of between 5 and 30 seconds duration. Such cases must be fully represented giving all details, and each case will be treated on its individual merits.

(b) For signals of less than 5 seconds duration, the level of individual tones shall not exceed -4 dBm.

• Speech signals from a telephone instrument conforming to this Specification will, typically, have a nominal level of -12 dBm measured against 600 ohms when averaged over three seconds.

• Automatically generated DTMF signals are subject to this requirement (see clause 5.2.2). Manually generated DTMF signals, since they are under the direct control of the user, cannot be easily restricted or measured. However, it is assumed that any individual DTMF digit is unlikely to exceed 5 seconds.

(c) The maximum instantaneous peak power of any transmitted signal measured

across an impedance of 600 Ohms shall not exceed a level that corresponds to that of a sine wave of 0 dBm.

• *Transient voice peaks may be as high as +12 dBm. These, because they are very brief, do not normally exceed the limit in (1) (c) above.*

(2) On any telephony device, it shall not be possible to generate a signal exceeding +10 dBV rms across a 600 Ohms termination for any acoustic stimulus at the microphone.

• *This requirement relates to the limit set on line signals such that potential interference to other Telecom customers due to crosstalk is minimised.*

(3) Any recorded message or voice signal transmitted into the Telecom PSTN shall be between the limits of -6 VU and -16 VU when measured using the test arrangement shown in Fig. 4-1(a) on a 0 km line. The preferred range is -6 VU to -12 VU.

(4) For any device capable of transmitting pre-recorded music, synthesised music or composite speech and music signals, the level of music or composite signals shall be between the limits of -12 VU and -25 VU when measured using the test arrangement shown in Fig. 4-1(a) on a 0 km line.

• *See Appendix 2 for further information on 'VU' (volume unit) measurements.*

## 4.3 Noise and Crosstalk

### 4.3.1 Equipment on-hook

(1) The idle state or on-hook psophometric noise power level, measured against 600 Ohms, of any device connected to a Telecom line shall be no greater than -65 dBmp.

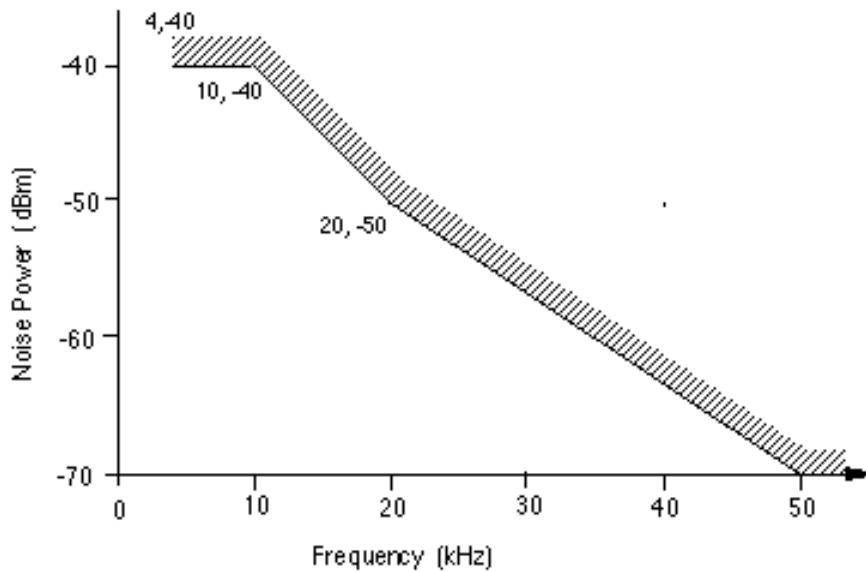
• *Mean psophometric noise power should be measured in accordance with ITU-T Rec. O. 41: 1994.*

• *On-hook noise may affect the perceived performance of other telephones used on the same line. Also, excessive noise levels on one line may induce unwanted noise on adjacent lines.*

(2) (a) The power level of individual spectral components above 4 kHz should not exceed the limits formed by straight lines joining the following coordinates (see Fig. 4-2):-

Frequency / Power Spectral Density	
(kHz)	(dBm)
4.0	-40
10.0	-40
20.0	-50
50.0	-70
>50.0 & <100.0	70
>100.0 & <10 MHz	-50

(b) The one minute mean power level in any 3 kHz bandwidth contained wholly above 4 kHz shall be no greater than the limits for the centre frequency of the band as determined in (a) above.



**FIG. 4-2 NOISE POWER SPECTRAL DENSITY LIMITS**

(3) For telephony devices, any coupling between the microphone and/or receiver, and the line, shall be such that the requirement of sub-clause (1) above is not exceeded when the room noise or conversation adjacent to the device is at a level of 65 dB SPL.

- This requirement relates to potential “bugging”, whereby the telephone in its on-hook state could provide a source of signals to an unlawful listener.

- dB SPL is the sound pressure level in dB referenced to 20  $\mu$ Pa.

#### 4.3.2 Equipment off-hook

(1) Non-signalling (call established) state:-

(a) The off-hook psophometric noise power level, generated by locally powered telephony devices when in the non-signalling state shall not exceed -60 dBmp, with the microphone rendered inoperative.

- Mean psophometric noise power should be measured in accordance with ITU-T, Rec. O. 41: 1994.

- A wide variation in ambient noise conditions may exist in any customer's premises and such noise is often at far higher levels than the electrical noise generated within modern terminal equipment.

(b) For devices transmitting recorded speech or music, the combined recording and playback facility shall have a signal-to-noise ratio of at least 20 dB over the frequency range 100 Hz to 5 kHz.

(c) For non-voice devices, the presence of unwanted signals in the frequency range 0 - 4 kHz is regarded as a marketing feature.

(d) For all devices, the noise requirements at frequencies above 4 kHz shall be as stated for the on-hook state in clause 4.3.1(2) above.

(2) During signalling (call set-up phase for all devices):-

(a) The individual power level of any extraneous frequency in the range 300 Hz to 5

kHz during signalling shall be at least 20 dB below that of the signalling frequency with the lowest level.

(b) The one minute mean power level in any 3 kHz bandwidth contained wholly above 5 kHz shall be at least 20 dB below that of the signalling frequency with the lowest level.

• "Noise" includes any unwanted signals such as distortion and intermodulation products that may occur during call set-up signalling.

### 4.3.3 Multi-line devices

Any device having direct access to more than one line shall have a minimum of 50 dB crosstalk isolation between individual lines over the frequency range 300 - 3400 Hz. This shall apply to both on-hook and off-hook conditions.

• This requirement applies mainly to devices such as two-line telephones and some simple key systems. Requirements for products such as PABXs are covered separately in Specification PTC 109.

## 4.4 Distortion

(1) Send harmonic distortion:-

(a) The total send harmonic distortion of any telephony device should not exceed 5% for a pure tone signal of -5 dBPa at a frequency of 500 Hz with line currents of 20 mA and 80 mA.

(b) The total send harmonic distortion of any device transmitting recorded speech shall not exceed 10% for frequencies in the range 300 Hz to 3400 Hz.

(c) The total send harmonic distortion introduced by any non-terminating series connected device shall not exceed 5% on a 1 kHz signal applied at a level of -4 dBm.

• The requirement stated in (c) above is designed to ensure that any distortion of signals, including DTMF, applied by the associated terminating device is within acceptable limits after passing through the series connected device. Hence the send test level of -4 dBm which is the maximum permissible send level for DTMF tones from terminating devices (see clause 5.2.2).

(2) The total receive harmonic distortion of any telephony device should be less than 6% for a pure tone signal of -10 dBV at a frequency of 500 Hz with line currents of 20 mA and 80 mA.

(3) The total sidetone harmonic distortion of any telephony device should be less than 10% for a pure tone signal of -5 dBPa at a frequency of 500 Hz with line currents of 20 mA and 80 mA.

(4) For digital PABX/KTS systems, distortion shall comply with the requirements of Specification PTC 109, Section 7.

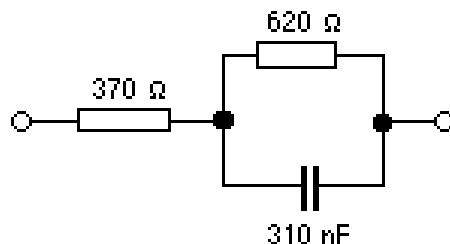
## 4.5 Line impedance of the device

### 4.5.1 Off-hook line impedance

(1) The objective off-hook impedance of any device, measured at the line terminals, is complex and is represented by a network consisting of a 370 Ohms resistor in series with a parallel combination of a 620 Ohms resistor and a 310 nF capacitor (see Fig. 4-3). This network is known as 'BT 3' for convenience.

• This impedance network was originally used by British Telecom.

• The impedance of a telephone instrument is also of extreme importance when connected to any private network or PABX. Incorrect impedance can result in excessive sidetone, echo, and/or instability problems.



**FIG. 4-3 IMPEDANCE REFERENCE NETWORK (BT 3)**

(2) Apart from the exceptions described in sub-clauses (4) to (8) below, the minimum return loss of the line port of any device against the impedance BT 3 shall be no lower than the following limits for line currents of 20 mA and 80 mA:-

(a) 10 dB at any frequency in the band 300 - 1000 Hz.

(b) 12 dB at any frequency in the band 1000 - 3400Hz.

(3) Apart from the exceptions described in sub-clauses (7) and (8), for telephony devices the echo return loss against the impedance BT 3 shall be no less than 14 dB.

• Echo return loss is derived from the return loss at individual frequencies, using the same formula as that described in ITU-T Recommendation G.122:1993 Annex B.4 for the derivation of "echo loss".

(4) For non-voice devices, the impedance requirements are relaxed from those stated above and are as stated in sub-clause (5) below. However, where a device meets only these relaxed requirements, the following warning notice shall be included in the User Manual:

**"This equipment does not fully meet Telecom's impedance requirements. Performance limitations may occur when used in conjunction with some parts of the network. Telecom will accept no responsibility should difficulties arise in such circumstances"**

(5) The relaxed requirements for the minimum return loss of non-voice devices are as follows, subject to the condition stated in sub-clause (4) above:-

(a) Minimum return loss, measured against the reference impedance "BT3", shall be at least 8 dB at any frequency in the band 300 to 3400 Hz, or

(b) minimum return loss, measured against an impedance of 600 Ohms, shall be at least 16 dB at any frequency in the band 300 to 3400 Hz, or

(c) minimum return loss, measured against a reference network made up from a 220 Ohms resistor in series with a parallel combination of an 820 Ohms resistor and a 120 nF capacitor, shall be at least:-

(i) 10 dB at any frequency in the band 300 to 600 Hz, and

(ii) 15 dB at any frequency in the band 600 to 3400 Hz.

• The impedance described in (c) is the ACIF objective requirement.

• Suppliers should note that any equipment complying only under these relaxed conditions may give

trouble when used in conjunction with some parts of the network. Telecom will accept no responsibility should difficulties arise in such circumstances. Suppliers are advised to monitor the performance of their equipment supplied under the relaxations of this Specification and to advise their customers where there is reason to believe that such problems will occur.

(6) Non-voice devices operating over a limited bandwidth (e.g. 1000 Hz to 2500 Hz) shall have minimum return loss of 3 dB against BT3 at frequencies outside the operating band. This relaxation is conditional on any signal transmitted outside the operating band being less than -30 dBm.

(7) Where a "hold" facility is provided on any type of device, the echo return loss against BT3 during activation of the hold condition shall be no less than 3 dB.

(8) While DTMF signals are being transmitted during the setting-up of a call, the minimum return loss against BT3 shall be no less than 5 dB.

- This relaxation does not apply to the transmission of DTMF signals following establishment of the call, e.g. signalling CPE to CPE.

#### 4.5.2 On-hook line impedance

The on-hook impedance (including impedance of bridging equipment) of any device connected to a Telecom line shall be not less than 10 kohms for the frequency range 300 Hz to 3400 Hz when measured with 1 V<sub>rms</sub> applied.

- This requirement may be relaxed for certain devices where it is known that they will definitely not be connected in parallel with any other device.

- Relaxation of this requirement may also be considered for devices using on-hook data transmission (see Section 11).

#### 4.6 Port impedances of series connected devices

- See clause 2.12 for general information on series connected devices.

- See also clause 4.1(2) for series connected devices with proprietary interfaces.

##### 4.6.1 Terminating devices

(1) For series connected terminating devices, including those containing a 4-wire element (see Fig. 4-5), the PSTN line port shall be as specified in clause 4.5.1(2) and (3) above with a reference BT3 network connected to the terminal equipment port.

(2) If the terminal equipment port of a series connected terminating device is 2-wire and provides a separately powered line feed to other terminal devices, the port impedance shall be nominally BT3 and shall satisfy the requirements of clause 4.5.1 above.

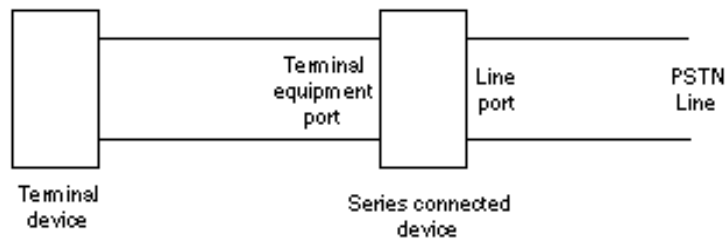
##### 4.6.2 Non-terminating devices

For a non-terminating series connected device designed for connection between the line and a separate terminal device, the return loss requirements are as follows:-

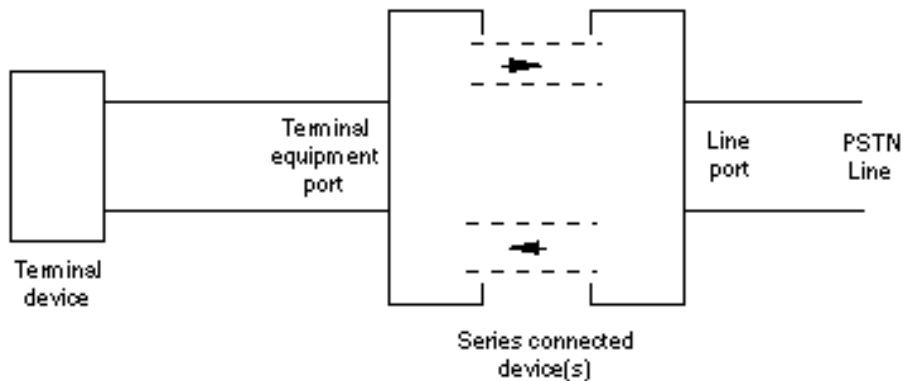
(a) The return loss at the line port of the series device shall be measured against BT3 for line currents of 20 mA and 80 mA, with the terminal equipment port terminated in a reference BT3 impedance (see Figs. 4-4 and 4-5).

- If the series device is dependent upon the d.c. line feed for its operation, to test the return loss it may be necessary to also provide a d.c. termination with the BT3 a.c. impedance.

(b) The return loss measured shall be no less than 25 dB at any frequency in the band 300 - 3400 Hz.



**FIG. 4-4 2-WIRE SERIES CONNECTED DEVICE**



**FIG. 4-5 4-WIRE SERIES CONNECTED DEVICE**

#### 4.7 Impedance of bridging equipment

See clause 4.5.2.

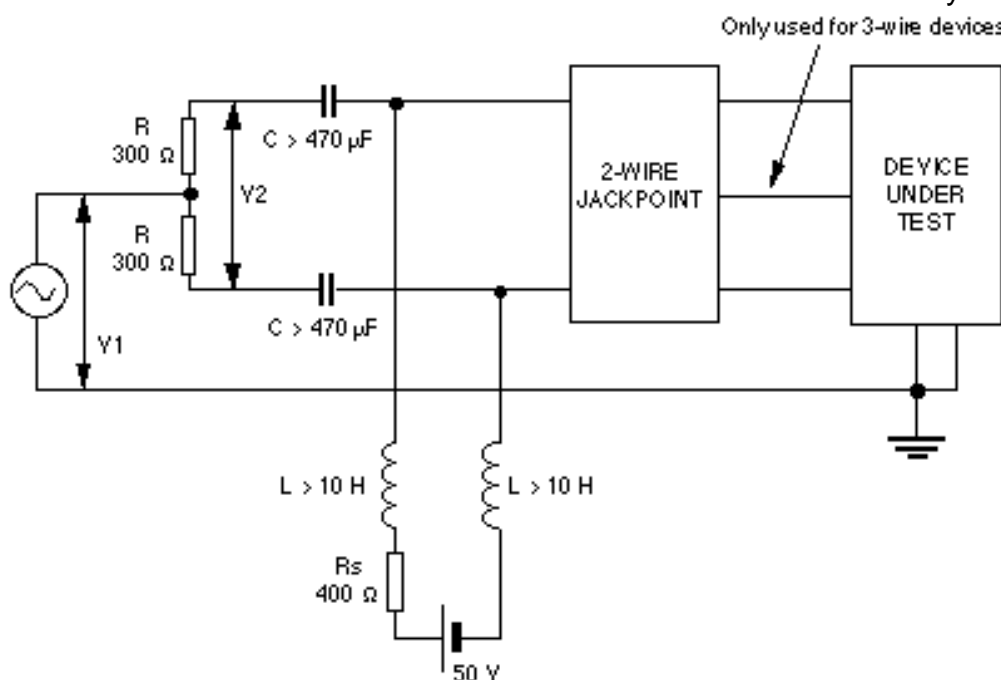
#### 4.8 Impedance balance ratio to earth

(1) Devices which have a direct or indirect connection to earth shall, for both on-hook and off-hook conditions, have an impedance balance ratio to earth of not less than 40 dB over the frequency range 200 - 4000 Hz when tested as shown in Fig. 4-6.

(2) For voice type equipment it is strongly recommended that, in the off-hook condition, devices should also have an impedance balance ratio to earth of not less than 60 dB over the frequency range 200 - 1000 Hz.

(3) Equipment connected directly or indirectly to mains power supplies shall also comply with the requirements of this clause.

• *ELV plug packs will provide some capacitive coupling between earth and the ELV output leads, so may affect impedance balance to earth in some cases. Equipment shall therefore be tested while connected to a power supply of the type supplied to customers.*



#### NOTES:

1. Resistors 'R' to be matched to within 0.1%
2. Capacitors 'C' to be matched to within 10%
3. Power earth & signal earth shall be connected together for duration of test
4. Balance Ratio to Earth =  $20 \log_{10} V_1/V_2$  dB
5. Balance ratio to be determined with device in both 'on-hook' and 'off-hook' conditions.

FIG. 4-6 MEASUREMENT OF IMPEDANCE BALANCE RATIO TO EARTH

## 4.9 Frequency response

### 4.9.1 Send frequency response of telephony devices

(1) The send frequency response of telephony devices connected to a zero length line, with the line current set at 20 mA, should preferably be within the limits specified below and shown in Fig. 4-7.

• The purpose is to ensure that the telephone is not excessively sensitive or excessively insensitive at particular frequencies. This is done by controlling the shape of the mask.

(2) The coordinates of the send frequency response mask, relative to the mid-point of the mask at 1 kHz are as follows:-

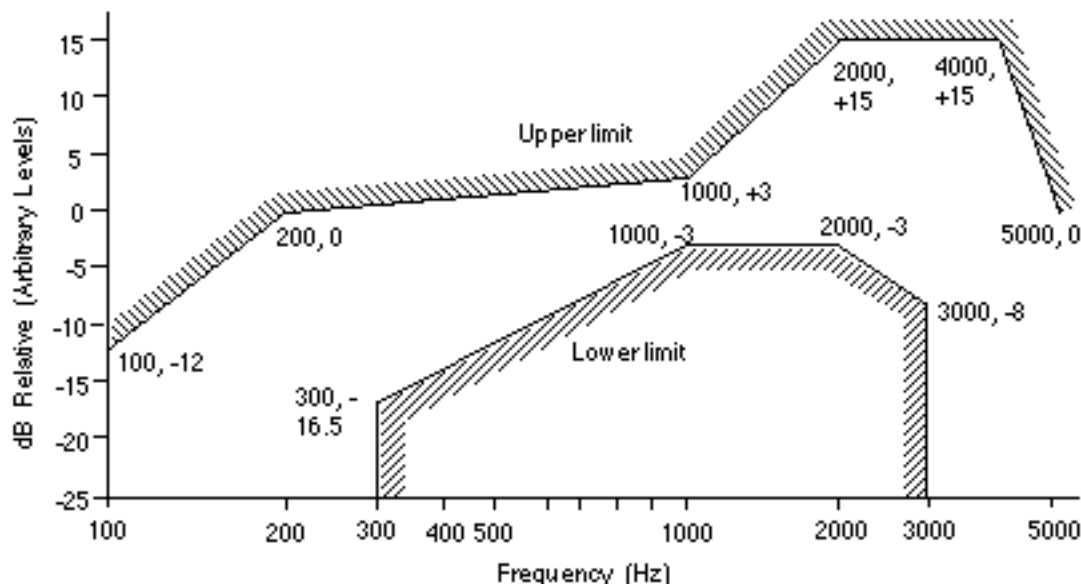
Frequency (Hz)	Lower Limit (dB)	Upper Limit (dB)
(100)	-	(-12)
200	-	0
300	-16.5,-25	-
1000	-3	-
2000	-3	+15
3000	-8,-25	+15
4000	-	+15
(5000)	-	(0)

• The values shown are not absolute values but arbitrary relative levels with respect to the mid-point of

the mask at 1 kHz. Compliance is checked by plotting frequency response on the same scales as the mask and adjusting the mask for "best fit".

- The figures in parenthesis are shown for guidance only and indicate the preferred performance at 100 Hz and 5000 Hz.

- Poor frequency response at the higher frequencies can result in poor articulation and the send mask is purposely sloped upwards to compensate for the frequency response of underground cables. Cables have increasing loss with increasing frequency.



**FIG. 4-7 SEND FREQUENCY RESPONSE OF TELEPHONY DEVICES**

(3) The send frequency response shall be measured.

#### 4.9.2 Receive frequency response of telephony devices

(1) The receive frequency response of telephony devices connected to a zero length line, with the line current set at 20 mA, should be within the limits specified below and shown in Fig. 4-8.

(2) The coordinates of the receive frequency response mask, relative to the mid-point of the mask at 1 kHz, are as follows:-

Frequency (Hz)	Lower Limit (dB)	Upper Limit (dB)
(100)	-	(-10)
200	-	+4
300	-20, -25	+4
500	-4	+4
1000	-4	+4
2000	-4	+4
3000	-12, -25	+4
4000	-	+4
(5000)	-	(-2)

- Compliance is checked by plotting frequency response on the same scales as the mask and adjusting the mask for "best fit". The limit values shown are not absolute values but arbitrary relative levels with respect to the mid-point of the mask at 1 kHz.

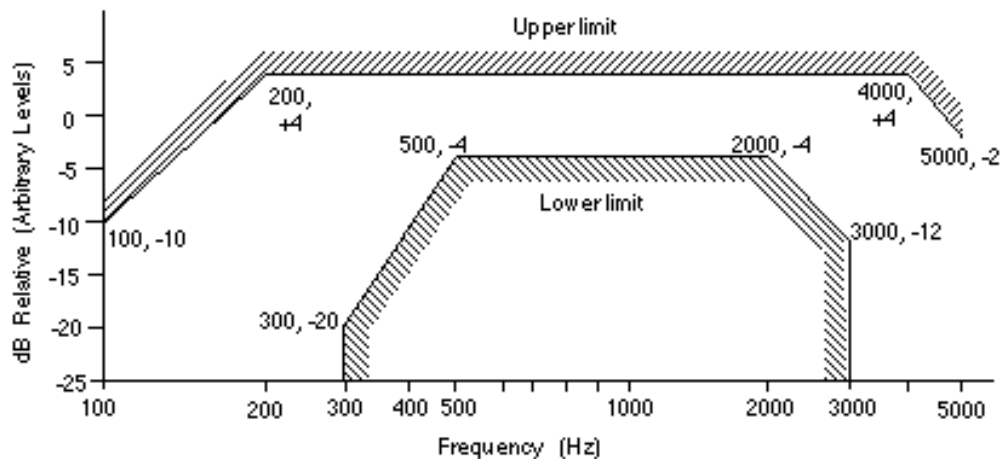
- The figures in parenthesis are shown for guidance only and indicate the preferred performance at 100 Hz and 5000 Hz.

- The receive response mask is deliberately 'flat', the cable response being totally compensated for by the send response mask.

(3) At 8 kHz the receive sensitivity should be not greater than -15 dBPa/V when measured on a zero length line.

- This is a preferred requirement for any telephony device which is likely to be connected to a PABX or other digitally encoded customer premises equipment using 8 kHz sampling.

(4) The receive frequency response and 8 kHz sensitivity shall be measured.



**FIG. 4-8 RECEIVE FREQUENCY RESPONSE OF TELEPHONY DEVICES**

#### 4.9.3 Non-voice equipment

(1) The frequency range normally available over the Telecom PSTN for the transmission of data is 300 - 3400 Hz (ref Document TNA 102, clause 8.1).

(2) Subject to the power limits stated in clause 4.2, any equipment may transmit frequencies in the range 0 - 4000 Hz, but there is little likelihood that the network will pass signals over the whole of that frequency range.

- Signal frequencies above 4 kHz are treated as noise and shall satisfy the requirements detailed in clause 4.3.2.

(3) Any non-voice device which transmits operational signals outside the basic 300 - 3400 Hz band shall have the capability of automatically reducing the transmitted signal bandwidth until it operates successfully. A suitable warning notice shall be inserted in the User Instructions for such devices (see also clause 2.11.1(6) and (7)).

- An example of this type of equipment is a 33.6 kbit/s data modem, capable of reducing its operational bit rate until successful transmission is obtained.

- A typical warning notice is given in Section 13 under clause 2.11.1.

#### 4.9.4 Series connected devices

The frequency response requirements of series connected devices over the frequency range 300 - 3400 Hz are as follows:-

(a) 2-wire series connected devices in the non-terminating state shall have an insertion loss of no more than 1 dB at all frequencies, when the indirectly connected terminal device is off-hook and connected to line (see Fig. 4-4).

(b) 4-wire series connected devices in the non-terminating state shall have an

insertion loss of no less than 2 dB and no more than 3 dB at all frequencies, when the indirectly connected terminal device is off-hook (see Fig. 4-5).

• 2-wire/4-wire/2-wire devices normally have gain facilities but there is a need to guard against instability within the product when the 2-wire ports are connected to line or other equipment. To achieve this without unduly penalising the attenuation, an insertion loss of 2-3 dB is specified.

(c) The objective maximum insertion loss for series connected devices is 1 dB at all frequencies but, such is the variety of devices in this category that this is not a mandatory requirement. Each case will be treated on its individual merits.

(d) Series connected devices set up for through transmission, but which provide a line termination, shall have an insertion loss of no more than 3 dB at all frequencies in the off-hook condition.

• 1 dB insertion loss will be required wherever it is considered reasonable to do so.

• Many series connected devices are capable of performing a 'terminating' function and a 'non-terminating' function at different times during the same call (ref. clause 2.12). For this reason the terms are used to describe the state rather than the device, even though they can serve to describe some devices.

#### 4.9.5 Bridging devices

The maximum insertion loss for bridging devices shall be 1 dB at all frequencies in the range 300 - 3400 Hz.

#### 4.10 Send and Receive Loudness Ratings (SLR & RLR)

(1) The transmission performance of telephony devices shall be assessed in terms of ITU-T IRS Loudness Ratings in accordance with Recommendations P. 64:1993, P. 65:1993 and P. 79:1993. The test arrangements are given in Appendix 2.

(2) Loudness ratings shall be assessed by taking measurements at 14 separate frequencies and weighting the results appropriately. For 14 frequency measurements the frequencies and their weightings are given in Table 1 of Appendix 2.

(3) The aim is that, if a telephony device is set to the SLR and RLR limits stated below, when connected to the Telecom PSTN the combined performance of that device and the network will satisfy ITU-T Rec. G.111:1993 and Rec. G.121:1993.

• Reference also Specification TNA 151, Issue 2.

(4) (a) The send and receive loudness ratings at all line currents, with the telephone connected directly to the feed bridge, shall be within the following limits:-

	SLR(dB)	RLR(dB)
Minimum (Loudest)	+2	-9.5
Objective $\pm$ Margin	+5 $\pm$ 3	-6.5 $\pm$ 3
Maximum (Quietest)	+8	-3.5

(b) There should be no more than 3 dB difference between the maximum and minimum send loudness rating results measured at line currents of 20 mA, 45 mA and 80 mA.

• The 3 dB recommended maximum difference reflects the preference for non-regulated telephones to be used.

(5) To assist suppliers to optimise performance, the following is the ideal design target area for SLR and RLR with the telephone connected directly to the feed bridge:-

	SLR(dB)	RLR(dB)
0 km Line	+5.0 ±1	-6.5 ±1

• *It should be noted that these design target area limits are not test limits for production samples. They are given here for guidance only.*

## 4.11 Sidetone for telephony devices

### 4.11.1 Significance of sidetone

(1) Sidetone is an important factor in telephony and can have as much effect on the perceived quality of a telephone conversation as the actual loudness and clarity of the speech signals.

(2) Sidetone performance results from human head characteristics in combination with the mechanical and electro-acoustical properties of the telephone. Some sidetone is important to avoid "deadness" on a telephone, but excessive levels of sidetone have a marked effect not only on the perception of received signals, but also on the volume of the speaker's voice. Thus, excessive sidetone in one telephone can have a marked effect on the received speech volume of the telephone at the other end of a call.

(3) A high level of sidetone also has a significant effect on the use of telephones in high ambient noise conditions, making received speech extremely difficult to understand.

• *Sidetone is related to SLR and RLR and any attempt to change them for telephones to achieve compliance with loudness rating requirements can also have a marked effect on sidetone performance.*

• *Reference ITU-T Recommendations G.121:1993 and P. 79:1993, and also ITU-T, Recommendation P. 76.*

### 4.11.2 Optimum sidetone performance

(1) The internationally recognised method for assessing sidetone is by use of sidetone masking rating (STMR). The "preferred range" of STMR for a telephone on a complete call connection is 7 - 12 dB.

• *Reference ITU-T Recommendation G.121:1993.*

(2) For optimum sidetone performance in the Telecom network, with the objective of being within the "preferred range" stated in (1) above, the equivalent sidetone balance impedance of a telephone ( $Z_{s0}$ ), should be close to the line terminating impedance "BT3" (ref. Fig. 4-3).

• *Accurate determination of STMR of a telephone for all types of complete connections is totally impractical due to the number of variables involved. However, assessment of STMR against the Telecom network terminating impedance "BT3" does provide some measure of sidetone performance.*

•  *$Z_{s0}$  is also sometimes known as the "minimum sidetone line impedance".*

• *Traditionally, the  $Z_{s0}$  of telephones has been considerably more reactive than BT3 in order to match more closely the combination of long cable pair connections in the local loop and the exchange impedance. This is no longer favoured due to the rapidly increasing number of short cable connections being used.*

#### 4.11.3 Sidetone Masking Rating (STMR)

(1) STMR shall be measured separately against the two impedances, 600 Ohms and the Telecom network line terminating impedance BT3.

(2) The value shall be no less than 7 dB against BT3

(3) It is preferred that STMR also be no less than 7 dB against 600 Ohms.

- *Measurement against two different impedances provides a better understanding of the likely sidetone performance when installed in practical conditions.*

- *This test requirement does not include use of an artificial line.*

#### 4.12 Instability

(1) All devices shall be stable under any normal range of conditions when connected to a PSTN line.

(2) Telephony devices shall be tested using the test set-up shown in Fig. 4-1, with the handset placed face down on a hard flat surface, it shall not be possible under any condition to induce an audible oscillation in the telephone when terminated by the following impedance networks:-

(a) a 270 Ohms resistor.

(b) a 1600 Ohms resistor in series with a 510 nF capacitor.

(3) The requirement of sub-clause (2) above applies to all telephony devices, including those fitted with a receive volume control when adjusted to both minimum and maximum settings.

- *Instability not only affects the user, but will also upset the other person taking part in the conversation.*

- *The network described in paragraph 4.12 (2) (b) copies the effect of an additional telephone attached to the same line being taken off hook during a telephonic conversation. All telephone appliances must remain stable under the combined impedance of two parallel off hook telephones.*

#### 4.13 Acoustic shock protection

The sound pressure at the earpiece of telephony products shall not exceed the following limits when a 1000 Hz sinusoidal signal of up to +24 dBV (15.85 V) is applied via a 600 Ohms resistor to the line terminals. The equipment shall comply at all line currents between 20 mA and 80 mA, and all signal generator voltages up to +24 dBV:-

(a) For handsets - max 118 dBA (approximately equivalent to +24 dBPa)

(b) For headsets - max 111 dBA

- *This requirement relates to the safety of the user and reduces the risk of line transients resulting in injury to the user's hearing.*

#### 4.14 Adjustable volume controls on telephony devices

(1) The requirements of clauses 4.2 to 4.13 shall be tested at both the "minimum" and "maximum" settings of all telephony products equipped with a receive volume control.

- *These tests are carried out at "minimum" and "maximum" as they are normally the only readily discernable settings for a continuously variable volume control. The intention is to demonstrate that the two extremes do, in fact, fit within the specified performance range.*

(2) When the volume control is set to maximum, the receive loudness rating shall be no louder than -14 dB at any line current (ref. clause 4.10(4)).

(3) It is strongly recommended that the volume control resets to a default setting when the device is restored to the on-hook state. This default setting should be such that the receive loudness rating resets to within the 'normal' range -3.5 dB to -9.5 dB (ref. clause 4.10(4)).

(4) It is preferable that the requirements of clause 4.10(4) (b) be complied with at both minimum and maximum settings of the volume control.

(5) User-controlled volume controls shall not affect compliance with either the d.c. voltage or the send performance characteristics.

(6) The frequency response of a telephone in this class should preferably lie within the receive frequency requirements of clause 4.9.2 for both the minimum and the maximum setting of the volume control.

#### **4.15 Telephony security in on-hook condition**

(1) The security of telephony devices between the transmitter and line while the device is on-hook is adequately covered by clause 4.3.1(3).

(2) Additionally, no component or combination of components on a telephony device shall be capable of reproducing audible or intelligible speech while that device is on-hook, and there is conversational speech present from another device connected to the same line.

• *An example of this is a ringing detector which responds to speech signals present on the line while the device is on-hook.*

• *This requirement relates to potential eavesdropping, whereby the telephone in its on-hook condition could provide a source of signals to an unlawful listener.*

#### **4.16 Recorded message quality**

(1) The speech quality of any recorded message transmission shall be suitably intelligible to the party on the other end of the call.

• *Reference clause 4.2 for power level of stored message transmissions.*

• *Reference clauses 4.3 & 4.4 for noise and distortion requirements.*

(2) Overall speech quality will be assessed subjectively by the testing authority and, in any cases of doubt, finally assessed by Access Standards at the time of application.

• *A suitable quantitative means of assessment may be introduced at some future date.*

• *Quantitative or subjective 'mean opinion score' assessment of speech quality is extremely complex and would be costly to the applicant. For this reason, no formal qualitative requirement is stated in this Specification.*

(3) Telecom reserves the right to re-assess the quality of the recorded speech transmission of any product after the grant of a Telepermit if there is evidence of substantial complaints from customers.

(4) If, during such a re-assessment, it is suitably established that the transmitted speech quality is unintelligible to another party when connected via the Telecom

PSTN, then either:-

- (a) the speech quality shall be improved to the satisfaction of Telecom, or
  - (b) the Telepermit will be cancelled.
- (5) The cost of such re-assessment shall be born by the Telepermit holder. Also, any cost incurred by Telecom for investigation of complaints by customers relating to transmitted speech quality may be passed on to the customer using the transmitting device.

## 5 SIGNALLING REQUIREMENTS

### 5.1 Signalling types

(1) The standard method of signalling between customer premises equipment and Telecom telephone exchanges is dual tone multi-frequency (DTMF) signalling. This method is also widely used for signalling from customer to customer after a call has been established.

(2) The Telecom network has traditionally supported reverse decadic (pulse) signalling. This dialling method will not be supported by the Next Generation Network (NGN) so Telecom's support for this signalling method has been withdrawn and CPE using only decadic (pulse) signalling will not be Telepermitted.

(3) Where CPE has the option of decadic signalling, **either**:

The option shall be disabled, **or**

If selected by a user accessible switch, a warning not to use the decadic or pulse setting shall be affixed to the CPE next to the switch, **or**

If selected via software settings, the user manual shall contain a warning not to use the decadic or pulse option.

• *It is strongly recommended that the decadic or pulse option be disabled.*

(4) It shall not be possible for any device to send DTMF signalling to line in the "on hook" condition.

• *When initiated, 'Handsfree' operation of telephony devices is regarded as an off-hook condition.*

(5) The test set-up for signalling tests is shown in Fig. 5-1.

### 5.2 Transmission of DTMF signalling

• *Reference ITU-T, Recommendation Q. 23.*

#### 5.2.1 DTMF frequencies

(1) The allocation of DTMF signalling frequencies shall be as follows:-

Low Group	High Group (Hz)			
(Hz)	1209	1336	1477	1633
697	1	2	3	A
770	4	5	6	B
852	7	8	9	C
941	*	0	#	D

(2) Each transmitted frequency shall be within  $\pm 1.5\%$  of the nominal frequency.

(3) DTMF signalling devices shall support at least the 10 numeric digits plus '\*' and '#' symbols.

• The 'A', 'B', 'C' and 'D' are rarely used at the date of issue of this Specification.

### 5.2.2 DTMF signalling requirements

(1) For optimum performance, all transmitted DTMF frequencies shall comply with the requirements of this Specification at all line currents in the range 20 mA to full current.

(2) All devices shall satisfy the following requirements during the transmission of DTMF signalling:-

(a) The impedance of the equipment shall be such that the return loss complies with sub-clause 4.5.1(8).

(b) Each individual signalling tone of a burst, when measured against 600 Ohms on a zero length line, shall be at a power level between -4 dBm and -13 dBm.

(c) For successful operation of DTMF signalling between customer premises, it is recommended that DTMF send levels be in the range -4 dBm to -10 dBm.

(d) There shall be a pre-emphasis in the range 1 to 3 dB for the high frequency tone group relative to the low frequency group.

(e) During DTMF signalling, any individual distortion or intermodulation products shall comply with clause 4.3.2(2).

### 5.2.3 Signal timing

The duration of transmitted DTMF signals shall comply with the following requirements:-

(a) The minimum valid tone duration shall be 60 ms, and the minimum inter-digital pause shall also be 60 ms, exclusive of any rise and fall times.

(b) The valid tone duration shall be timed when the signal is within the acceptable tolerances stated in clauses 5.2.1 and 5.2.2.

(c) The inter-digital pause shall be measured following rapid successive operation of any of the DTMF keys.

• Even if buffering of manually operated DTMF signals is not provided, the minimum tone duration is still likely to be around 60 ms.

### 5.2.4 Series connected equipment

(1) Any harmonic distortion of DTMF signals introduced by series connected devices shall not exceed 5 %.

(2) For terminating series connected devices, any DTMF signalling facility shall comply with the requirements of clauses 5.2.1 to 5.2.3.

### 5.2.5 Speech circuit suppression

(1) For all devices capable of sending DTMF signals, the normal transmission path from any voice or similar source shall be attenuated in both directions of transmission by at least 30 dB during DTMF sending. This applies to terminating devices and also to other series connected devices capable of being used on the same line as a terminating device.

(2) On telephony devices, a confidence tone may be applied to the receiver so that

the user is aware that signals are being sent to line.

- The application of confidence tone and the level selected are regarded as marketing features.

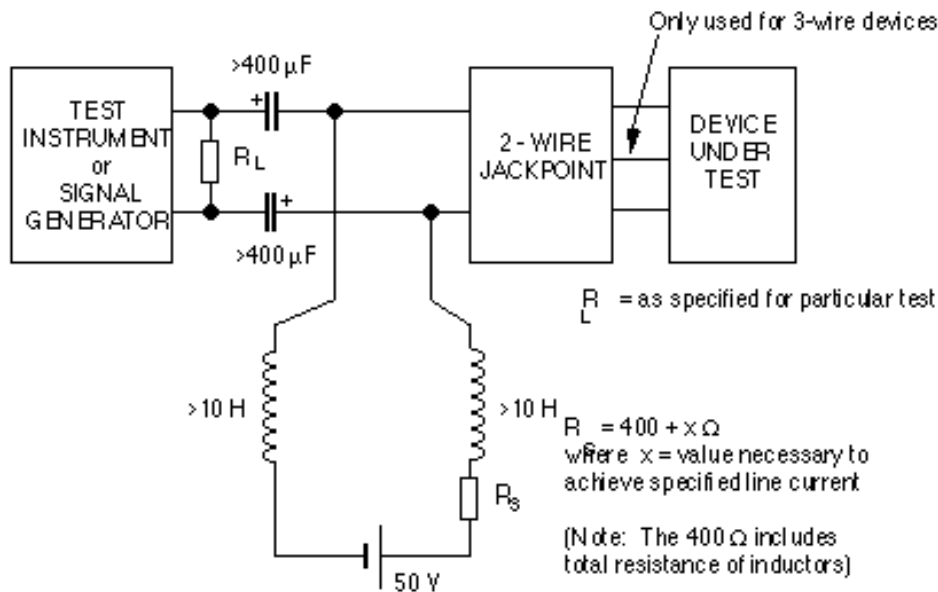


FIG. 5-1 TEST SET-UP FOR SIGNALLING TESTS

### 5.3 DTMF receivers

(1) Any device incorporating a DTMF receiver as one of its main functions shall be capable of responding to DTMF signals in the following ranges:-

- Any receive level between -5 dBm and -30 dBm.
- DTMF frequencies within  $\pm (1.5 \% + 2 \text{ Hz})$  of the nominal values (ref. clause 5.2.1(1)).

- It is strongly recommended that devices respond down to -40 dBm (ref Document TNA 102, clause 5.2.2).

(2) The receiver shall recognise any valid DTMF signal that is present for a minimum of 55 ms, as long as it is preceded by a continuous pause of at least 55 ms.

### 5.4 Breaks in line current during signalling

(1) During the switching of any call through the PSTN there may be short periods when the line current feeding CPE is interrupted. Where such interruptions occur they are usually within the inter-digital pauses, or at the end of dialling, during the call set-up period.

(2) The dialler circuitry on any DTMF device shall be capable of tolerating line breaks of up to 50 ms at any time during call set-up without affecting the signalling performance.

- Although this requirement is mandatory, products will only be subjected to formal compliance testing if other tests indicate that performance is being adversely affected.

## 5.5 Automatic dialling devices

### 5.5.1 General requirements

(1) Devices which have automatic dialling features, but which do not forward a pre-recorded voice or data message when the call is answered, shall only be activated manually. This includes devices with features such as last number re-dial, memory dialling, automatic dial back, etc.

• *Requirements for automatic calling equipment with calling messages, such as memory fax machines, telemarketing equipment, alarm security equipment, etc., are covered separately in Section 8.*

(2) For the purpose of this clause, there shall be no more than one call attempt to the same number for each manual operation.

• *Any device which makes more than one call attempt to the same number is classified as an “automatic calling device” and is covered separately in Section 8.*

(3) The user instructions associated with any automatic dialling equipment shall clearly state the following:-

**“This equipment shall not be set up to make automatic calls to the Telecom “111” Emergency Service”**

• *This warning notice also appears under section 8.1.7 of this specification entitled “User Instructions”. Test Laboratories need not apply the same warning notice twice to items of CPE.*

(4) Equipment designed for automatic dialling shall be capable of having the called numbers re-programmed or edited. This may take the form of installer programming locally or from an external source, internal software programming or associated DTMF keypad for the purpose of manually editing individual programmed numbers.

• *It is sometimes necessary to insert prefix digits additional to the number programmed (see clause 5.6.2 below).*

(5) Where an adjunct unit has an integral keypad, it shall be regarded, for dialling purposes, as equivalent to CPE with an integral display unit.

(6) When dialling a local number, only the 7 digit number shown in the directory needs to be dialled. Nevertheless, a customer may dial the “0” and the area code for a local call wholly **within** the Telecom network. This does NOT incur a toll charge.

(7) Should a Telecom customer also be the customer of a toll by-pass carrier and subscribe to Telecom’s non-code access service, local calls preceded by the “0” and area code will be passed to the other carrier (see clause 5.5.3).

• *Such customers will need to choose whether or not the use of an automatic dial back feature is justified. In some cases, such units will be unacceptable.*

(8) Where automatic calling devices are under centralised control, so that large numbers of them can call the same PSTN number or group of numbers at the same time, the user must negotiate the number of redial attempts and the delays between attempts with the Telecom service concerned.

• *The circumstances of automatic calling are varied and the aim is to assess the specific calling conditions for each customer and negotiate precautions where required.*

### 5.5.2 Caller display equipment

(1) Caller display devices which offer a dial-back facility represent a potential difficulty for users. The number forwarded from the network comprises only the area code and the local number, with no leading "0". Wrong numbers will result in MOST cases when such devices dial only the number received.

*• Without the "0" prefix, the area code is seen by the exchange as the first digit of a local number. The last digit of the true local number is then ignored. The only case for which the correct number is shown and dialled is where the device is used within a Centrex group.*

*• See also clause 11.4.5 for further information on number formats.*

(2) There are three possible ways to avoid the problem described in (1) above, and one of them should be employed on adjunct caller display units. The possibilities are as follows:-

(a) Dispense with the dial back feature totally.

(b) Provide for digit insertion in accordance with sub-clause (5) below.

(c) Incorporate a keypad for manual insertion of digits.

(3) Telecom pre-sets each line in the local exchange to either "normally display" or "normally withhold" the calling number, as determined by the customer concerned. It should be noted that callers (who may or may not be the actual customer) may wish to control the display of their numbers on a call by call basis as follows:-

(a) To withhold a normally displayed calling number, dial the prefix "0197".

(b) To display a normally withheld calling number, dial the prefix "0196".

(4) Where dialling such prefixes involves the use of an associated CPE device, potential problems may arise, as explained in clause 5.5.4.

(5) Where a dial back feature is provided on an adjunct caller display unit and there is no associated keypad on the unit:-

(a) The digit "0" shall be inserted as the first digit where the number received from the network comprises 8, 9 or 10 digits.

*• Local and national calls are indicated by a number length of 8, 9 or 10 digits.*

(b) No digits shall be inserted where the number received from the network comprises 7 digits or less.

*• Such short numbers indicate either a Centrex call or an incoming international call for which the number is not available.*

(6) For international length numbers, an adjunct caller display unit should be capable of storing and/or displaying up to 15 digits. If a dial back feature is provided on such units, the digits "00" should be inserted as the first digits for all cases where the number received from the network comprises 11 or more digits.

*• The majority of numbers of this length will, in due course, represent international incoming calls.*

*• Note that there may be some incoming international calls which result in number lengths of less than 10 digits, but these are expected to be in the minority. Typical examples are those from the Pacific*

Islands.

(7) Display units providing auto dial back facilities may also provide the following facilities:-

(a) For dialling local numbers, a device may be programmed to automatically delete the “0” prefix and area code digit and dial only the 7 digits of the local number.

• *It should be noted that every area code used in the Telecom PSTN serves more than one local calling area. Any dial back logic will thus need to examine the one digit area code and one or more digits of the following 7-digit number in order to accurately determine whether the number received from the network relates to a local call. Since the digits indicating local calls vary from area to area, this arrangement is likely to be practicable only for Computer-Telephony Integration (CTI) systems.*

(b) Where an exchange line access prefix is necessary, the device may be programmed to automatically insert it. In such cases, the access prefix must only be inserted for local and national calls, and not for calls internal to a Centrex group or PABX network.

• *To avoid any customer misunderstanding, it is recommended that suppliers clearly state in the product brochures whether or not the product is “Centrex compatible”.*

### 5.5.3 Non-code access to other networks

(1) Many Telecom customers use another carrier’s toll services for their national calls and have their line set up so that their chosen carrier’s access code is automatically inserted by the Telecom exchange. This service is activated when the caller dials a “0” or “00” prefix before the wanted number. Should such a customer dial the “0” prefix and area code for local calls, these calls will also be passed to the other carrier as if they were national calls. As a result, a toll charge may be incurred.

(2) Telecom area codes serve more than one local calling area. As a result, on caller display devices, complex user programming would be necessary to automatically separate local calls from national calls, as covered in clause 5.5.2 above.

### 5.5.4 Manual insertion of additional digits

(1) In some cases it is necessary to dial digits manually in addition to those dialled by an automatic dialling device. Usually this will be carried out from an associated telephone. Use of such arrangements may give rise to the following difficulties:-

(a) If both the adjunct automatic dialling unit and the associated telephone draw current from the line, there may be insufficient current available to power both devices.

(b) If both devices terminate the line, the combined impedance of the two devices is unlikely to meet the requirements of clause 4.5.

• *This is acceptable for a limited period before actual speech transmission takes place, provided that the automatic dialling device goes on-hook as soon as dialling is completed.*

• *From a user viewpoint, the need to manually dial part of the number via the telephone is not very convenient. Also, if the two devices are connected in parallel rather than series, then the sound level from the receiver may be objectionable when the display unit is dialling the remaining digits (series connected devices are required to comply with the speech path suppression requirements of clause 5.2.5).*

(c) Adjunct dialling units use DTMF signalling and can therefore only be used in conjunction with DTMF telephones.

- See also clause 5.1(3).
- These potential problems are likely to result in complaints from users and, possibly, product returns.

(d) An adjunct dialling unit is unlikely to be able to suppress the speech performance of an associated telephone during dialling (ref clause 5.2.5). Use in high ambient noise areas or during loud conversation could lead to digits being ignored by the local exchange and calls timing out.

- Note that this affects ONLY the calling party, as missed digits usually do not result in a wrong number.

(2) Where it is necessary to use an associated telephone with an adjunct dialling unit for dialling prefix(es), suppliers shall include the following warning notices in sales brochures and user instructions:-

**“This unit will only work in conjunction with a tone signalling (DTMF) telephone, but some telephones may not be compatible. Since noise or speech from the telephone can upset dialling from this unit, errors may result if the devices are used together in other than quiet conditions.”**

“Where it is necessary to dial prefix digits, such as a Caller Display override code (“0196” or “0197”), this unit will have to be used in conjunction with an associated tone signalling (DTMF) telephone.”

“Note that some telephones are NOT compatible with this unit and dialling errors may result if the two devices are used together in other than quiet conditions. The Telecom Faults Service is NOT to be called should such problems arise. In such cases, it is recommended that the prefix and wanted number are dialled manually”.

### 5.5.5 User instructions

(1) In view of the above complications resulting from use of automatic dialling devices, clear and comprehensive User Instructions shall be supplied.

- This is particularly important for devices intended to operate with Telecom’s Caller Display service.

(2) In addition to the specified mandatory warnings, it is recommended that the User Instructions also include a brief explanation of the reasons behind these requirements.

(3) The user instructions shall clearly explain:-

(a) the appropriate dialling procedures for local and national calls for both direct line and Centrex customers.

- The most commonly used exchange line access prefix for New Zealand PABX systems, Telecom Centrex lines, etc, is the digit “1”. However, other access digits may also be encountered.

(b) The impact of “non-code access” to a network other than the local network to which a display unit is connected.

(4) To minimise liability under New Zealand consumer protection legislation, suppliers shall make purchasers aware of this issue by inserting the following warning in the User Instructions.

“If a charge for local calls is unacceptable, the “Dial” button should NOT be used for local calls. Only the 7-digits of the local number should be dialled from your telephone. DO NOT dial the area code digit or the “0” prefix”

• Under New Zealand consumer protection legislation, the supplier is responsible for ensuring that a product is fit for its intended purpose. A warning to the above effect is likely to minimise the number of product returns or claims by purchasers who make use of Telecom's non code access service.

## 5.6 Keypad layout

### 5.6.1 International standard layout

(1) The standard requirement for keypads is that they be 'alpha-numeric'. The layout agreed internationally at the World Telecommunications Standardisation Conference, March 1993, has been adopted by Telecom in New Zealand. The layout is as shown below in sub-clause (2) and the date for implementation was 1 April 1996.

• This new standard is published in the following standard documents:-

1. ITU-T Recommendation E. 161
2. International Standard ISO/IEC 9995-8:1994
3. ACA TS 002:1996

• ANSI and ETSI publications also include the same standard.

(2) The internationally agreed standard alpha-numeric keypad layout is as follows:-

1	ABC 2	DEF 3
GHI 4	JKL 5	MNO 6
PQRS 7	TUV 8	WXYZ 9
*	0	#

(3) For equipment which does not comply with this standard layout, details of the actual layout shall be stated in the application or in an associated test report.

• It is strongly recommended that all products marketed comply with the layout in sub-clause (2) above. Failure to do so will inevitably cause confusion to callers. Alpha-numeric "word numbers" are very popular, particularly for customers with "0800" or "0900" numbers.

• At some future date, the alpha-numeric layout shown in sub-clause (2) above may become mandatory. If so, from that time no Telepermit applications will be accepted for products with layouts that are numerical only, or that are similar to the above but with 'Q' and 'Z' on digit 1, or with 'Q' and 'Z' omitted.

(4) Equipment that does not use a keypad for sending (e.g. modems and PC's) shall be exempt from the requirement to comply with the above layout.

### 5.6.2 Tactile performance and service life

There is no formal requirement for keypad performance.

• The operating life of a keypad, its construction and function are all regarded as marketing features.

## 6 D.C. CHARACTERISTICS

### 6.1 CPE power supply methods

Customer premises equipment connected to a PSTN line may be powered by two alternative methods as follows:-

(a) Line powered, which relies entirely on the d.c. supplied from the line for all its electrical functions.

(b) Locally powered, which has its own power source for the main functions (i.e. speech transmission, etc.), but relies on the line feed for supervisory functions.

• *'Locally powered' includes battery powered devices such as some types of Caller Display Units.*

### 6.2 Function of d.c. line feed

(1) For line powered devices, the d.c. line feed from the exchange performs two basic functions by providing power for the following:-

(a) Supervisory and signalling functions.

(b) Speech signals and general operation of customer equipment.

(c) Maintenance of memory facilities in customer equipment.

• *(a) and (b) are dependent on d.c. line current in the off-hook condition. (c) However is normally maintained by the very small current flowing when the customer equipment is on-hook.*

(2) For both line and locally powered equipment, satisfactory performance is dependent on the d.c. characteristics of that equipment satisfying the off-hook requirements of clause 6.3.

(3) With certain exceptions (see sub-clause (4) below), all customer equipment shall continue to operate normally, and the requirements of this Specification shall be met independently of changes to the d.c. line conditions described in Section 4 of Technical Document TNA 102. Typical changes are short breaks, transient voltages, line polarity, etc.

• *Changes to line polarity may occur as follows and customer equipment shall not be affected by such changes:-*

(a) *Rearrangements within the network may result in reversal of the line polarity. Customer wiring also does not necessarily maintain polarity.*

(b) *Line reversals can occur before during or after the application of ringing and at other times during a call.*

(4) Some locally powered devices are dependent on a particular line polarity (e.g. some PABXs, etc) for correct operation. This requirement shall be made clear to both customers and installers, and the matter will need to be discussed between installers and local Telecom staff at the time of installation.

### 6.3 Off-hook d.c. line characteristics

(1) For all devices designed for connection to a PSTN line, to ensure satisfactory operation, the d.c. voltage versus current characteristics in the off-hook condition shall be no greater than the upper limit curve shown in Fig. 6-1. This curve is formed by straight lines joining the following coordinates:-

**UPPER LIMIT CURVE**
**CURRENT  
(mA)**

 0  
20  
60

**VOLTAGE  
(Volts)**

 9  
9  
27

(2) In order to improve the chances of call handover where applicable, the off-hook d.c. characteristics should also not be less than the lower limit of the curve shown in Fig. 6-1. This curve is formed by straight lines joining the following coordinates:-

**CURRENT  
(mA)**

 10  
20  
100

**LOWER LIMIT CURVE**
**VOLTAGE  
(Volts)**

 0  
6  
10

• Although not mandatory, this requirement is strongly recommended for all devices with the possible exception of facsimile equipment and data modems, where handover is unlikely to occur.

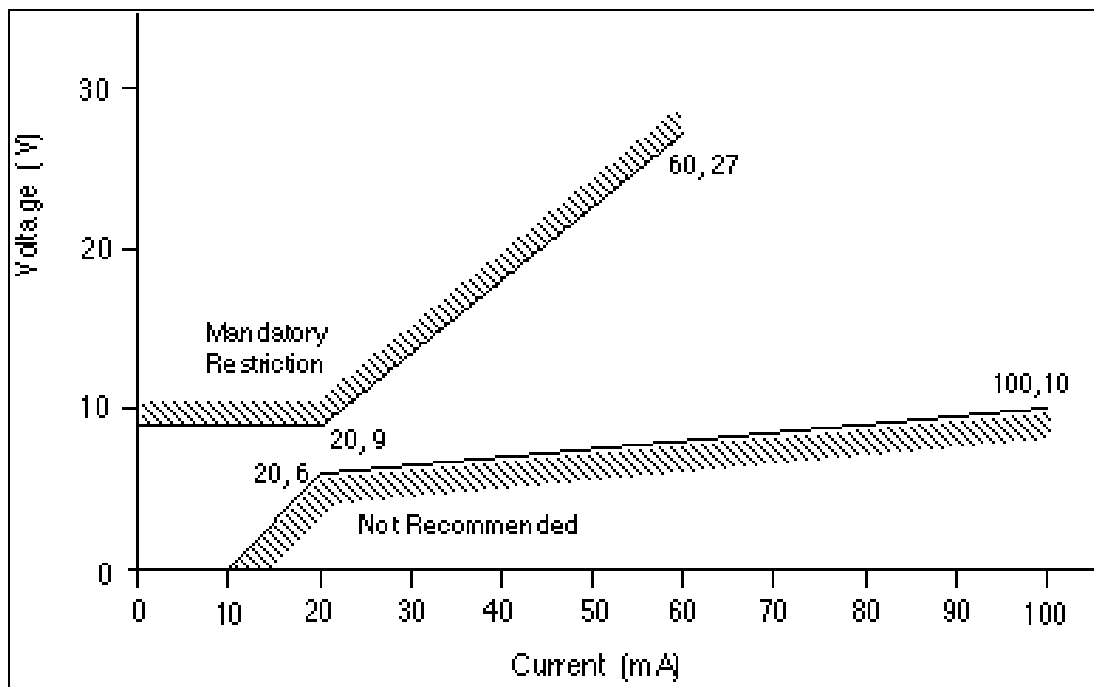


FIG. 6-1 LIMITS OF D.C. CHARACTERISTICS

(3) For voice equipment with d.c. characteristics that lie beneath the lower limit curve shown in Fig. 6-1, the user instructions shall contain a warning as follows:-

**"This equipment may not provide for the effective hand-over of a call to another device connected to the same line."**

(4) All products shall be capable of full operation down to a line current of 20 mA.

• Satisfactory operation at line currents down to 18 mA is desirable as this may occur on occasions,

particularly from derived circuit systems during mains power failure.

- Notwithstanding compliance with these requirements, no guarantee can be given that effective transmission will be achieved between or by two or more items of equipment which are connected to the same line.

## 6.4 Supervisory conditions

### (1) Line seizure:

Customer equipment shall initiate an outgoing call (seize an exchange line) by going off-hook and drawing d.c. line current from the PSTN line (see also clause 8.1 for devices with automatic line seizure facilities).

### (2) Ring trip:

Similarly, customer equipment shall answer an incoming call (trip the incoming ring), by going off-hook and drawing d.c. line current from the PSTN line.

### (3) Call release:

The equipment shall terminate a call by going on-hook and breaking the line current. At this point it shall be ready to receive a subsequent incoming call.

- These conditions also apply to series-connected devices (ref. clause 6.9.1(4))

(4) It is strongly recommended that hookswitch contacts are 'debounced' to avoid spurious line seizure following call release.

(5) To ensure satisfactory performance of each of these supervisory functions, the device shall satisfy the mandatory requirements given in clause 6.3.

- An increasing number of line feeds have limited current sources (such as those provided by "derived circuit" equipment and many PABXs). For this reason it is not permitted to have customer equipment incorporating constant current sinks as a means of holding the line in a seized condition. This is reflected in the d.c. characteristic upper limit curve having a finite slope from the 20 mA minimum rather than a vertical constant current characteristic.

(6) Any CPE device that relies entirely on a local power source for its operation (either battery or mains) shall automatically release any call in progress within 5 seconds of failure of that power source.

- This does not necessarily apply if some functions are line powered. For example, a mains powered answerphone with a line powered handset does not have to release a call while the handset is being used on a call in progress.

- See also Section 8 for requirements for automatic calling and automatic answering devices.

## 6.5 Hold Condition

- This facility typically places a condition on the line to maintain a call in progress while the user is away from the telephone, or wishes to transfer to another device connected to the same line to retrieve the call. This condition typically does not apply to PABXs or other customer switching devices.

(1) Where a device has a manually operated 'hold' (commonly used for call 'handover') facility, such a facility shall be subject to at least one of the following conditions:-

(a) Some part of the equipment, such as a control switch, etc, shall be clearly seen to be in other than the normal idle condition, or

(b) Some form of lamp or signal shall be provided to clearly indicate that the terminal equipment is in the 'hold' condition.

and

(c) The terminal equipment shall time out the 'hold' condition and release within 3 minutes.

(2) When 'hold' is activated, the device shall maintain the line current at not less than 15 mA when connected to a nominal 24 V, 400 Ohms source.

(3) Following activation of the 'hold' condition as described in sub-clause (2) above, full release to the on-hook condition shall occur within 500 ms of separate application of each of the following:-

(a) A 450 Ohms resistive shunt.

(b) The same type of terminal device, connected in parallel to the same source, going off-hook.

(c) Disconnection of the line current source.

(4) It is strongly recommended that the 'hold' condition should be inoperable if another device on the same line is off-hook.

(5) On series connected automatic dialling devices, the dialling feature shall release from the line and hand over control to the associated telephone within 1 second of sending the last digit of the called number.

• *The Telecom network now makes extensive use of No. 7 signalling, such that the call may be switched through immediately the last digit is received. Should the dialling function hold across the line, it may prevent the associated telephone receiving sufficient line current to turn on. If the called party answers immediately, any delay in completing the speech path may result in that party dropping the call.*

(6) The dialling feature may initially drop back to a hold condition, in accordance with sub-clause (3). In such cases, the hold condition may be indicated by a message on the associated display to the effect "**Pick up phone**".

• *Because of their varying characteristics, not all telephones and automatic diallers can be relied upon to work in combination or provide an effective handover from one to the other.*

## 6.6 Line breaks

The duration of any undefined interruption or random break in the d.c. path caused by the equipment shall not exceed 9 ms.

## 6.7 On-hook line current

(1) The total current drawn by all equipment connected to a PSTN line within a customer's premises in the idle condition shall not exceed 1 mA.

(2) In the on-hook state the direct current drawn from a nominal 50 V supply by any single item of equipment shall be not greater than 120  $\mu$ A.

• *The on-hook current drain should be as low as possible to allow customers the freedom to install several telephones without undue risk of exceeding the maximum value for the line.*

## 6.8 Recall and call waiting

(1) The recall facility is in the form of a timed break in the holding loop condition during a call, and it is known as "timed-break recall" or "TBR". It is strongly recommended that this facility is provided on telephony devices.

(2) To activate call waiting, it is necessary to signal a break equal to the TBR signal. If a separate 'call waiting' key is provided, it shall either provide the same facility as the TBR or be rendered inoperable and suitable mention made in the User Instructions.

(3) Where provided, the TBR of customer products shall be within the range 300 ms to 800 ms. If a product cannot be set to operate within this range then the TBR function shall be disabled. Also, a suitable explanation shall be inserted in the User Instructions advising users that the facility is not available.

(4) For the highest probability of correct operation in all situations, TBR should be within the range 500 - 650 ms.

• *Following investigations, it has been found that there are a number of earlier exchanges which require TBR to be within 500 - 800 ms to ensure consistent and reliable operation.*

• *While most modern PABXs will accept a lower TBR on their extension ports, some earlier PABX products, many of which are still in service, require that TBR be in the range 300 - 650 ms.*

(5) Since 100 % certainty of operation cannot be guaranteed for products with TBR of less than the preferred minimum, the following warning notice shall be included in the User Instructions for all products providing a TBR of less than 500 ms:-

**“The recall facility of this product may not always operate correctly on some parts of the Telecom network or on some PABXs available on the market. If this is the case then ‘recall’ can be activated by ‘flashing’ the switch-hook or repeat use of the recall button.**

**RECALL PROBLEMS WITH THIS PRODUCT ARE NOT TO BE REPORTED TO THE TELECOM FAULTS SERVICE”**

## 6.9 Series connected equipment

### 6.9.1 D.C. line characteristics

(1) Some series connected devices provide a continuous d.c. path between ports at some stage of operation. On such devices, the sum of the total voltage drops between ports via each leg shall, for the off-hook condition, not exceed the limit curve shown in Fig. 6-2, which is formed by straight lines joining the following coordinates:-

#### LINE CURRENT

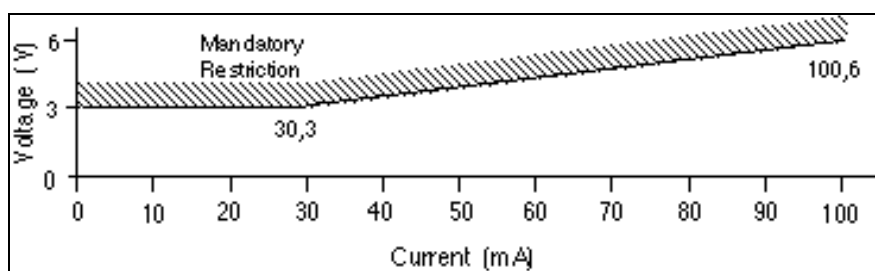
0 - 30 mA

100 mA

#### MAX VOLTAGE DROP

3 V

6 V



**FIG. 6-2 VOLTAGE DROP THROUGH SERIES CONNECTED DEVICES**

(2) Some series connected devices perform a switching function during ringing and it is necessary to restrict any 'in-rush' current that may occur. In such cases, the current drawn at the line port shall fall to a level not exceeding 5 mA within a period of 10 ms

following the connection of a call to a terminal equipment port. The following test set-up shall be used (see Fig. 6-3):-

- (a) With a 50 V dc source in series with a 400 Ohms resistor connected directly to the line port, and,
- (b) a series network consisting of a 5  $\mu$ F capacitor and an 1800 Ohms resistor connected to the terminal equipment port.

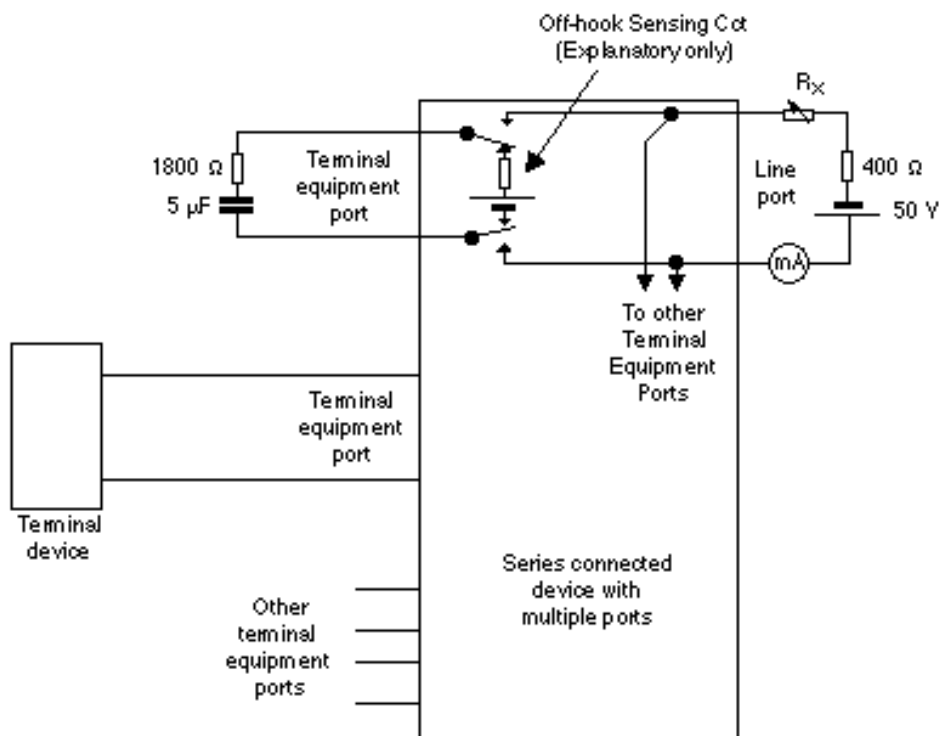


FIG. 6-3 SERIES CONNECTED DEVICE: TEST SET-UP

(3) For connections between the line port and each terminal port of multiple port devices, the requirements of sub-clauses (1) and (2) above shall apply (see Fig. 6-3).

• This ensures that the local exchange will not detect any 'in-rush' current caused by the capacitive loads as an off-hook condition. The time at which a connection is made to the terminating equipment cannot be clearly defined, and may be outside the period during which the local exchange equipment is desensitised to in-rush current.

(4) All series connected equipment shall, in conjunction with any terminating device, satisfy the requirements of clauses 6.3 to 6.8.

• For 2-wire - 4-wire - 2-wire devices (see Fig. 4-5 in Section 4), the 2-wire PSTN line port provides termination of the d.c. path and it is important that it satisfies all d.c. requirements, even though it is not strictly functioning as a terminating device.

(5) For some series connected automatic dialling devices when dialling, it is necessary for both the device and an associated telephone to terminate the line at the same time. Depending on the characteristics of the telephone, this may present difficulties as there may be insufficient current to serve both devices.

• See also clause 5.6.4 and the associated mandatory warning notices.

## 6.9.2 Call pick-up

Where appropriate, provision may be included on series connected devices for

incoming calls to be picked up by terminal CPE other than that receiving an incoming ring. This can be achieved by going off-hook and sending a suitable signal back to the series connected device to divert the incoming call.

- *This is a common feature on PABXs and may soon be regarded as normal for multiple port Distinctive Alert decoders.*

### 6.9.3 Call collision

(1) A common problem for series connected switching devices is for an outgoing call attempt to occur while an incoming call is being processed, i.e. call collision. To avoid this possibility, it is recommended that the switching device returns busy tone to all ports during the processing period.

(2) The normal network busy tone is defined in Document TNA 102, clause 7.1. It may however be desirable to consider use of a more urgent “busy” for this application.

- *This recommendation applies particularly to multiple port Distinctive Alert decoders.*

- *Care must be taken to make sure no lockup situations arise from solutions to call pickup (clause 6.9.2), and call collision.*

### 6.9.4 Line grabbing equipment

(1) Some series connected devices incorporate a line grabbing function whereby all other equipment normally connected is isolated from the line (see clause 10.7.1). The following conditions shall apply:-

(a) Where the line grabbing function is designed to seize the line even when another call is in progress, the equipment shall terminate the existing call by opening the loop for at least 2 seconds before initiating the next call.

(b) To initiate a subsequent call, the equipment shall comply with the call initiation requirements of clause 8.1.2(1).

- *It should be noted that a few older generation Telecom exchanges provide for a calling party to hold a call for up to 8 seconds when the called party breaks the connection. In such cases, a line grabbing device may not be able to release an existing call and initiate a new call unless a suitable delay is incorporated, or several attempts are made and dial tone is detected before signalling commences.*

(2) Line grabbing equipment designed to make automatic test calls shall incorporate in the User Instructions suitable information advising the customer of the conditions to be experienced if they are using the line when a test call occurs. Routine test calls should preferably be delayed until the line is free.

- *Disconnecting, or dialling over, a call in progress inconveniences customers and is only really necessary in an emergency.*

(3) The following warning notices shall be inserted in the User Instructions for all line grabbing equipment:-

**“This equipment is set up to carry out test calls at pre-determined times. Such test calls will interrupt any other calls that may be set up on the line at the same time. The timing set for such test calls should be discussed with the installer”**

**“The timing set for test calls from this equipment may be subject to ‘drift’. If this proves to be inconvenient and your calls are interrupted, then the problem of timing should be discussed with the equipment installer. The matter should NOT be reported as a fault to Telecom Faults Service”**

- *A typical example of such equipment is an alarm system designed to make calls in an emergency.*

## 6.10 D.C. line feed to other devices

(1) For series connected equipment, all ports for connection to other items of CPE shall provide a d.c. line feed. This may be sourced from the PSTN as specified in clause 6.9.1 or locally powered.

(2) There are two alternative recommended methods of locally powered line feed as follows:-

(a) 50 V d.c., fed via a constant impedance source (commonly 400 Ohms), with current usually limited at around 60 - 80 mA.

(b) Constant or restricted current in the range 18 mA to 45 mA.

*• It is expected that, for most applications, clause (2) (b) will apply. Method (2) (a) is that normally used in Telecom exchanges.*

*• The line feed is normally applied as negative battery (relative to earth) on one wire and earth on the other. This is not however mandatory for this application. CPE devices are required to be polarity insensitive so it is not necessary to specify a particular polarity for line feed.*

(3) The User Instructions shall clearly state any restrictions on the loop resistance of line between the series device and the CPE connected to it such that sufficient current can be drawn to establish the off-hook condition.

*• Equipment covered by this clause, though series connected, is normally expected to be installed within the same premises as the terminal CPE. As a result the line length will normally be extremely short.*

*• For the small number of cases involving devices which are designed to be installed remote from the terminal CPE, consideration must be given to the Telecom local line limits, i.e. the limit will apply to the total of the length of line between exchange and device plus the length of line between the device and the terminal CPE. For such devices, each application will be considered on its individual merits.*

(4) Ripple components shall not exceed 2 mV psophometric.

(5) The line feed shall be such that the equipment recognises the CPE state as follows:-

(a) Off-hook, when the d.c. feed current is greater than 15 mA for a period not less than 10 ms for a load of 1000 Ohms.

*• When ringing is being sent to CPE, the ring trip d.c. would normally have to be maintained for 40 ms or more.*

(b) On-hook, when the d.c. feed current is less than 5 mA for a period not less than 1000 ms for a load of 10 kOhms.

(6) Many CPE devices have features such as 'last number redial' or 'memory dial' which depend on a small on-hook line current for the maintenance of memory information. The line feed provided by series connected switching devices shall either:-

(a) provide a d.c. power source capable of supplying a continuous on-hook current of at least 150 µA in order to maintain such memories, or,

(b) have a clear warning inserted in the User Instructions advising users that such terminal devices used with the series connected device may lose their memory functions.

*• Series connected devices without switching facilities will normally apply feed voltage to all terminal CPE ports in the on-hook condition anyway.*

(7) The User Instructions shall give some indication of the maximum number of

parallel CPE devices that can satisfactorily be operated on one port. This number of devices, however, is subject to the limitations of clause 7.7.2 which means the maximum will never exceed 4 or 5.

• *Individual items of CPE are normally restricted to drawing no more than 120  $\mu$ A from the line in the on-hook condition. This limit may be used as a means of establishing the number of items likely to operate.*

## 6.11 Fail-safe requirements

### 6.11.1 All customer equipment

(1) On restoration of power after a power failure, all equipment powered by a.c. mains, shall comply with the following:-

(a) Revert within 5 seconds to, or continue in, the on-hook state without seizing the line, and

(b) Remain in the on-hook state until another incoming or outgoing call is initiated.

(2) All battery powered equipment shall fail safe and not cause any harm to the Telecom network under the following conditions:-

(a) If the life of its batteries is approaching a critical point.

(b) If the battery voltage falls for any reason to that level which could cause the device to malfunction.

(3) If, under any power failure conditions, the basic telephony functions of any device are lost then the following warning notice shall be included in the user instructions:-

#### **“IMPORTANT NOTICE**

**“Under power failure conditions, this telephone may not operate. Please ensure that a separate telephone, not dependent on local power, is available for emergency use”**

### 6.11.2 Additional requirements for series connected equipment

(1) Other than on 4-wire devices for which fail-safe arrangements are difficult to achieve, every possible step shall be taken to maintain basic telephone service when a failure of series connected equipment occurs. To this end, the fail-safe mechanisms stated in the following sub-clauses shall be provided:-

(2) Multiple port devices (see Fig. 6-3):-

(a) In the event of a power failure, the line port shall be directly connected within 5 seconds to at least one of the terminal equipment ports. The port or ports shall be clearly marked and shall also be clearly indicated in the User Manual.

(b) In the event of a logic or component failure, the device shall be designed to fail to a predetermined state within 5 seconds, details of which shall be given in the User Manual.

• *Techniques such as ‘watch dog’ timers and relays which connect through in their power off state are typical solutions which would achieve the above requirements.*

• *In the event of failure, it is normally expected that all telephones are connected, but not automatic*

*answering devices.*

(3) Single port devices:-

(a) It is strongly recommended that the failsafe mechanisms necessary for multiple devices be provided on single port devices.

(b) User Manuals associated with single port devices shall include details of whether or not there is any failsafe connection provided in the event of any type of failure.

### **6.12 PABX call waiting**

On some PABXs, the call/message waiting indicator on extension devices is activated by a 100 V d.c. signal from the PABX. CPE items with this facility shall satisfy all electrical safety requirements of Specification AS/NZS 60950.

## 7 RINGING

### 7.1 General

(1) The provision of any form of ringing detection is not mandatory for devices connected to the Telecom PSTN. If, however, a ringing detection device is connected across a line in the on-hook state, it shall comply with the requirements of this Section.

(2) There are four possible ringing cadences used which are known as 'Distinctive Alerts' (DA1-DA4). Full details of these are covered in Technical Document TNA 102. The requirements for identification of these cadences by decoding devices are included in this Section.

(3) As an operational guide, the standard Telecom ringing supply is 25 Hz and the voltage at the customer's premises will generally lie in the range 30 - 85 V rms. Testing to this Specification is based on 38 V rms which is typical for a line with multiple CPE connected.

• See *Technical Document TNA 102, Section 6, for further details on ringing supply.*

### 7.2 Stand-alone ringers and alerting devices

(1) Stand-alone ringing devices have long been a common method of providing an auxiliary ringing facility. These include bell sets, sounders, lamp units, or other alerting devices which are not an integral part of another item of customer equipment.

(2) Older designs currently in use are suitable for connection to the previous standard 3-wire wiring arrangement, making use of the ringing (shunt) wire and not having an integral capacitor. As stated in clause 7.1(6) above the preference now for all CPE is for 2-wire connection with the capacitor incorporated, although this is only mandatory for CPE mounted outdoors (see clause 7.3 below).

#### (3) Ringers for interior use

The requirements for stand-alone ringing devices designed for use within buildings on customers' premises are as follows:-

(a) New ringer designs intended for mounting within the customer's premises, and not exposed to the weather, shall be either:-

(i) Plug-connected, using the standard BT plug to clause 10.2, or

(ii) Provided with a suitable BT plug-ended connecting cord adapter to permit plug connection in those cases where the basic design was originally fitted with screw or IDC terminations.

(b) The plug ended cord supplied with a ringer should be no longer than 3 metres in length.

(c) The design of existing ringers, which have already been granted Telepermits, should preferably also be converted to plug connection at the earliest opportunity.

• *Telecom's aim is for all customer equipment to be plug-connected so that customers have the opportunity to relocate their terminal equipment as and when necessary. This also provides the benefit that suspect equipment can be removed for fault investigation without the need for a service call.*

(4) Ringers for exterior use

See clause 7.3 below.

### 7.3 Externally mounted devices

All new equipment intended for mounting outside buildings or other weatherproof enclosures (i.e. all weather resistant devices) shall incorporate the following:-

- (a) 2-wire connection with a capacitor of nominal value not greater than 1  $\mu$ F in series with the detector (ref. Section 10)
- (b) Screw or IDC terminals.
- (c) Weather resistant cable access.

### 7.4 Audible characteristics

(1) The sound level for audible operation of a ringing detector, if provided, shall be at least 50 dBA when measured at 1 metre from the ringer in any direction while it is mounted on a hard surface.

• *It is recommended that a ringer be capable of producing a minimum acoustic level of 75 dBA. However, this is not mandatory.*

(2) There are no further requirements (e.g. frequency) specified for the audible characteristics.

• *The nature of the sound output signal and the frequency (or frequencies) used are regarded as marketing features.*

### 7.5 Ringer sensitivity and loading

#### 7.5.1 General operation

(1) During assessment of 'ringer sensitivity' and 'ringer loading', ringing detectors shall operate reliably, and any audible ringer shall be deemed to operate when it emits an audible signal compliant with clause 7.4.

• *An audible ringing detector is regarded as operating 'reliably' when it rings audibly and 'cleanly' with no hesitation, 'stuttering' or shortening of the 'on' period.*

• *Note that 'operation' of a ringing detector does not mean answering a call. It simply means the reliable indication of the presence of ringing on the line.*

(2) The sensitivity and loading requirements shall be tested for each of the four Distinctive Alert cadences (DA1-DA4), unless the device is set to differentiate between DA's and operate to only one of them. Where a device does not respond to all DA's, an indication of the DA's which the device does not respond to shall be included on the Telepermit label along with the 'RN' allocated (ref clause 7.6). Also, the following warning notice shall be included in the user instructions:-

**“This device only responds to Distinctive Alert cadence(s) DA'x' ”**

(3) Where Distinctive Alert decoding is built-in (on equipment other than automatic answering devices), the ringing detector shall provide an alerting signal as soon as possible after completion of the decoding process and not more than 3 seconds after ringing is applied.

• *The minimum time in which the decoding process can be completed is 1600 ms. Therefore, a distinctive alert decoder is required to extend ringing between 1600 ms and 3000 ms of ringing being*

applied.

(4) For a product to be claimed as compatible with a given Distinctive Alert cadence, the ringing detector shall respond reliably to cadence “on” periods within the range of 360 ms to 440 ms. Also, although the following specified ringing cadence ranges for “on” periods are not mandatory requirements, performance shall be tested against them to provide an indication of their capabilities:-

(i) Capability A: 320 ms to 480 ms.

(ii) Capability B: 280 ms to 520 ms.

### 7.5.2 Ringer sensitivity

(1) Where ringing detectors are provided, the ‘ringer sensitivity (RS)’ on a scale of 0 - 5 shall be determined using the test set-up shown in Fig. 7-1. The method used for determining ‘RS’ is described in detail in Appendix 2. This applies to both 2-wire and 3-wire devices.

(2) Ringing detectors shall not operate to ringing voltages of 30 V<sub>p-p</sub> or less.

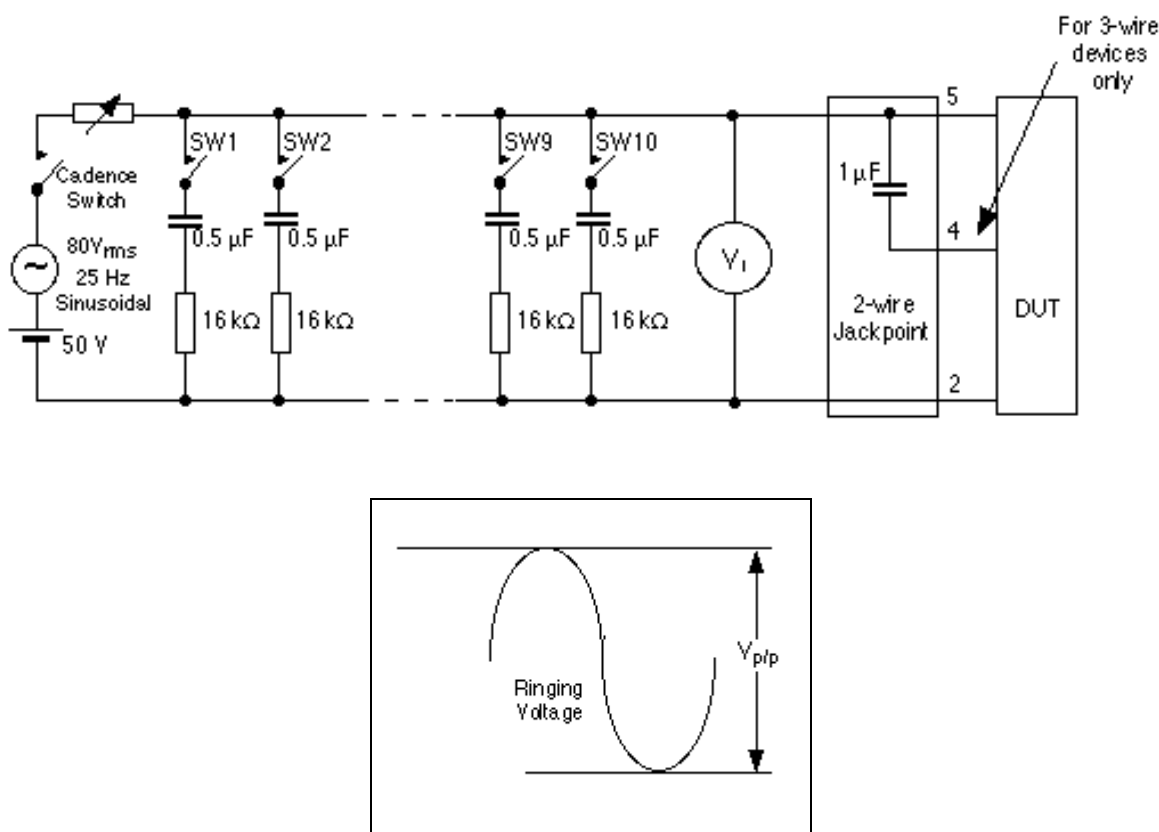


FIG. 7-1 TEST SET-UP FOR ‘RN’ ASSESSMENT

(3) Telephony devices shall be tested for ringing detector response to applied ringing of 40 ms duration. If a ringing detector does respond, then the following warning notice shall be included in the user instructions:-

**“This device may be subject to ringing or bell tinkle when certain other devices are connected to the same line. If this occurs, the problem should not be referred to the Telecom Faults Service”**

• A typical example of this problem may arise if a customer uses the device in conjunction with a fax machine and Telecom's 'Faxability' service.

(4) Devices shall be tested for impulse immunity from any parallel connected device. If a ringing detector does respond to impulses, then the following warning notice shall be included in the user instructions:-

**“This device may be subject to ringing or bell tinkle when calls are made from another device on the same line. If this occurs, the problem should not be referred to the Telecom Faults Service”**

### 7.5.3 Ringer loading

As for ringer sensitivity, all ringing detectors shall be assigned a 'ringer loading (RL)' number on a scale of 0 - 5, which shall be determined using the test set-up shown in Fig. 7-1. The method used for determining this ringer loading number is described in detail in Appendix 2. This applies to both 2-wire and 3-wire devices.

## 7.6 Ringing number (RN)

(1) The ringing number (RN) allocated shall be in the range 0.5 - 5 and shall be equal to the higher of the following:-

- (a) Ringer sensitivity number (ref. clause 7.5.2).
- (b) Ringer loading number (ref. clause 7.5.3).

(2) If the RN derived as above equates to zero, then it shall be rounded up to 0.5.

• Telecom reserves the right to increase the value of 'RN' above that derived in (1) and (2) if other factors, such as excessive 'on-hook d.c.', indicate the need. However, this is expected to occur in only rare and exceptional cases.

(3) For correct operation, the total of the RN's of all devices connected to a PSTN line at any given time should not exceed 5.

• Note that the RN assessment is not intended to be an accurate measurement, but is primarily a simple guide to customers as to the total number of items they may connect to a line.

(4) Where equipment is not intended to be connected to a line in parallel with other terminal equipment, this shall be clearly stated in the user instructions.

• Some items of series connected equipment do not normally have other devices connected in parallel with their PSTN line port. In cases where this possibility is envisaged, then the factors influencing the RN should be considered in the design.

## 7.7 Series connected devices

• See clause 2.12 and Fig.7-2 for explanation of series connected devices.

### 7.7.1 General requirements

The requirements for general operation stated in clause 7.5.1 shall be applied equally to series connected devices.

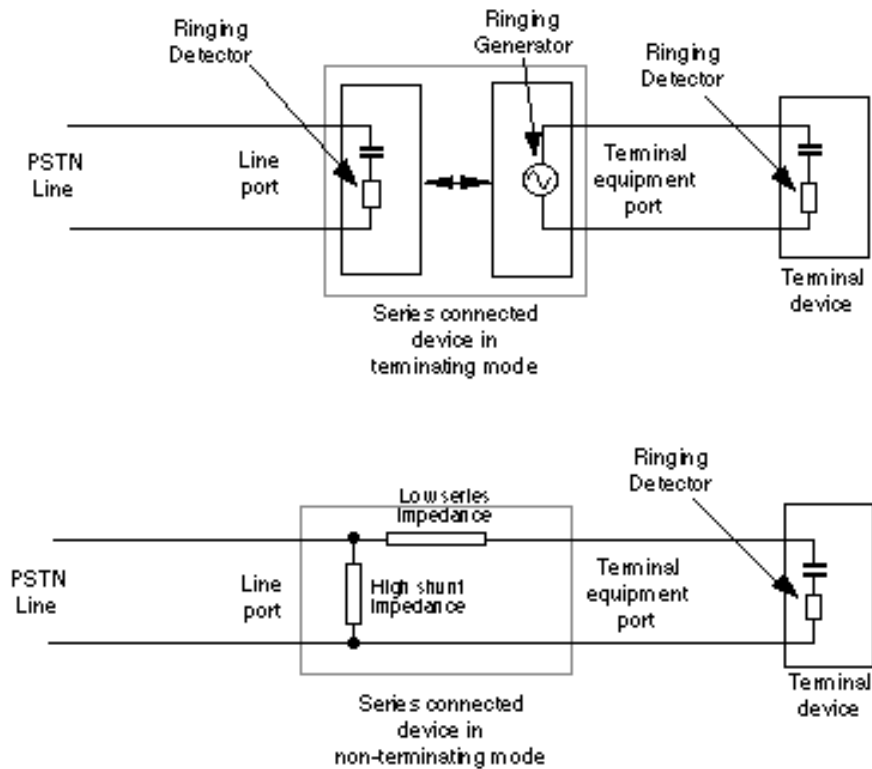


FIG. 7-2 TERMINATING & NON-TERMINATION SERIES CONNECTED DEVICES

### 7.7.2 Devices without a terminating facility

- (1) Series connected devices which do not have a terminating facility shall be tested using the test set-up shown in Fig. 7-3. (Details of the test methods are given in Appendix 2.)
- (2) All such series connected devices shall be allocated a ringing number RN, as described below.
- (3) All such series connected devices shall extend ringing to their terminal equipment ports such that a “ringing load” ( $L_{RN}$ ) having a total RN of not less than ‘4’ shall operate satisfactorily, when ringing is applied to the line port. The ringer loading number (RL) of the series connected device shall then be derived as follows:-

$$RL = 5 - L_{RN}$$

• This means that the Ringer Loading of all such devices cannot exceed a value of 1.

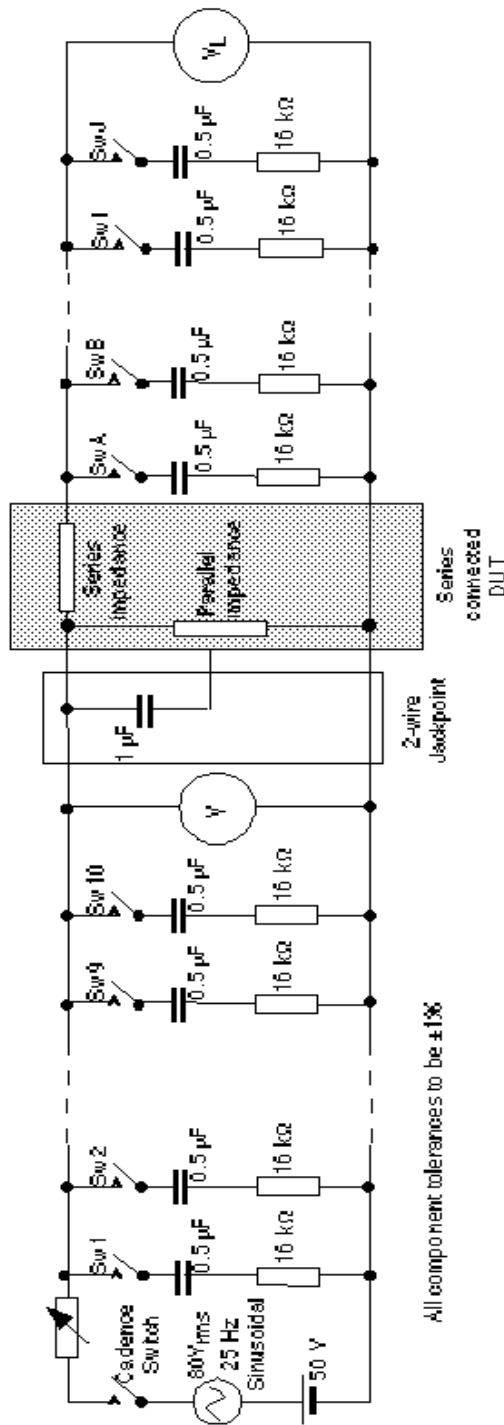


FIG. 7-3 TEST SET-UP FOR SERIES CONNECTED RINGING DEVICES



FIG. 7-3 TEST SET-UP FOR SERIES CONNECTED RINGING DEVICES

(4) For devices which do not detect or respond to ringing, this Ringer Loading number shall become the RN of the device, because there is no ringer sensitivity.

(5) All such series connected devices which respond to ringing shall be tested for ringer sensitivity and the RN derived as follows:-

(a) For devices which disconnect the terminal ports while responding to the first cadence of incoming ringing from line, ringer sensitivity and RN shall be assessed in accordance with 7.5.2 and 7.6, with the terminal ports disconnected.

• *A common example is a distinctive alert decoder which responds to the first cadence of incoming ringing, and then extends subsequent cadences to a terminating equipment port. Such a device has to be assessed for ringer sensitivity during the first cadence when the terminating ports are disconnected and there is no ringing load.*

(b) For devices which respond to ringing, but have their terminal ports connected at the same time, sensitivity and RN shall be assessed by varying the ringing loads connected in parallel with the line and terminal equipment ports. (Details of the test method are given in Appendix 2.)

• *In some cases, the line ports of series connected devices are not expected to be connected in parallel with other devices. However, the possibility of this occurring has to be allowed for.*

### 7.7.3 Devices with terminating facility

Series connected devices capable of a terminating function shall comply with the requirements of clauses 7.5 and 7.6.

### 7.7.4 Terminal equipment (or extension) ports

(1) Series connected equipment shall not connect ringing to any terminal port which is in the off-hook condition. Similarly, after ringing has been applied to a port, it shall be disconnected within 100 ms of detection of an off-hook condition.

• *This requirement applies to the application of either network ringing or locally generated ringing.*

(2) Series connected equipment designed to extend calls to a terminal equipment port via a 4-wire path shall be capable of reproducing, at the terminal equipment port, the original ringing cadence received at the PSTN line port. The timing distortion of the cadence produced between the two 2-wire ports shall not be in excess of  $\pm 5\%$ .

• *If timing distortion is excessive, it is recommended that the correct cadence is regenerated.*

### 7.7.5 Locally generated ringing

On series connected devices which generate their own ringing for local use, and do not simply extend the network ringing to the associated CPE, the local ringing source shall satisfy the following requirements:-

(a) The ringing supply shall comply with the electrical safety requirements of AS/NZS 60950.

(b) The ringing voltage and duration shall comply with the requirements of AS/NZS 60950.

(c) Ringing shall be connected to the port as a loop connection, i.e. one terminal of the ringer supply connected to one wire of the port with the other wire serving as a ring return path to the other side of the ringer supply.

(d) The ringing frequency shall be  $25 \pm 1$  Hz.

(e) The crest factor of the ringing waveform shall be checked and should preferably be

between 1.2 and 1.6.

- *The crest factor is defined as the ratio of the peak to r.m.s. voltage, and this equates to a value of 1.414 for a pure sine wave.*

- *Some telephone devices tend to be subject to premature ring trip when subjected to square wave ringing signals.*

(f) If the crest factor is outside the limits stated in (e) above, then the following warning notice shall be included in the User Instructions:-

**“Difficulties may be experienced with this device ringing some types of telephone connected to it. If this problem occurs, it should be referred to the equipment installer. The matter should NOT be referred to Telecom Faults Service”**

(g) The ringing output shall be rated for the aggregated RN of the CPE which will respond reliably to ringing. This is defined as the number of 0.5  $\mu$ F + 1 loads across which the ringing source can maintain 107 V<sub>p-p</sub>, divided by 2.

(h) The application of a load of twice the RN rating determined in (g) above, connected in parallel with a 10 kOhms resistor, shall not cause ring trip.

- *Clause 6.10 (5) (a) describes off-hook ring trip conditions.*

(i) Ringing cadences used should preferably be in accordance with those stated in Technical Document TNA 102, clause 6.4 with a tolerance of  $\pm 10$  %. The preferred cadence is DA1.

- *Some CPE may only respond to DA1.*

- *This requirement relates particularly to use of terminating devices designed to respond to distinctive alert cadences.*

(j) If the ringing cadence used is not in accordance with TNA 102, the following warning notice shall be included in the User Instructions:-

**“Devices designed to respond to particular ringing cadences may not respond when used with this equipment”**

## 7.8 Ringer ON/OFF switch

Control switches for the ringer are permissible as a means of allowing a greater number of CPE items to be connected to the same line without exceeding the ringing loading.

- *The provision of a ringer ON/OFF switch is regarded as a marketing feature.*

## 7.9 Bell tinkle

Reference clause 7.5.2(4) for requirements.

## 8 AUTOMATIC CALL SET-UP, ANSWERING & RECORDING FUNCTIONS

### 8.1 Automatic call set-up and repeat calls

#### 8.1.1 General

This clause covers the calling requirements for equipment which is programmed to both automatically initiate and dial up predetermined calls. It is not intended to cover manually initiated functions such as 'last number redial', etc.

• *Types of equipment covered are memory fax machines, telemarketing equipment, security alarm equipment, etc.*

• *Requirements for devices with manually initiated automatic dialling facilities are covered by clause 5.6 (e.g. last number re-dial, telephones with memory dialling, call back devices, etc.).*

#### 8.1.2 Call initiation

(1) Equipment designed for automatic calling, whether for repeat calls to the same number or to different numbers, shall either,

(a) Detect dial tone, or,

(b) Introduce a delay of at least 1 second and not more than 7 seconds before commencement of dialling.

• *Any pre-programmed numbers should be clearly associated with the name of the called party to enable ready revision in the event of number changes.*

(2) Equipment shall not go off-hook automatically for reasons other than a call attempt, except as follows:-

(a) On no more than two occasions, each for a period of 1-5 seconds duration, and,

(b) Only within the 30 minute period immediately following completion of a call, or an unsuccessful call attempt.

• *Some equipment automatically goes off-hook briefly to check for conditions such as 'message waiting', i.e. 'stutter' dial tone. It is not acceptable for this function to continue indefinitely and it is therefore restricted to the first 30 minutes following completion of a call or call attempt.*

• *Some devices are designed to repeatedly activate the off-hook condition for security reasons. Only in very specific and strongly justified circumstances are such devices acceptable to Telecom.*

#### 8.1.3 Automatic re-attempts to the same number

(1) Automatic call re-attempts to the same number shall be restricted as follows:-

(a) Not more than ten call attempts to the same number within any 30 minute period, and

(b) The equipment shall go on-hook for a period of not less than 30 seconds between the end of one attempt and the beginning of the next attempt.

• *It is recommended that the period between calls to the same number be greater than the mandated minimum of 30 seconds. Statistically, it is likely that any call detected will still be in progress after a further 30 seconds. A more realistic period between attempts is 60 seconds.*

(2) For any automatic calling device where the requirements of (1) above are determined by other equipment (e.g. software in a PC), then the following warning notice shall be incorporated in the User Manual:-

**“Some parameters required for compliance with Telecom’s Telepermit requirements are dependent on the equipment (PC) associated with this device. The associated equipment shall be set to operate within the following limits for compliance with Telecom’s Specifications:-**

**(a) There shall be no more than 10 call attempts to the same number within any 30 minute period for any single manual call initiation, and**

**(b) The equipment shall go on-hook for a period of not less than 30 seconds between the end of one attempt and the beginning of the next attempt”**

#### **8.1.4 Automatic calls to different numbers**

(1) Automatic calling equipment programmed to make a series of calls to different numbers shall go on-hook for a period of not less than 2 seconds between the end of one call attempt and the beginning of the next.

(2) For any automatic calling device where the requirements of (1) above are determined by other equipment (e.g. software in a PC), then the following warning notice shall be incorporated in the User Manual:-

**“Some parameters required for compliance with Telecom’s Telepermit requirements are dependent on the equipment (PC) associated with this device. In order to operate within the limits for compliance with Telecom’s Specifications, the associated equipment shall be set to ensure that automatic calls to different numbers are spaced such that there is no less than 5 seconds between the end of one call attempt and the beginning of another”**

• See also clause 8.1.2.

#### **8.1.5 Termination of failed call attempts**

(1) For any call which is not answered within 90 seconds of the transmission of the last digit of the called party's number, the equipment shall terminate that call and restore to the on-hook state.

(2) It is recommended that such equipment terminate any such call within 30 seconds of receipt of busy tone, number unobtainable tone or disconnect tone.

#### **8.1.6 Call identification phase**

(1) If a recorded voice message is used, this shall comply with the following:-

(a) It shall provide clearly the identity of the caller.

(b) It shall be repeated at least once.

(2) Automatic calling equipment designed for attended operation shall provide an audio monitor during the call set-up phase.

• This enables the calling party to identify that a wrong number has been called and avoid repeat calls to the same number.

(3) In the case of a facsimile machine with automatic dialling facilities, the identification tone known as CNG tone shall be provided as per ITU-T Recommendation T.30. The implementation of CNG tone is mandatory for all facsimile devices.

- *Facsimile calls are often manually set up on a call by call basis, but automatically executed (including re-tries) on an unattended basis. Accidental calls to ordinary telephone customers can at least be identified by those customers by the presence of the CNG tone.*

### 8.1.7 User Instructions

The user instructions associated with automatic calling equipment shall:-

- (a) Include a statement to the effect that such equipment should not be used under any circumstances which may constitute a nuisance to other Telecom customers.
- (b) In the case of **voice** equipment, clearly state the following:-

**“This equipment shall not be set up to make automatic calls to the Telecom ‘111’ Emergency Service”**

- *Under Telecom's terms for the provision of service, no Telecom customer is permitted to cause a nuisance to other users of the network. However users may not realize that the incorrect application of automatic calling equipment could give rise to such problems.*
- *A typical example of such nuisance calls is repeated attempts to make unsolicited sales offers to the same number or group of numbers, such as when a block of numbers terminate on the same PABX.*

### 8.1.8 Call logging

All automatic calling equipment which incorporates call logging facilities shall comply with one of the following:-

- (a) It is preferred that all calls which are answered should be logged, regardless of whether they are successful or not. If not, then,
- (b) if the equipment logs only calls which result in successful machine to machine handshake, the User Instructions shall contain the following warning:-

**"The call log incorporated in this equipment does not record all answered calls. The call log, therefore may not agree with the Telecom account which may include calls not shown on the log."**

- *This ensures that either:*

- (a) *all calls from the calling equipment which are successfully switched through the Telecom Network may be reconciled with the Telecom billing record. For example a facsimile call to a wrong number in an overseas country, with several retries could run up a significant Telecom bill. Even though the calls were actually answered, this bill could not be reconciled with the facsimile machine record if the individual call attempts were not logged, or*
- (b) *the user is fully aware that unsuccessful calls and wrong numbers will not necessarily show up on the machine record.*

### 8.1.9 Recording Billing Information after Called Number Answer

(1) Systems that collect dialled numbers for call billing purposes shall not record any end to end DTMF signalling that takes place after an answer signal has been received.

- *Digits signalled after an answer signal do not relate to call charging, but they may contain information that is confidential to the customer.*

## 8.2 Automatic answering equipment

### 8.2.1 Call answering

(1) The requirements for equipment which has an automatic answering function are as follows:-

(a) It is strongly recommended that all incoming calls are answered in not less than 5 seconds and not more than 15 seconds.

(b) All incoming calls shall be answered in not less than 3 seconds and not more than 30 seconds of receipt of the ringing signal. This shall apply independently of which of the four Distinctive Alert ringing cadences is used. The only exceptions are those given in sub-clause (4) below.

(c) In all cases where the mandatory requirements of (b) above are not met, detailed reasons shall be given. Telecom reserves the right to decline any product if the reasons given are considered less than satisfactory.

• *This ensures that the caller does hear at least a short burst of ringing tone. This helps in locating faults or operating problems in that test calls can be made manually to confirm whether switching through the network has been successful.*

• *Calling line identification information is transmitted during the first cadence of ringing. It is important therefore that the first cadence (3 seconds) is not interrupted.*

(2) For any automatic answering device where the requirements of (1) above are determined by other equipment (e.g. software in a PC), then the following warning notice shall be incorporated in the User Manual:-

**“Some parameters required for compliance with Telecom’s Telepermit requirements are dependent on the equipment (PC) associated with this device. In order to operate within the limits for compliance with Telecom’s Specifications, the associated equipment shall be set to ensure that calls are answered between 3 and 30 seconds of receipt of ringing”**

(3) An incoming call should not be answered if the primary function of the equipment is either non-operational or is still in the process of resetting after release from a previous call.

• *Examples of being non-operational are as follows:-*

(a) *A facsimile machine which has no paper or message storage facility.*

(b) *A modem with circuit 108.2 negated.*

(c) *An answering machine with no storage capacity remaining.*

(4) Consideration will be given to exemptions from the answering delay requirements in sub-clause (1) above in the following circumstances, each case being considered on its individual merits:-

(a) A minimum delay of less than 3 seconds on equipment designed for calls between machines and normally addressed to unlisted numbers.

• *Typical examples are short data calls such as electronic fund transfers and credit card authorisation calls where the entire length of call is likely to be less than 3 seconds.*

(b) Extended maximum delays where there are specific operational reasons.

### 8.2.2 Voice announcements and recognition tones

(1) Some form of voice announcement or recognition tone (e.g. 2100 Hz) shall be offered to the caller within 5 seconds of answering the call.

• *This is to ensure that the calling party, who will usually be paying for the call, is aware that the call has in fact been answered and charging has commenced.*

(2) Any facility for providing voice announcements when answering a call should have the capacity to store an announcement of at least 10 seconds duration.

• *This allows sufficient time for a clear message, bearing in mind that most callers will usually miss the first word or two of any announcement unless it is repeated.*

(3) Some equipment also has an automatic switching function which is performed after the call is answered. On such devices, unless a suitable voice announcement is made, any ringing tone returned to the calling party shall be recognisably different to that used by Telecom in the PSTN (ref. Technical Document TNA 102, clause 7.1).

• *A suggested sequence is as follows:-*

(a) *Equipment goes off-hook after say 3-4 seconds of commencement of incoming ringing (at this point charging for the call begins).*

(b) *Within 500 ms of going off-hook, the equipment returns three tones, e.g. 256 Hz for 400 ms, 100 ms silence, 304 Hz for 400 ms, 100 ms silence, and then 383 Hz for 600 ms (this corresponds to the first three notes of a C minor chord). An alternative to the three tones is a voice message instructing the calling party as appropriate.*

(c) *The equipment then returns the North American ringing tone cadence of one second of 400 Hz followed by a 3 second gap, all repeated up to 5 times. During this period, the equipment monitors the incoming call for any tones such as CNG (fax) or DTMF (answerphone) to determine the correct destination of the call.*

(d) *If the call has not been successfully dealt with within 5 cadences, the equipment sends a single tone of say 1800 Hz for 200 ms then terminates the call. Alternatively, it is acceptable for the switch to divert the call to the fax machine at this point on the basis that the originating call may have been from a manual fax machine which would not send CNG tone.*

### 8.3 Remote interrogation

Facilities for the interrogation and remote control of automatic answering equipment by a remote device are acceptable, but are regarded as marketing features. The remote device shall satisfy the Telepermit requirements applicable to its normal functions.

### 8.4 Call release

(1) All equipment which is capable of either automatically initiating and/or answering calls, shall release such calls (ref. clause 6.4(3)) as follows:-

(a) Within 60 seconds in the event of carrier failure or lack of activity.

• *'Failed call attempts' by automatic calling equipment are covered separately in clause 8.1.5.*

• *Voice equipment, such as answer phones, must be careful to differentiate between disconnect tone and voice activity when determining the beginning of the timeout process.*

• *If one party releases, the other party may receive disconnect tone (or one of the other supervisory tones) from the exchange. In some circumstances this may be mistaken for interrupted carrier (e.g. the frequencies used by the backward channel of a V. 23 modem are very close to the disconnect tone frequency).*

• *ITU-T fsk modems (Recommendations V. 21 and V. 23) specify a maximum 'carrier on' to 'carrier off' detection delay of 80 ms.*

(b) Within 15 seconds of completion of its intended function.

• For example, a modem should release within 15 seconds of the DTE negating circuit 108.2, and a fax machine should release within 15 seconds of the sending/reception of the 'end of procedure' (EOP) message (ref. ITU-T Rec. T. 30)

(c) Within 5 seconds in the event of a failure in the power supply to the equipment.

(2) For answering devices which cannot detect the difference between legitimate carriers and disconnect tone, the call release mechanism should be capable of being initiated within 150 ms of carrier loss.

• The 150 ms is short enough to be well within the minimum 'off' period of any exchange generated tone and long enough for carrier detect circuitry to detect loss of carrier.

(3) For automatic answering devices which have a switching function performed after the call is initially answered, the call shall be released if the dependent terminal equipment does not go off-hook within 60 seconds of the call being initially answered.

• This restricts the total call length so that the calling party is not billed for more than 1 minute for what is essentially an ineffective call.

(4) Automatic answering devices having no supervisory capability, shall automatically release calls within 2 minutes of going off-hook.

## 8.5 Recording functions

(1) There are legal considerations relating to the use of listening devices designed to record telephone conversations. Section 216 of the Crimes Act 1962 (which includes a definition of such devices) makes it an offence to intentionally intercept a private communication by means of a listening device unless one of the permitted exceptions applies. One of these is that at least one party to the conversation must be aware that the conversation is being recorded.

• This clause does not relate to a simple answering machine or voice messaging system which records a message from a caller and is not capable of recording a both-way conversation. The caller is normally aware that the message is being recorded and makes a definite decision to proceed.

(2) The Privacy Act 1993 contains additional constraints on the use of recording devices. Use of a recording device to record a telephone conversation is deemed to be "collection of personal information" under this Act. Generally speaking, the Act requires that such "collection" shall only be carried out with the permission of the person concerned. The Privacy Act also requires that the information be obtained from the individual concerned, and sets strict conditions as to what information is being collected, what it is to be used for, and to whom it may be disclosed.

• While such issues are under the control of the user of the equipment, it is important that suppliers remind users of their legal obligations in respect to the use of their products.

• Refer to the Privacy Act for full details.

(3) In view of the above legal obligations, it is a mandatory requirement that the User Instructions for devices capable of recording two-way conversations contain a warning notice as follows:-

**"All persons using this device for recording telephone conversations shall comply with New Zealand law. This requires that at least one party to the conversation is to be aware that it is being recorded. In addition, the Principles enumerated in the Privacy Act 1993 shall be complied with in respect to the**

**nature of the personal information collected, the purpose for its collection, how it is used and what is disclosed to any other party.”**

- (4) There are two basic categories of two-way recording device as follows:-
- (a) An answering machine with the facility to record complete conversations. The technical requirements for answering machines detailed throughout this Specification shall apply to such devices.
  - (b) A recording device designed to bridge a telephone line. Such devices shall comply with the requirements of this Specification.

## 9 BILLING SECURITY

### 9.1 Cordless devices

(1) Cordless devices include the following types of equipment:-

(a) Simple cordless telephones with one portable unit dedicated to one base unit (CT1).

(b) The more complex arrangements such as CT2 and CT3 multiple user systems.

(2) Cordless devices shall incorporate a security system which will, as far as practicable, eliminate the risk of other similar devices accessing the transmission of speech or other communications. Such security systems fall into one of the following categories:-

(a) A system of security codes which satisfies the requirements of clause 9.2.

(b) A process accepted within the industry as being highly secure. Such a process will be subject to acceptance by Access Standards.

• *An example of an acceptable 'highly secure' process is the DSS system.*

### 9.2 Security codes for cordless devices

(1) The following requirements relating to the use of security codes apply as appropriate:-

(a) No less than 8000 security codes shall be provided to control radio frequency access between a portable handset and its base unit(s).

• *This is required to minimise the risk of fraudulent calling by any person "roaming" with a cordless handset or inadvertent access to an adjacent base station of the same make and model over a common radio channel.*

• *The requirement for the increased number of security codes from the 1000 minimum proposed in November 1995 recognises the continually increasing numbers of cordless telephones in service in urban areas.*

• *It is estimated that there may now be 100,000 or more of the most common models in service on the Telecom network. The 8000 codes now called for, together with the number of selectable frequencies available and the geographical location factors ensure a security probability closely aligned with the ACA requirement without being excessively restrictive.*

(b) The applicant shall state in the User Instructions the number of discrete codes that are available to each model for which a Telepermit is required.

(c) The applicant shall describe in general terms how the security codes are allocated. Also a written assurance shall be given stating that allocation of those security codes is randomly spread over the entire range specified by the manufacturer.

• *For example, are they pre-allocated by the manufacturer on a truly random basis, or are they generated within the telephone as part of an initialisation process Ohms*

(d) If a security code can be 'lost' for any reason, then regeneration of a code shall also be on a random basis. A security code shall not, under any circumstances, be allocated by means of a default code list for that particular make and model.

• Typically, security codes may be lost in some models if the battery is removed or left discharged for a prolonged period.

(e) The applicant shall describe how the security codes used are transferred between portable and base units to ensure security from unauthorised handsets.

(f) Preferably, if the handset of a simple cordless phone is in place on its associated base unit, the PSTN line should not be accessible from another handset via the radio path.

• This does not apply in cases where a base unit is designed to cope with more than one portable unit, as in systems using processes such as CT2 and CT3.

(g) The following shall apply to all originated calls:-

(i) The security code shall be automatically transmitted by the portable unit.

(ii) The base unit shall seize the PSTN line only after the pre-determined security code is received.

(h) On incoming calls, only the portable unit with the predetermined security code should ring, regardless of other portable units being within radio range of the base unit.

## 10 NETWORK CONNECTION

### 10.1 Telecom standard

(1) The preferred method of connection to the Telecom network is now 2-wire and all new devices should be compatible with this arrangement.

• *This is in line with most international standards.*

(2) The previous Telecom standard was a 3-wire parallel connection arrangement, which included provision of a "ringer" capacitor, a surge suppressor and an "out-of-service" resistor in the network termination (Master Socket).

• *Further information is given in Specification TNA 102, Section 9.*

(3) 3-wire connected CPE is no longer acceptable for Telepermitting purposes.

### 10.2 Connection methods

(1) The primary method of connection of terminal equipment is via a plug to BS 6312:1985, with the latch adjacent to plug pin 6. The plug mates with a standard Telecom socket which terminates the customer's premises wiring.

• *The plug to BS 6312:1985 is commonly known as a "BT" plug.*

(2) (a) The socket/plug pin numbering is as follows:-

Pin 1	not used
Pin 2	A-wire
Pin 3	not used
Pin 4	not used
Pin 5	B-wire
Pin 6	not used

• *It should be noted that the present terminating hardware used by Telecom in customer premises wiring introduces another numbering reversal between the socket pin numbers and the wiring terminal numbers (see TNA 102, clause 9.3(2)). Suppliers should be aware of this potential source of confusion.*

(b) The 'A' & 'B' wires referred to (socket pins 2 & 5) are the two wires of the line to the Telecom local exchange and they form the basis of the 2-wire connection method.

• *The reference to 'A' & 'B' wires is used for convenience. They do not necessarily relate to any particular polarity since there is a high risk of line reversals occurring (see also clause 6.2(3)).*

(3) An acceptable alternative plug and socket arrangement for 2-wire connection in a business premise is the 8-way modular connector specified in IEC 603-7, and also in EIA/TIA-568 and EIA/TIA-570. The preferred pin-out designation is T568A, using pins 4 & 5 as shown in Technical Document TNA 102, Fig. 7.

• *This modular connector is also specified in AS/NZS 3080:1996 and ISO/IEC 11801:1995.*

• *This 8-way plug and socket is commonly known as "RJ45" in New Zealand. However, this is not strictly the correct designation.*

(4) Either BT plugs or 8-way modular plugs may be fitted on 2-wire connected CPE without the need for separate Telepermits. However, where the 8-way plug is fitted, this should be clearly shown on product packaging.

(5) Devices fitted with plugs of types other than those described above will be considered for the grant of a Telepermit in the following circumstances:-

(a) If a device is offered for sale complete with an adapter unit which provides a means of compliance with this Section.

(b) If a device is regarded as an integral part of another item of equipment. In this case the device may be connected to its 'parent' equipment by means of a non-standard plug and socket.

• *An example of this is a facsimile machine with an integral one-piece telephone. Any Telepermit granted for such telephones will be as part of the facsimile machine, not as a "stand-alone" telephone instrument.*

• *A further example is a device connected to a PABX or KTS by means of a proprietary interface. Similarly, such a device will be treated as part of the PABX or KTS.*

(c) Devices categorised as PABXs or key telephone systems which are designed to be hard wired to PSTN lines via a distribution terminal.

(6) All types of plugs or circumstances not covered by sub-clauses (1) to (5) above shall be regarded as unacceptable for Telepermit purposes.

• *This exclusion applies also to the commonly known 'RJ11' or 'RJ12' miniature 4 way or 6 way versions plug which will physically mate with an RJ45 socket. This combination is not considered satisfactory as the plug is insecure when in position and the plug moulding may overstress the outer springs of the socket.*

### 10.3 Series connected devices

#### 10.3.1 Line grabbing connections

(1) Some series connected devices incorporate a line grabbing function whereby all other equipment normally connected is isolated from the line. It is necessary to connect such equipment on the network side of all installed sockets and the following connection arrangements shall apply:-

(a) Detailed instructions shall be given on the correct method of installing the equipment, and either:-

(i) These instructions shall nominate the actual hardware to be used, or,

(ii) The necessary hardware shall be supplied with the equipment concerned.

(b) The equipment connection shall be such that it ensures connection of other socket terminations across the line in the idle condition.

• *A typical example of such equipment is an alarm system designed to make calls in an emergency.*

#### 10.3.2 Handover

(1) A device may plug into a Telecom socket and provide its own extension socket. Another item of equipment plugged into that socket (usually a telephone) is used to establish a call. Once the call has been established, the equipment (usually under manual control) will then "grab" the Telecom line from the secondary device and continue with the same call.

(2) During a handover process any d.c. break shall be no greater than 9 ms.

(3) One of the following alternatives shall apply:-

(a) The appropriate requirements for 3-wire connection as detailed in clauses 10.2 and 10.4 of this Specification shall be complied with, or,

(b) If a 2-wire socket to clause 10.3 is used, the User Manual shall contain a warning to the effect that not all telephones will respond to incoming ringing when connected to the extension socket.

• *A common example of this arrangement is a dedicated telephone connected to the extension socket of a modem or facsimile machine, preferably with no other equipment connected to the same line.*

• *Where any Telepermitted device may be associated with the port, that port shall support both 2-wire and 3-wire connected devices as required by clause 7.7.2(3).*

### 10.3.3 Fault clearance

(1) There are significant fault clearance considerations for series connected devices which impact on the premises wiring, which is to be maintained by Telecom. Mandatory requirements are detailed in the following sub-clauses. Two types of installation directly concerned are as follows:-

(a) Any installation with a device requiring secondary fixed wiring on the terminal side of the device.

#### (2) Secondary fixed wiring

Some devices are designed for installations where there is a possibility of secondary fixed wiring arrangements on the terminal outlet side. In such cases, the customer will need to be aware of the necessary procedure in the event of a fault affecting the series connected device. These devices shall have an entry in the User Manual as follows:-

**"In the event of any problem with this device, it is to be disconnected, and a CPE item connected to one of its terminal ports may be connected directly in its place. The user should then arrange for the product to be repaired. Should the matter be reported to Telecom as a wiring fault, and the fault is proven to be due to this product, a call-out charge will be incurred."**

### 10.4 Connection method for externally mounted devices

(1) Any device designed for installation outside of buildings on customers' premises and subject to exposure to the weather, shall NOT be capable of direct plug connection to the network.

• *The BT jackpoint is not suitable for external use due to its lack of corrosion protection.*

(2) Telecom's standard installation practice is for fixed wiring from the device to be BT plug connected within the building.

(3) The cable used to connect any exterior-mounted device to the internal building cabling shall be of a suitable type for the environmental conditions. This implies the need for relatively thick insulation and sheathing. For this reason, all such devices shall have terminals suitable for connection of heavier weather resistant cable.

- *The most suitable means of connection is to terminate the external cable from the device on a terminal block mounted adjacent to, or within the mounting box of a standard jackpoint which is part of the internal premises cabling within the building. A flying lead with one end connected to this terminal block, can have a BT plug on the other end which inserts into the standard jackpoint.*

## **10.5 Other jackpoint connections**

(1) For connection to analogue leased lines, the modular connection arrangement shown in Technical Document TNA 102, clause 9.3(3) is recommended.

- *This is the standard 8-way plug and socket commonly known as 'RJ45'. Commercial building cabling compliant with AS/NZS 3080 uses this type of socket.*

(2) For connection of proprietary interfaces such as the extension phones on some key systems and PABXs, the 4/6-way North American modular plug and socket is recommended where only 2-pair or 3-pair cable is installed.

(3) It is strongly recommended that the BT plug and socket arrangement is not used for either of the above applications. This will avoid the confusion of PSTN telephones or other devices (having BT plugs) being incorrectly connected to the wrong interface.

## 11 SUPPLEMENTARY SERVICES AND SPECIAL FEATURES

### 11.1 Analogue Calling Line Identification (CLI) equipment

#### 11.1.1 General

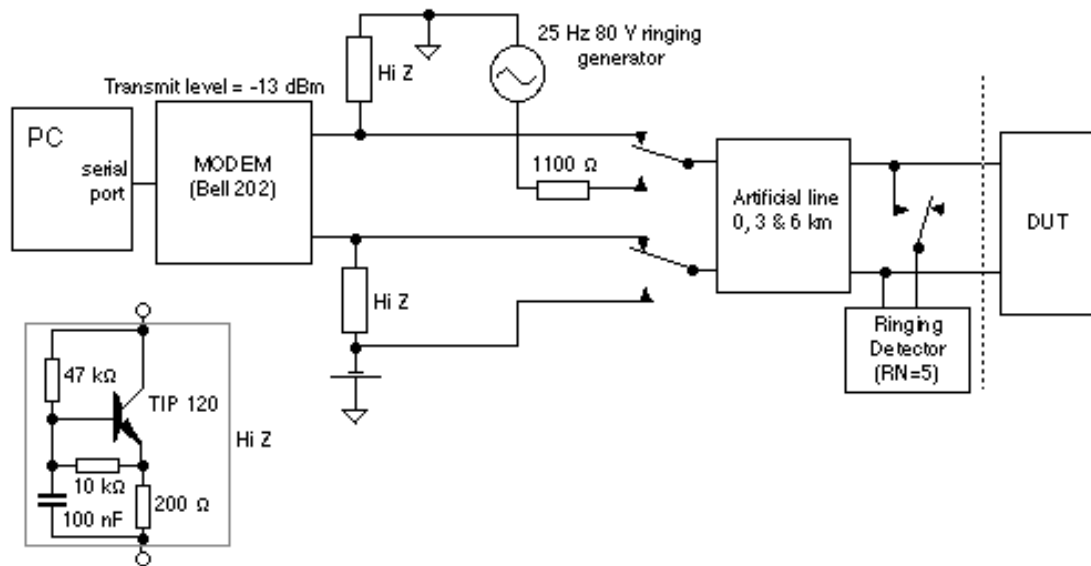
(1) Analogue CLI equipment designed for the Telecom 'Caller Display' service uses the on-hook data transmission facilities described in Technical Document TNA 102, Sections 10 and 11.

(2) The basic on-hook requirements stated in this Specification apply to analogue CLI equipment except where specifically stated in the following clauses. Also, there are certain requirements and design considerations which are not covered elsewhere in this Specification. The following clauses detail these additional requirements, and also include some general requirements for on hook data transmission devices which could be used for future services. Fig. 11-2 shows the test set up for these additional requirements for analogue CLI devices.

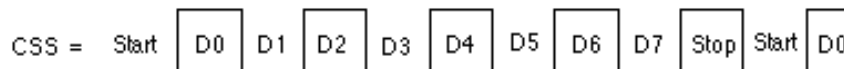
(3) Where the CLI receiver is incorporated in other customer equipment covered by this Specification, then the normal overall requirements for that type of equipment will apply, along with the following additional requirements.

(4) Analogue CLI equipment which is compatible with the recommendations of Bellcore Special Report SR-TSV-002476, Issue 1: December 1992, is likely to satisfy the requirements of this Specification. There are some differences which should be noted and these are stated where appropriate.

*• The Telecom on hook data transmission and associated analogue CLI requirements are based on the Bellcore system. However, to call back the number passed forward from the network, digit insertion or deletion is necessary. This impacts on the design of any devices which provide a dial-back feature.*



Set serial port: 8 bits data, 1 stop bit



D7                      D0  
 0 1 0 1 0 1 0 1  
 = 5                      5 (hex)    (\$55)

Notes:

Checksum = 2's complement of the modulo 256 sum of all words from the message type onwards

Modulo 256 sum = exclusive OR of each word

2's complement (X) = \$00 - X

## FIG. 11-2 TEST SET UP FOR ANALOGUE CALLING LINE IDENTIFICATION EQUIPMENT

### 11.1.2 On-hook impedance

(1) During the reception of data the receiver of an on-hook device may, for the purpose of improving impedance matching, terminate the line with a more suitable a.c. impedance (e.g. BT3) than that stated in clause 4.5.2. In this case the following shall apply:-

(a) This impedance shall be removed either when the second ring cadence occurs (preferably just before), or when another device on the same line goes off-hook.

(b) If coded ringing is implemented on the same line, the unit shall also decode the ringing to determine when the impedance should be applied and removed.

- There is potential for confusion between DA2 and DA4 because of the extended silent period between the first two bursts of ringing.
- The difference should be noted between the standard Telecom New Zealand off-hook impedance BT3 (ref clause 4.5.1) and the 600 Ohms plus 2.16  $\mu$ F series network commonly used on North American products. However, it is not anticipated that this difference will cause any problems for on-hook data transmission.

(2) At all other times, the on-hook impedance shall be as stated in clause 4.5.2.

### 11.1.3 Ringing

(1) The four ringing cadences (DA1 - DA4) used on PSTN lines are described in Section 6 of Technical Document TNA 102, and the requirements for response to these cadences are detailed in Section 7 of this Specification. On hook data, when available, will be capable of being transmitted on all four cadences.

(2) It should be noted that, due to the difference in cadences, there is less time available for data transmission than the nominal 4 seconds available in North America. This limits the amount of data that can be sent, particularly for cadences DA3 and DA4, but this should not impact on the receiver.

• *Although not planned at present, there is always the possibility that Telecom may, at some future date, increase the data capacity by shortening the 500 ms and 200 ms gaps before and after data is transmitted (see Fig. 11-3), and also the message preamble (250 ms CSS and 180 ms mark). Any equipment not dependent on the timing of these signals would remain compatible should such changes be implemented.*

(3) On hook data transmission receivers shall be compatible with the requirements of Section 7 of this Specification.

(4) It is strongly recommended that on hook data transmission equipment should always look for data, and not uses ringing as a 'wake up' signal.

• *This will allow the device to be compatible with future services such as 'message waiting indication' which use on-hook data transmission not associated with ringing.*

• *Any device which looks for data at all times and does not terminate the line should not experience any difficulties with the Telecom New Zealand ringing cadences DA1 - DA4.*

• *Any device which uses ringing as a wake up signal for data reception or to switch in an a.c. terminating impedance during data transmission is likely to experience difficulties with the ringing cadences, particularly DA4.*

### 11.1.4 Data capture

(1) The receivers of all devices which use on hook data transmission shall be capable of receiving data in the format described in Technical Document TNA 102, Section 10. Both single data message format (SDMF) and multiple data message format (MDMF) shall be supported.

(2) Receivers should be capable of receiving data during any of the four ringing cadences used (see clause 11.1.3(a) above). If not, a suitable warning shall be included which clearly explains to the customer which DA codes the device is compatible with. Fig. 11-3 illustrates the timing requirements for analogue CLI devices with respect to the different DA codes.

• *It should be noted that the data is limited to 'Time/Date' and 'Directory Number' when sent with DA3 and DA4 cadences.*

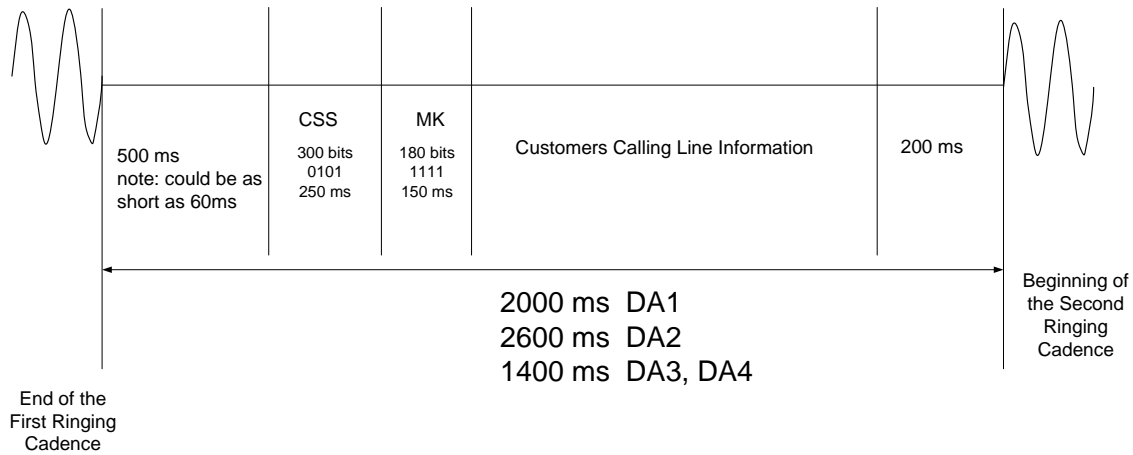
(3) Receivers shall perform satisfactorily when connected via a zero; 3 km and 6 km artificial line (see Fig. 4-1(b) in Section 4). In each case the test shall be carried out with and without a ringer built out to a RN of 5 (ref. Section 7) connected in parallel. The ringer shall remain operational for all the tests in which it is connected.

(4) Response shall be checked at 6km in parallel with ringing detector (RN = 5) with CSS preamble beginning 60 ms after the end of the first ringing cadence

(5) All messages that contain corrupted data, as indicated by an incorrect checksum, shall be discarded.

(6) It is recommended that the receiver functions should be independent of the exact length of the CSS and pre-message mark signal.

• These are not included in the checksum and do not carry any information except to function as a 'wake up' signal.



Ringling Cadence	Time Available for CLI	Total Number of Characters	Characters Available for ACLIP Directory Number Single Data Message Format *2	Characters Available for ACLIP Directory number and Name Multiple Data Message Format *3
DA1	900 ms	108	97	91
DA2	1500 ms	180	169	163
DA3, 4	300 ms	36	25	19

**Notes:**

\*1 10 bits per character, 1200 bps

\*2 Overhead for SDMF:

Message Type - 1 Character  
 Message length - 1 Character  
 Date/Time - 8 Characters  
 Directory Number - X Characters  
 Checksum - 1 Character

Total Characters = 11 + X

\*3 Overhead for MDMF

Message Type - 1 Character  
 Message Length - 1 Character  
 Date/Time Parameter Type - 1 Character  
 Date/ Time Parameter Length - 1 Character  
 Date/Time - 8 Characters  
 Directory Number Parameter Type - 1 Character  
 Directory Number Parameter Length - 1 Character  
 Directory Number - X Characters  
 Name Parameter Type - 1 Character  
 Name Parameter Length - 1 Character  
 Name - Y Characters  
 Checksum - 1 Character  
 Total Characters = 17 + X + Y

FIG. 11-3 TIMING DIAGRAM FOR ANALOGUE CALLING LINE IDENTIFICATION SIGNALS

### 11.1.5 Number format passed from the network

(1) For local and national calls, the number sent forward from the Telecom network is in the format "area code" plus "customer number". No "0" national call prefix is passed

forward from the network.

- *This is the format used within the Telecom network and between New Zealand networks for passing calling numbers. For such applications, the “0” has no meaning.*
- *Display equipment designers should note that there is no format differentiation between national and local calls.*
- *The great majority of calls will consist of 8 digits, but calls from mobile networks will be up to 10 digits in total.*
- *As examples; on a typical 10-digit display originally designed for the North American network, an Auckland caller’s number could be displayed as “9 876 5432”. Telecom cellular callers’ numbers, which could be either 8 or 9 digits, could be displayed as “2 567 8901” or “25 234 5678”.*

(2) For incoming international calls entering New Zealand via a Telecom International Exchange, the digits “0000” are currently passed forward. This will continue to be the practice for any international numbers that are either not available or need to be withheld in the future for any reason.

- *The actual numbers are currently withheld to protect the privacy of overseas callers.*
- *It should be noted that not all international calls arrive in New Zealand via the Telecom Gateway. Many arrive via other carriers.*

(3) In due course, some international numbers are expected to be made available to New Zealand customers. Where such numbers are available for presentation, the number sent forward from the Telecom network will be in the format “country code” plus “area code” plus “customer number”. No “00” international call prefix will be passed forward from the network. As a result, there could be confusion between national and international numbers on display units.

- *When international numbers are available for presentation to New Zealand customers, the number length may be any length up to 15 digits. See warning note on clause 11.1.6.*
- *The timing for such a service introduction is unknown at this stage.*

(4) For incoming calls wholly within a Centrex group, the number passed forward will be the extension number used within that Centrex customer’s network. The number length will be within the range of 2 to 7 digits.

(5) The number actually passed from the network may not relate to a specific person or line.

- *For example, where the pilot number of a DDI PABX group is passed forward, a display user dialling that number is likely to reach the PABX operator, not the person who originally made the call. Similarly, a small percentage of displayed numbers may not correspond with a number that can be called back.*

### **11.1.6 Data display**

(1) It is strongly recommended that the number displayed should in ALL cases correspond with the number to be dialled back by a residential or direct line user. To achieve this, the digit insertion rules of clause 5.5.2 apply.

(2) Where the display does not correspond exactly with the number to be called back, the need to insert prefix(es) for manual dialling shall be explained in the user instructions (see clause 5.5.5)

- *Displaying the number complete with any necessary prefixes is most likely to avoid users calling the wrong numbers.*

- *Some display units will be capable of storing any digits which exceed the display length and/or any prefix digits that are automatically inserted for dialling back to the calling number. Nevertheless, it is preferred that the display matches the actual number to be dialled in all cases. This will minimise any potential confusion for users.*

- *Business customers connected to Centrex or PABX extensions will also need to dial a trunk access prefix. The capability to insert this prefix is regarded as a marketing feature.*

(3) Where “0000” is displayed for incoming international calls and not translated into some form of informative text, the significance of the “0000” should be explained to the user.

(4) The provision of a display facility on analogue CLI devices is not mandatory as it may be provided separately on other associated equipment such as PC's. In such cases an interface such as V.24/RS232 will be necessary. Wherever provided, the following display functions are recommended:-

(a) Minimum display of time/date and the directory number.

(b) Minimum number capacity of 15 digits, which allows for full international numbers to be displayed, without prefix. For the display to include the '00' international prefix, then 17 digits is recommended.

(c) If fewer than the recommended number digits are displayed, the display should 'right justify' the full number so that the full local number will always be displayed. In such cases, it is preferable that the display has a scroll capability so that all digits can be viewed.

- *Confusion can arise where displays do not show all digits of a number. For example, a 10 digit display might show “12 2283 6789” which could be a number in Sydney, Australia, with the first digit “6” of the country code not displayed. Alternatively it could be a number in Cardiff, Wales with the country code “44” not displayed, or a number in some other country for which one or more leading digits are not displayed.*

(d) Minimum capacity for name information, 20 characters.

- *Name information will not be available on early implementations of the Caller Display service, and may not be present at all in some circumstances.*

- *Note that this field is simply alpha-numeric text and could be used for displaying more general messages.*

(e) Cause of absence of display, i.e. Out of Area (O), or Anonymous (P). It is recommended that the complete IA5 (ASCII) character set for this field is decoded.

(5) The maximum number of digits that can be displayed shall be stated in all Telepermit applications.

### 11.1.7 Data storage

(1) For on hook data transmission equipment, there are no mandatory requirements for the amount of incoming data that can be stored. However, there are obvious benefits in storing such data, particularly in unattended situations.

(2) On analogue CLI devices, it is recommended that the details for at least 10 calls be held in memory on a 'first in - first out' basis.

(3) If data storage is incorporated, the CLI device shall also discard any data which becomes corrupted.

**11.1.8 Dial back considerations**

(1) Requirements for automatic dial back facilities are covered in clause 5.6.

(2) Display units having no dial back facility are acceptable for Telepermit purposes. All such devices shall be provided with clear instructions to users to ensure that the risk of wrong numbers is minimised. This particularly applies to display units which do not display precisely the digits to be dialled (see clause 11.1.6).

## 12 PHYSICAL CONSTRUCTION AND MODIFICATIONS

### 12.1 External design

There are no formal Telecom requirements for the external design or appearance of any equipment, other than where the physical construction prevents compliance with:-

- (a) The electrical safety requirements specified in AS/NZS 60950, or
- (b) The performance requirements of this Specification.

### 12.2 Switches and connectors

All connectors, switches, keys, relays, etc., that are associated with a device, the operation of which depend on moving parts or physical contact, shall function reliably and positively at all times.

- *Failure to do so can result in the false operation of network equipment which is liable to inconvenience other Telecom customers.*

### 12.3 Modifications

(1) Any interim or temporary modifications carried out prior to submission for testing shall be detailed by the applicant. This information shall be submitted to the Testing Authority, and shall also accompany the documentation submitted to Telecom in support of a Telepermit application.

(2) In many cases, modifications are suggested by the Testing Authority to enable a product to comply with the test requirements of this and any other relevant PTC Specifications. Details of all such modifications shall be recorded as part of the Test Report for that product and a complete list of all modifications shall be furnished as part of the application.

(3) For each modification, the Applicant shall submit the following information in accordance with the above:-

- (a) Technical details of the modification, indicating both the schematic changes and the physical implementation.
- (b) Details of how the permanent modification is to be incorporated into production units. This shall include information on who will implement the modification.
- (c) The parameters which the modification is intended to rectify.

- *In some cases, modifications will be carried out by the manufacturer. In other cases, however, the modifications will be carried out after importation, and Telecom needs assurance that the quality of the modification work is satisfactory and reliable.*

- *The intention is to protect the Telecom Network (and personnel), suppliers and customers from manufacturers who modify units for compliance testing without later incorporating those modifications into all of their production units. Failure to carry out modifications could have implications for importers, distributors and retailers under the New Zealand consumer protection legislation.*

(4) Upon application to Telecom for a Telepermit grant, Telecom will assess whether further tests will be required on production samples.

- *Retesting may be necessary if the production implementation of a modification potentially impacts upon the compliance of some other parameter(s). For example, a modification to the circuitry in the vicinity of the Telecom line interface to comply with network requirements may also alter creepage distances between tracks and/or components, and thus possibly invalidate some of the test results against Specification AS/NZS 60950 for electrical safety.*

## **12.4 Photographs**

All Telepermit applications shall be accompanied by detailed colour photographs showing relevant internal construction details. These photographs may be either:-

- (a) Taken by the Testing Authority and included as part of the Test Report, or
- (b) Supplied by the Applicant, in which case they must be verified by the Testing Authority as authentic photographs of the product concerned.

- *Relevant details would include circuit boards containing telecommunications functions, power supplies and any modifications which could affect compliance with PTC Specifications. Photographs are required only of assemblies which contain components likely to affect compliance with any PTC Specification.*

## 13 EQUIPMENT DOCUMENTATION

### 13.1 General

All CPE designed for connection to the Telecom Network shall be supplied with appropriate documentation. The requirements for documentation will vary according to the intended function and complexity of the CPE in question.

### 13.2 Documentation requirement

Documentation should cover the following topics:

(1) Installation Instructions

This would normally include:-

- (a) Unpacking instructions.
- (b) Assembly instructions.
- (c) Instructions for connection to Power Supply, Telecom Network, and other equipment.
- (d) Set-up instructions.

(2) Operating Instructions

(3) Special Conditions

(a) The 'Special Conditions' will usually be set as a result of the equipment complying with either a requirement less stringent than Telecom's objective requirement, or a limitation in the equipment capability which may prevent access to a particular network function.

(b) These conditions shall be documented as warning notes and shall be either included in the appropriate part of the User Documentation or contained in an attachment to the User Documentation.

(c) A full list of the warnings is given in clause 13.3. The appropriate warnings, if any, shall be listed in the Test Report under this clause (see Appendix 3 of this Specification)

### 13.3 User Documentation Warnings

(1) The following is a list of the User Documentation Warnings. Most are taken from the text of this Specification, and in some circumstances additional warnings may be added where a circumstance is not covered by this Specification.

(2) Also there is a warning entitled "General Warning" which is applicable to all products and shall be included in the User Documentation in all cases.

(3) For the warnings taken from the text of this Specification, the relevant clause number and heading is given for ease of reference.

#### General warning

**"The grant of a Telepermit for any item of terminal equipment indicates only that Telecom has accepted that the item complies with minimum conditions for connection to its network. It indicates no endorsement of the product by Telecom, nor does it provide any sort of warranty. Above all, it provides no assurance that any item will work correctly in all respects with another item of Telepermitted equipment of a different make or model, nor does it imply that any**

**product is compatible with all of Telecom's network services"**

### **Warnings taken from Specification text**

#### **2.11.1 Compliance testing**

(6) & (7) (Functional tests)

Typical warning for 56 kbit/s modems as an example:

**"This equipment is not capable, under all operating conditions, of correct operation at the higher speeds for which it is designed. Telecom will accept no responsibility should difficulties arise in such circumstances"**

#### **4.5.1 Off-hook line impedance**

(4)

**"This equipment does not fully meet Telecom's impedance requirements. Performance limitations may occur when used in conjunction with some parts of the network. Telecom will accept no responsibility should difficulties arise in such circumstances"**

#### **5.6.1**

**General requirements (automatic dialling devices)**

(3)

**"This equipment shall not be set up to make automatic calls to the Telecom '111' Emergency Service"**

#### **5.5.4**

**Manual insertion of additional digits**

(2)

**"This unit will only work in conjunction with a tone signalling (DTMF) telephone, but some telephones may not be compatible. Since noise or speech from the telephone can upset dialling from this unit, errors may result if the devices are used together in other than quiet conditions"**

**"Where it is necessary to dial prefix digits, such as a Caller Display override code ("0196" or "0197"), this unit will have to be used in conjunction with an associated tone signalling (DTMF) telephone"**

**"Note that some telephones are NOT compatible with this unit and dialling errors may result if the two devices are used together in other than quiet conditions. The Telecom Faults Service is NOT to be called should such problems arise. In such cases, it is recommended that the prefix and wanted number are dialled manually"**

#### **5.5.5**

**User instructions**

(4)

**"If a charge for local calls is unacceptable, the 'Dial' button should NOT be used for local calls. Only the 7-digits of the local number should be dialled from your telephone. DO NOT dial the area code digit or the '0' prefix"**

**6.3****Off-hook d.c. line characteristics**

(3)

"This equipment may not provide for the effective hand-over of a call to another device connected to the same line."

**6.8****Recall and call waiting**

(5)

"The recall facility of this product may not always operate correctly on some parts of the Telecom network or on some PABXs available on the market. If this is the case then 'recall' can be activated by 'flashing' the switch-hook or repeat use of the recall button.

**RECALL PROBLEMS WITH THIS PRODUCT ARE NOT TO BE REPORTED TO THE TELECOM FAULTS SERVICE"**

**6.9.4****Line grabbing equipment**

(3)

"This equipment is set up to carry out test calls at pre-determined times. Such test calls will interrupt any other calls that may be set up on the line at the same time. The timing set for such test calls should be discussed with the installer"

"The timing set for test calls from this equipment may be subject to 'drift'. If this proves to be inconvenient and your calls are interrupted, then the problem of timing should be discussed with the equipment installer. The matter should NOT be reported as a fault to Telecom Faults Service"

**6.11.1****All customer equipment (fail safe requirements)**

(3)

**"IMPORTANT NOTICE**

**Under power failure conditions, this telephone may not operate. Please ensure that a separate telephone, not dependent on local power, is available for emergency use"**

**7.5.1****General operation (ringer sensitivity and loading)**

"This device only responds to Distinctive Alert cadence(s) DA'x' "

**7.5.2****Ringer sensitivity**

(3)

"This device may be subject to ringing or bell tinkle when certain other devices are connected to the same line. If this occurs, the problem should not be referred to the Telecom Faults Service"

(4)

"This device may be subject to ringing or bell tinkle when calls are made from another device on the same line. If this occurs, the problem should not be referred to the Telecom Faults Service"

**7.7.5****Locally generated ringing**

(f)

**“Difficulties may be experienced with this device ringing some types of telephone connected to it. If this problem occurs, it should be referred to the equipment installer. The matter should NOT be referred to Telecom Faults Service”**

(j)

**“Devices designed to respond to particular ringing cadences may not respond when used with this equipment”**

**8.1.3****Automatic re-attempts to the same number**

(2)

**“Some parameters required for compliance with Telecom’s Telepermit requirements are dependent on the equipment (PC) associated with this device. The associated equipment shall be set to operate within the following limits for compliance with Telecom’s Specifications:-**

**(a) There shall be no more than 10 call attempts to the same number within any 30 minute period for any single manual call initiation, and**

**(b) The equipment shall go on-hook for a period of not less than 30 seconds between the end of one attempt and the beginning of the next attempt”**

**8.1.4****Automatic calls to different numbers**

(2)

**“Some parameters required for compliance with Telecom’s Telepermit requirements are dependent on the equipment (PC) associated with this device. In order to operate within the limits for compliance with Telecom’s Specifications, the associated equipment shall be set to ensure that automatic calls to different numbers are spaced such that there is no less than 5 seconds between the end of one call attempt and the beginning of another”**

**8.1.7****User Instructions (automatic call set-up)**

(b)

**“This equipment shall not be set up to make automatic calls to the Telecom ‘111’ Emergency Service”**

**8.1.8****Call logging (automatic call set-up)**

(b)

**"The call log incorporated in this equipment does not record all answered calls. The call log, therefore may not agree with the Telecom account which may include calls not shown on the log"**

**8.2.1****Call answering (automatic answering equipment)**

(2)

**“Some parameters required for compliance with Telecom’s Telepermit requirements are dependent on the equipment (PC) associated with this device. In order to operate within the limits for compliance with Telecom’s Specifications, the associated equipment shall be set to ensure that calls are answered between 3 and 30 seconds of receipt of ringing”**

**8.5****Recording functions**

(3)

**“All persons using this device for recording telephone conversations shall comply with New Zealand law. This requires that at least one party to the conversation is to be aware that it is being recorded. In addition, the Principles enumerated in the Privacy Act 1993 shall be complied with in respect to the nature of the personal information collected, the purpose for its collection, how it is used and what is disclosed to any other party”**

**10.3.3****Fault clearance**

(2)

**"In the event of any problem with this device, it is to be disconnected, and a CPE item connected to one of its terminal ports may be connected directly in its place. The user should then arrange for the product to be repaired. Should the matter be reported to Telecom as a wiring fault, and the fault is proven to be due to this product, a call-out charge will be incurred"**

**PTC 200 APPENDIX 1****SAMPLES AND EVALUATION****A1.1****Evaluation principles**

(1) Telecom has an obligation to protect all its customers against avoidable malfunctions by ensuring that the whole system meets recognised standards. Any malfunctions can lead the customer to suspect the integrity of the Telecom network. Telecom therefore has to be assured that all equipment connected to its network is likely to meet the minimum standards set by this Specification.

(2) Absolute confidence in the equipment connected would require that every item be thoroughly tested, but this is clearly impractical. For most types of equipment, a test of one unit is accepted as a reasonable means of assessment. However, for telephony devices, the electro-acoustic facilities require a more stringent approach and a minimum sample of three units are required to be tested.

- *Previously, Specification PTC 202 called for 20 samples of telephones to be tested.*

(3) Limits in this Specification make full allowance for production tolerances.

- *Telecom accepts that any production process needs to have some allowance for process and component variability and the various limits have been set as a compromise between network ideals and typical production capability.*

**A1.2****Number of samples****A1.2.1****Simple telephony devices**

(1) For all simple telephony devices, a sample of three units shall be submitted to a recognised Testing Authority for each electrical/acoustic design for testing against this Specification. All three units should meet requirements before a Telepermit can be granted.

(2) Telecom, however, reserves the right to call for larger samples to be tested if the test results and/or other information supplied indicate doubtful compliance. If considered necessary, Telecom will call for a sample of 20 units to be tested against selected clauses of Section 4, and an acceptable quality level (AQL) of 10 % defective (ref. British Standard BS 6002) will be used to determine acceptability.

(3) Should test results indicate that a sample made up of two or more types of telephone claimed to be "electro-acoustically identical" actually consists of differently performing designs, the Testing Authority shall arrange for additional units to be provided by the Applicant to make up the full sample of each type.

**A1.2.2****Other devices**

(1) A sample of one unit of non-telephony devices shall be submitted to a recognised Testing Authority for testing against this Specification.

(2) Also, at the discretion of Access Standards, for more complex or specialised telephony devices, testing of only one unit may be accepted.

**PTC 200 APPENDIX 2****TEST PROCEDURES****A2.1****GENERAL CONDITIONS FOR TESTING**

(1) Unless otherwise stated in this Specification, the tests are to be carried out under the normal operating conditions of connection to the Telecom network, and with the equipment operating as intended.

(2) All claimed product functions requiring compliance with this Specification shall be tested.

(3) Not all requirements of this Specification are included in the Test Schedule in Appendix No. 3. The schedule includes only those requirements which are considered consistent with acceptable performance. However, Access Standards reserves the right to amend the Test Schedule should ongoing experience reveal that this is necessary.

(4) The primary aim of the test programme is for the independent Testing Authority to be able to satisfy itself that the product under test does in fact comply with Telecom requirements (and therefore is not likely to cause trouble to either the user or the Telecom network, or to lower customer perception of network performance).

(5) The performance criteria quoted in this Specification are regarded as true values. Testing Authorities will be required to indicate the measurement uncertainty in cases where the test result fails that specified by a small margin. The uncertainty may be used to adjust the calculated mean of any marginally failing test result in the Applicant's favour. In general, component tolerances of test set-ups should be  $\pm 1\%$ .

(6) Tests are made in any order except where otherwise specified. Where testing involves taking measurements at different currents or line lengths, measurements are made at the lowest current first, increasing sequentially to the highest, in order to avoid a heating effect on the line test circuit.

(7) The tests are made with the appropriate cordage and plug attached and with the device connected to the relevant test circuit via the new Telecom standard 2-wire line termination and jackpoint combination (see Technical Document TNA 102 Fig. 6 (c) for component and wiring details). The 2-wire jackpoint shall satisfy the requirements of Specification PTC 223.

(8) For apparatus which must be used with protection barriers or line isolating units, the specified type is connected in its normal position for the tests.

(9) Where the device is reliant on more complex equipment for its operation, arrangements may be made for assistance to be given, by the Applicant, to the Testing Authority for the test set-up. Such arrangements will be at the discretion of the Testing Authority.

(10) Where called for, performance shall be assessed against an artificial line made up of sections of maximum length 0.5 km (ref. Fig.A1(b)), providing an adjustable line length of from 0 to 6 km. (For preference, line lengths of 0.1 km should be used, each consisting of two series resistors of 8.4  $\Omega$  and two parallel capacitors of 2.5 nF as shown in Fig. 4-1(b).)

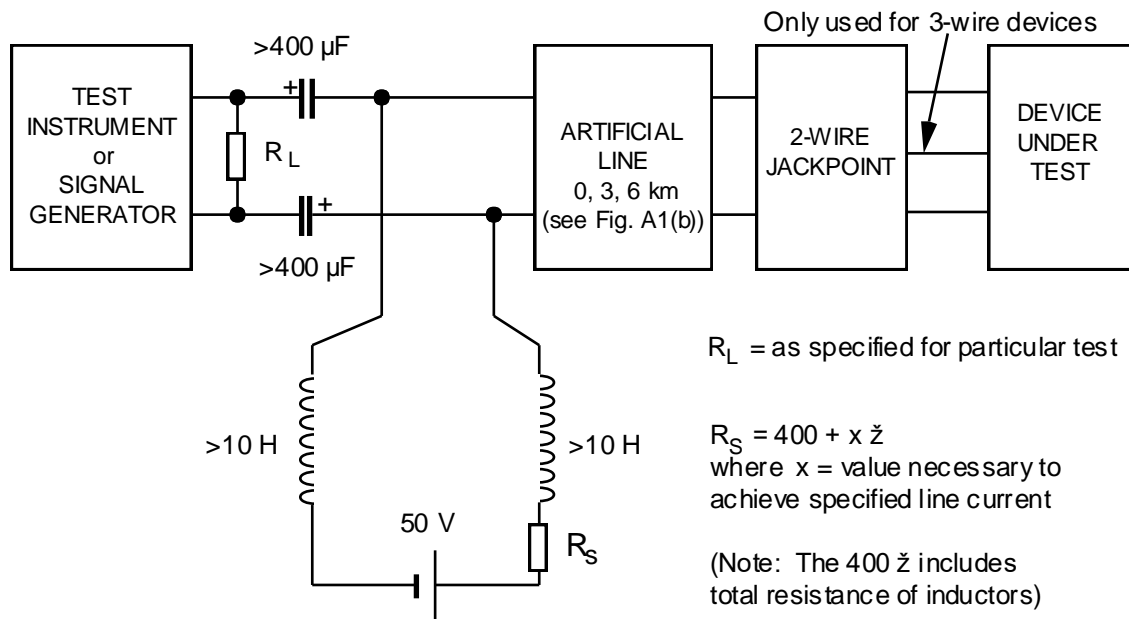
(11) Test procedures for several parameters are specified for different values of line current. The source resistance ( $R_s$ ) is adjusted to obtain the current required for each test (see Fig. A1). Alternatively, these tests may be performed by switching discrete values of  $R_s$  as follows:-

APPROXIMATE LINE CURRENT	$R_s$	APPROX. EQUIVALENT LENGTH of 0.5 mm ARTIFICIAL LINE
Full current (max 80 mA)	400 $\Omega$	0 km
45 mA	400 + 350 $\Omega$	2 km
30 mA	400 + 850 $\Omega$	5 km
25 mA	400 + 1350 $\Omega$	8 km
20 mA	400 + 1750 $\Omega$	10 km

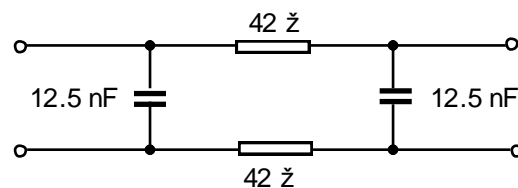
• The above are approximately equivalent only.

• There is no requirement to test above 80 mA. If full current is greater than 80 mA, it may be adjusted down to that value by increasing the value of  $R_s$ .

(12) Simple functional tests may be carried out to ensure that the equipment is operational to the extent that calls may be initiated, answered and terminated reliably under a typical range of line conditions, and to confirm that the basic functions of the equipment can be demonstrated.



**FIG. A1(a) TEST SET-UP**



**FIG. A1(b) ARTIFICIAL LINE SEGMENT (0.5 km Line Length)**

## A2.2 TEST SET-UP PROCEDURES

### A2.2.1

This Specification covers a wide range of equipment types and actual tests required will vary from item to item. The Testing Authority will have to use some discretion in defining the test programme necessary for each case. This will depend on the functions offered by the product under test.

### A2.2.2

#### Clause-by-clause procedures

The following **Clause numbering** corresponds with that used in the body of this Specification and the Test Schedule in Appendix 3.

## 4.1

### General (also ref. clause 4.14)

- (1) (c) Where adjustable volume controls are fitted on telephony devices, two sets of tests will be required for the parameters affected. The tests are necessary to determine the effects of the volume control and ensure that there is at least one setting at which the transmission performance requirements are fully complied with.

The tests affected are to clauses 4.2 to 4.13 of this Specification and each should be carried out with the volume control set in turn to both "minimum" and "maximum".

- (2) In most cases where a proprietary interface is involved, it will only be necessary to test the combination of non-terminating series-connected device and terminal device. However, if the interface can function as proprietary or standard depending on the number of individual connections used, then the series-connected device should also be tested as such on its own.

• *Typical examples are some small PABX/KTS's with extension interfaces which are basically designed for proprietary telephones and consist of, typically, separate 'data' (or signalling) and 'voice' connections. In some such cases, standard 2-wire telephones can be connected using the 'voice' connections only.*

## 4.2

### Transmitted power limitations

The test set-up for checking the transmitted power levels is shown in Fig. A1, using zero length line and a 600  $\Omega$  non-reactive resistor as  $R_L$ . Tests shall be carried out at current values of 40 mA and full current (or 80 mA).

- (1) (a) & (b) Signals should be measured over their full period, or over 1 minute for longer duration signals. It is acceptable to measure a large number of instantaneous values over this period, and then average these values.

(c) The maximum value of instantaneous power is to be measured by recording the highest peak measured during a 1 minute period of normal transmission. The tests should be made for all combinations of speed and modulation in multiple speed equipment.

(2) For the acoustic stimulus test of telephony devices, the measuring instrument must be calibrated in dBV rms. Sinusoidal signals are applied to the mouth reference point at a sound pressure level of 20 dBPa at a frequency of 1 kHz.

(3) & (4) The transmitted power level of recorded speech shall be measured using a VU meter and associated adjustable attenuator as follows:-

(a) The adjustable attenuator, which should have a control graduated in VU's, is to be connected such that the signal being measured is applied to the VU meter via the attenuator.

• *A correctly calibrated VU meter with active input will give a reference deflection (0 VU) when bridging a transmission line at a point where a sinusoidal voltage exists which develops 1 mW in a resistance of 600 ohm (0 dBm).*

• *Since the impedance of the DUT should be 'BT 3' rather than 600  $\Omega$ , an error is introduced when measuring. However, this error is ignored for the purpose of these measurements.*

(b) When monitoring telephone speech signals, the measurement is determined by the greatest deflections on the meter occurring in a period of about 5 to 10 seconds. One or two occasional deflections of unusual amplitude should be ignored.

(c) The attenuator should be adjusted until the deflections, interpreted as described in (2) above, just reach the scale point corresponding to reference deflection (0 VU). The volume in VU is determined by the markings on the attenuator control at the setting thus obtained.

(d) If for any reason the deflections cannot be adjusted to the reference deflection, the measurement is given by the algebraic addition of the attenuator setting and the actual deflection as read on the meter scale.

• *Equivalent test results using one of the internationally recognised peak programme meters (ppm) will also be accepted. In such cases the ppm standard used should be stated with the results so that they can be correctly evaluated.*

(e) The speech recorded for test purposes should be from a standard source established by the Testing Authority for this purpose.

(f) The same recording shall be used for testing power levels and for the subjective assessment of speech quality (ref. clause 4.16).

**\* VU meters**

*For further information on VU meters, reference should be made to the CCITT White Book referred to above. However, copies of that document may be difficult to obtain in New Zealand and for this reason the following information is given:-*

*Characteristics of VU Meter*

(1) *If a sinusoidal signal in the frequency range 35 Hz to 10,000 Hz, of an amplitude which causes a reference deflection of 0 VU under steady-state conditions, is applied to the meter then that meter shall initially register 99% of the reference deflection within 0.3 seconds ( $\pm 10\%$ ). It shall then overswing the reference deflection by 1- 1.5%.*

(2) *The total time required for the meter pointer to reach its position of rest on the removal of the signal shall not be greatly different from the time of response.*

(3) *The variation of response with frequency from that at 1 kHz shall be within the following limits:-*

(a) *No more than 0.2 dB between 35 and 10,000 Hz.*

(b) *No more than 0.5 dB between 25 and 16,000 Hz.*

(4) *The point of reference deflection shall be marked '0 VU'. The remainder of the scale shall be graduated in VU above and below reference deflection.*

### 4.3

#### **Noise and crosstalk**

The test set-up for testing noise and crosstalk levels is shown in Fig. A1, using zero length line and a 600  $\Omega$  non-reactive resistor as R<sub>L</sub>. A measuring instrument of high input impedance is connected across the 600  $\Omega$  resistor, calibrated in units of dBmp (using psophometric weighting in accordance with CCITT Blue Book, Rec. O.41). Tests shall be carried out at full current (or 80 mA).

#### 4.3.1

##### **Equipment on-hook**

(1) The noise level is measured by averaging over a minimum period of 1 second. The measurement is made three times and the highest value of the three measurements is selected as a determination of the noise level.

(2) For noise signals above 4 kHz, a spectrum analyser with the capability of measuring frequencies up to at least 150 kHz shall be used, connected as above. The analyser shall be set up to average no less than 50 samples.

#### 4.3.2

##### **Equipment off-hook**

For all noise tests with the equipment off-hook, the test set-up is as above but with the microphone of any telephony device replaced by a resistor of value equivalent to the resistance of the microphone at 1000 Hz.

(1) (a) Noise signals in the 300 Hz - 4000 Hz range shall be measured as in clause 4.3.1 (1) above.

(b) Signal to noise ratio should be tested at 1000 Hz. Where the record level is adjustable, the input test signal will be adjusted so that the associated VU meter indicates 0 dB.

• *It is assumed that any equipment having automatically controlled recording levels will be already set to this level.*

(d) Noise signals above 4 kHz shall be measured as in clause 4.3.1 (2) above.

(2) Signal to noise ratio should be tested using a signal of 1000 Hz set at a level equivalent to the lowest transmit level of any signal frequency in the range 300 Hz to 3400 Hz used by the device. The noise signals both above and below 4 kHz shall be measured as in clause 4.3.1 above.

### 4.3.3

#### Multi-line devices

A 1000 Hz test signal shall be applied to one line at a level of 0 dBm and crosstalk isolation measured on each other line on the device. For the off-hook condition, the microphone of each handset on the device shall be replaced by a resistor of value equivalent to the resistance of the microphone at 1000 Hz.

## 4.4

### Distortion

(1) (b) Total send harmonic distortion of devices transmitting recorded speech or music should be measured using a signal frequency of 1000 Hz. Where the record level is adjustable, the input test signal shall be adjusted so that the associated VU meter indicates 0 dB.

• *It is assumed that any equipment having automatically controlled recording levels will be already set to this level.*

(c) Total send harmonic distortion introduced by non-terminating devices should be measured using a signal frequency of 1000 Hz applied at a level of -4 dBm.

### 4.5.1

#### Off-hook impedance

(2) & (3)

(a) The minimum Return Loss and Echo Return Loss of the device against a reference impedance of BT3 shall be measured at the line terminals, with the telephone off-hook and supplied from a high impedance d.c. feed (see Fig. A1). The microphone on each telephony device tested shall be replaced by a resistor of value equivalent to the resistance of the microphone at 1000 Hz. Measurements shall be made at both 20 mA and full current (or 80 mA) on a 0 km line.

(b) The test signals shall be of the standard frequencies 300 to 3400 Hz in 100 Hz increments, preferably at a level of -10 dBV. Tests made with closer frequency separation are acceptable provided that the full range is covered.

• *The test signal level of -10 dBV may not always be achievable on all test instruments, and is therefore only stated as a preference to Test Laboratories.*

(6) For devices equipped with a "hold" facility, echo return loss will be measured as above but with the device on-hook and the "hold" condition activated.

### 4.5.2

#### On-hook impedance

The on-hook impedance shall be measured at the line terminals, with the device in the on-hook condition and connected to a high impedance 50 V d.c. feed (ref. Fig. A1) via a 0 km line.

Measurements shall be made by applying 1 Vrms over the frequency range 300 Hz to 3400 Hz at 200 Hz intervals, using a known source impedance. The required impedance magnitude at each frequency is calculated from the voltages across the known source impedance and impedance of the device.



#### 4.9 & 4.10

#### Frequency response and Loudness Ratings

**NOTE:** Some of the following clauses relate to electro-acoustic tests of telephony devices. The basic requirements for such tests are as follows:-

- (a) All electro-acoustic tests are to be carried out in an environment where the ambient noise is insufficient to influence the acoustic measurements being made.
- (b) The setting up of the mouthpiece and earpiece shall be as follows:-
  - (i) Where the mouthpiece of the handset is fixed relative to the earpiece, the handset is placed in the loudness rating guard-ring position as described in CCITT Blue Book, Recommendation P. 76, Annex A.
  - (ii) Where the mouthpiece of the device is not fixed relative to the earpiece, the front plane of the mouthpiece is mounted 15 mm in front of the lip ring and coaxial with the artificial mouth.
  - (iii) The earpiece is sealed to the knife-edge of the artificial ear.

#### 4.9.1

##### Send frequency response of telephony devices

The telephony device is connected to the test equipment as shown in Fig. A1 with  $R_L$  set at a value of 600  $\Omega$  resistive, a line length of 0 km, and current set at 20 mA. Measurements shall be made:-

- (a) using the 14 test frequencies specified in Table 1, or
- (b) making a continuous sweep across full frequency band specified.

The send sensitivity  $S_{mjn}$  is determined by the procedure described in ITU-T Recommendation P.64:1993. The output voltage is measured at the fundamental frequency of the stimulus. The results are expressed in dBV/ $P_a$ .

#### 4.9.2

##### Receive frequency response of telephony devices

The test set-up is the same as for send frequency response (ref. clause 4.9.1 above) with the generator set to deliver an e.m.f. of -10 dBV.

The receive sensitivity,  $S_{jen}$  is measured as a function of frequency as described in ITU-T Recommendation P. 64:1993. The sound pressure is measured at the fundamental frequency of the stimulus. The results are expressed in dBPa/ $\sqrt{V}$ .

#### 4.9.3

##### (Frequency response of) non-voice equipment

- (3) On devices that transmit frequencies above 3400 Hz, check that operation between units continues when the frequency range is restricted to 300 - 3400 Hz.

For this test, a suitable low pass filter with a cut-off frequency between 3400 Hz and 3500 Hz shall be inserted in the connection between units.

#### 4.9.4

##### (Frequency response of) series connected and bridging devices

(1) (a), (b) & (c) On non-terminating series connected and bridging devices, the insertion loss is to be measured between the line port and terminal equipment port using 600 Ω terminations on both the frequency generator and level measuring instrument. Measurements shall be taken at 300 Hz, 500 Hz, 1000 Hz, 2000 Hz, 3000 Hz and 3400 Hz.

(d) Series connected devices in the terminating state shall be measured as above in the off-hook condition.

(2) For proprietary interface devices, the combination of terminal and series connected device shall be tested as in 4.9.1 and 4.9.2, or 4.9.3, as appropriate.

#### 4.10

##### Send and Receive Loudness Ratings (telephony devices)

(1), (2) & (4) The telephony device is connected to the test equipment as shown in Fig. A1 with  $R_L$  set at a value of 600 Ω resistive, a line length of 0 km.

The tests are performed with line currents of 20 mA, 45 mA and full current (or 80 mA) at the 14 frequencies,  $f_n$ , shown in Table 1, to obtain values for the send sensitivity,  $S_{mjn}$ , and receive sensitivity,  $S_{jen}$ , of the line test circuit.

The send loudness rating, SLR (in dB), is calculated from the following formula:-

$$SLR = \frac{-10}{0.175} \log_{10} \sum_{n=1}^{14} 10^{0.0175 (S_{mjn} - W_{sn})}$$

where:-

$W_{sn}$  is the send weighting factor given in Table 1.

$S_{mjn}$  is the send sensitivity of the line test circuit (in dBV/Pa).

The receive loudness rating, RLR (in dB), is calculated from the following formula:-

$$RLR = \frac{-10}{0.175} \log_{10} \sum_{n=1}^{14} 10^{0.0175 (S_{jen} - L_{En} - W_{Rn})}$$

where:-

$W_{Rn}$  is the receive weighting factor, given in Table 1;

$L_{En}$  is the real ear loss, given in Table 1 (in dB).

$S_{jen}$  is the receive sensitivity of the line test circuit (in dBPa/V).

**TABLE 1: PARAMETERS REQUIRED TO CALCULATE SLR, STMR AND RLR**

n	$f_n$	$L_{En}$	$W_{Rn}$	$W_{Sn}$	$W_{Mn}$
	(Hz)	(dB)	(dB)	(dB)	(dB)
1	200	8.4	85.0	76.9	86.4
2	250	4.9	74.7	62.6	81.9
3	315	1.0	79.0	62.0	78.5
4	400	-0.7	63.7	44.7	78.2
5	500	-2.2	73.5	53.1	72.8
6	630	-2.6	69.1	48.5	67.6
7	800	-3.2	68.0	47.6	58.4
8	1000	-2.3	68.7	50.1	49.7
9	1250	-1.2	75.1	59.1	48.0
10	1600	-0.1	70.4	56.7	48.7
11	2000	3.6	81.4	72.2	50.7
12	2500	7.4	76.5	72.6	49.8
13	3150	6.7	93.3	89.2	48.4
14	4000	8.8	113.8	117.0	49.2

**NOTE:** Values for  $f_n$  are taken from BS 3593:1963.

#### 4.11.3

##### Sidetone Masking Rating (STMR)

The telephony device is connected to the test equipment as shown in Fig. A1 with  $R_L$  set at a value of 600  $\Omega$  resistive, a line length of 0 km. The test is performed with line currents of 20 mA, 45 mA and full current (or 80 mA). The test is then repeated with  $R_L$  set at BT3. For each of the 14 frequencies,  $f_n$ , the sidetone loss of the line test circuit is determined by a procedure consistent with that described in ITU-T Rec. P. 64:1993.

- (a) The sidetone loss,  $L_{MeSTn}$ , is calculated from the formula:-

$$L_{MeSTn} = 20 \log_{10} (P_{mn}/P_{en})$$

where:-

$P_{mn}$  is the free field sound pressure at the mouth reference point (in Pa);

$P_{en}$  is the sound pressure generated in the artificial ear (in Pa).

- (b) The masked sidetone loudness rating, STMR (in dB), is calculated from the

formula:-

$$STMR = \frac{-10}{0.225} \log_{10} \sum_{n=1}^{14} 10^{-0.0225(L_{MeSTn} + L_{En} + W_{Mn})}$$

where:-

$W_{Mn}$  is the sidetone weighting factor, given in Table 1;

$L_{MeSTn}$  is the sidetone loss (in dB);

$L_{En}$  is the real ear loss, given in Table 1 (in dB).

## 4.12

### Instability test

(1) Check stability of normal operations of all devices, other than telephony devices, when connected as in Fig. A1 with a 0 km artificial line and a BT3 network connected in place of  $R_L$ . This check shall be carried out with line currents of 20 mA and full current (or 80 mA).

(2)&(3) For telephony devices the test set-up is as shown in Fig. A1 with 0 km artificial line. The handset is placed (off-hook) face down on a hard flat surface for the duration of the test. With the line current set at 20 mA, checks are to be made for any sustained audible oscillation emitted by the device when each of the following alternative terminations are used in place of  $R_L$ :-

- (a) A 270  $\Omega$  resistor, and,
- (b) a 1600  $\Omega$  resistor in series with a 510 nF capacitor.

This test is to be repeated at full current (or 80 mA). Also, for devices fitted with a user-controlled receive volume control, the checks are to be made with the volume control set at both maximum and minimum positions.

## 4.13

### Acoustic shock tests (of telephony devices)

The telephony device is connected to the test equipment as shown in Fig. A1 with  $R_L$  set at a value of 600  $\Omega$  resistive, a line length of 0 km and full current (or 80 mA).

The generator is set to deliver sinusoidal signals at an e.m.f. of +24 dBV r.m.s. at a frequency of 1 kHz.

## 4.14

### Adjustable volume control

See clause 4.1.

## 4.15

### Telephony security in on-hook condition

The telephony device is connected to a line in parallel with another telephony device. With the first device on-hook, a call is established from the second device and conversation should proceed. The first device, while still on-hook, should then be monitored subjectively to ensure that no evidence of speech can be detected within 300 mm of the device.

#### 4.16

##### Recorded speech quality

The speech recorded for test purposes should be from a standard source established by the Testing Authority for this purpose. The recording shall be the same as that used for testing power levels (ref. clause 4.2). A subjective assessment of speech quality shall be made.

#### 5.1

##### Signalling types

(4) While testing transmission security (ref. clause 4.15 above), a check shall be made to ensure DTMF signals cannot be transmitted while the device is on-hook.

#### 5.2

##### Transmission of DTMF signalling

DTMF signalling shall be tested using the set-up shown in Fig. A1, with  $R_L$  set at a value of  $600 \Omega$  resistive and full current (or 80 mA). For line powered devices, additional tests shall be performed at 25 mA line current.

#### 5.2.2

(2)(e) A test frequency of 1 kHz shall be used for the test to satisfy requirements of clause 4.3.2(2).

#### 5.5.1

##### Automatic dialling devices (general requirements)

Functional check and timing only required.

#### 5.5.2

##### Caller display equipment

Functional check only required.

#### 6.2

##### Function of d.c. line feed (polarity reversals)

(3) It will not be necessary to repeat all tests with the line polarity reversed. Having confirmed compliance with other performance requirements using a particular line polarity, a simple functional test with the polarity reversed shall be carried out to ensure that transmission and signalling are operational.

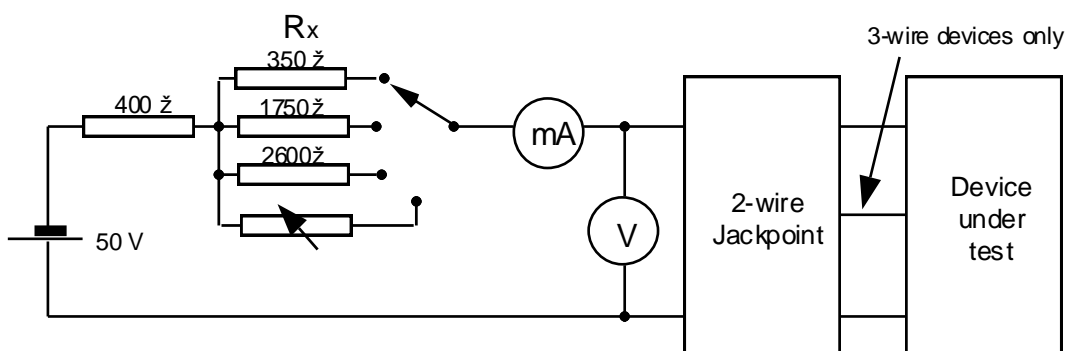


FIG. A3 TEST SET-UP FOR D.C. CHARACTERISTICS

### 6.3

#### Off-hook d.c. line Characteristics

The DC characteristics shall be tested using the set-up shown in Fig. A3. The voltage and current measurements shall be taken with the resistance 'Rx' set to 2600  $\Omega$ , 1750  $\Omega$  and 350  $\Omega$  respectively (approx. 15 mA, 20 mA and 45 mA).

### 6.5

#### Hold condition (if provided)

(2) With the 'hold' facility activated, the off-hook line current shall be adjusted to 20 mA by varying 'Rx' with the device connected to a 400  $\Omega$ , 24 V dc source (ref. Fig. A3). The line current shall be checked when an additional 40  $\Omega$  resistor is placed in series with the source and the source voltage is reduced to 21 V.

• *The above tests confirm correct operation of the device under worst limit conditions when connected to a nominal 24 V, 400  $\Omega$  source, i.e. 24 $\pm$ 3 V and 400 $\pm$ 40  $\Omega$ .*

(3) & (5) The test set-up in Fig. A3 shall be suitably modified for these tests and the timing requirements checked.

### 6.7

#### On-hook line current

With the device connected to the 50 V battery via a 1500  $\Omega$  resistor, the current drawn shall be checked under both normal and reversed line conditions. The value to be recorded shall be the higher of the two measurements taken.

### 6.8

#### Recall and call waiting

For equipment with "TBR" ("recall") and/or "call waiting" key function, the device should be connected as shown in Fig. A3 in the off-hook state, with 'Rx' set at 1750  $\Omega$  (or current set at 20 mA). The duration of the timed break shall then be checked when the 'recall' key is operated.

### 6.9.1

#### D.C. line characteristics (series connected equipment)

(1) The test set-up is as shown in Fig. A4, but with a reference telephone connected to the terminal equipment port. With the telephone off-hook, the volt drop is measured between ports with feed currents of 20 mA, 30 mA, 40 mA and full current (or 80 mA).

(2) On devices which perform a switching function during ringing, the 'in-rush' current is checked as the switching takes place.

(4) Clauses 6.3 to 6.8 shall be checked using the test set-up with reference telephone used in (1) above.

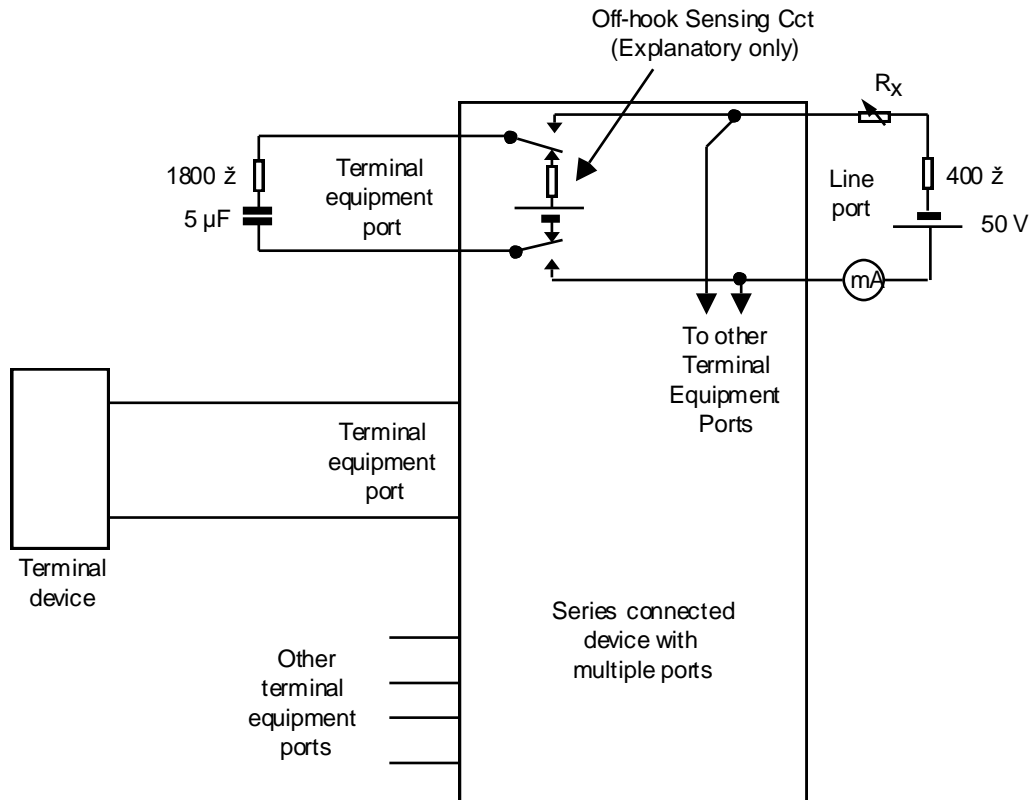


FIG. A4 TEST SET-UP FOR SERIES CONNECTED DEVICE

#### 6.9.4

##### Line grabbing equipment

(1) A suitable test set-up, using a reference telephone connected to the terminal equipment port, shall be used to enable the timing requirements to be checked.

#### 6.10

##### D.C. line feed to other devices

(4), (5) & (6) Test measurements to be carried out using a reference telephone connected to the port under test.

#### 6.11

##### Fail-safe requirements

Functional checks only required. To simulate a power failure, the supply voltage should be gradually be reduced until the equipment fails to operate.

#### 7.1

##### General

(7) The test method (see 7.5 & 7.6 below) for Ringing Number quantifies both sensitivity and loading on a scale of 0.5 - 5. The test set-up is shown in Figure A5. Because of the adoption of 2-wiring, 3-wire CPE will be rated connected via a 2-wire socket. The sensitivity test also covers sensitivity to cadence timing.

The RN shall be measured and recorded for each of the Distinctive Alert ringing cadences, and also separately for the on and off states of equipment with a ringer on/off option.

## 7.4

### Audible characteristics of ringer

Minimum ringing acoustic output for “acceptance” is set very low at only 50 dBA. This may be assessed subjectively and it need only be measured where there is doubt whether this level is met.

## 7.5.1

### General operation

Reliable operation is described as follows:-

#### (a) Devices with audible ringers

The ringer under test is required to follow the ringing cadence reliably by ringing audibly and “cleanly” with no hesitation or “stuttering”. Electronic ringers often take longer to start with decreasing voltage, and this has the effect of shortening the ringing bursts within the cadence. Where there is a discernible shortening (by more than 5%) of the ring burst when one extra load is load is switched in, then the sensitivity shall be calculated with that load switched out.

#### (b) Auto Answer ringers

Reliable operation for an automatic answer device is determined by the equipment answering on application of ringing in the expected number of cadences. The test shall be repeated five times with the ring bursts lengthened and shortened by 40 ms (see figure A5), and the equipment shall answer each time.

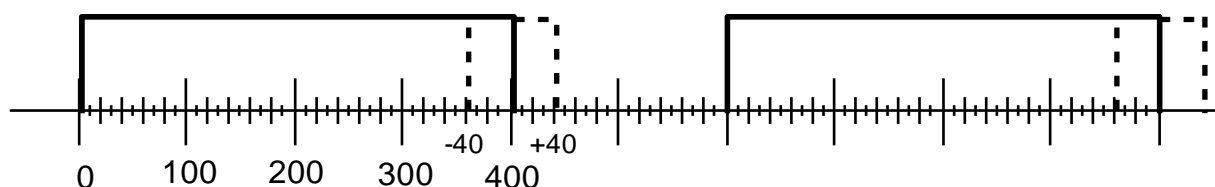


FIG. A5 CADENCE TOLERANCE

## 7.5.2

### Ringer sensitivity

(1) (a) The test set-up for ringer sensitivity is shown in Fig. A6. The set-up shall be calibrated as follows:-

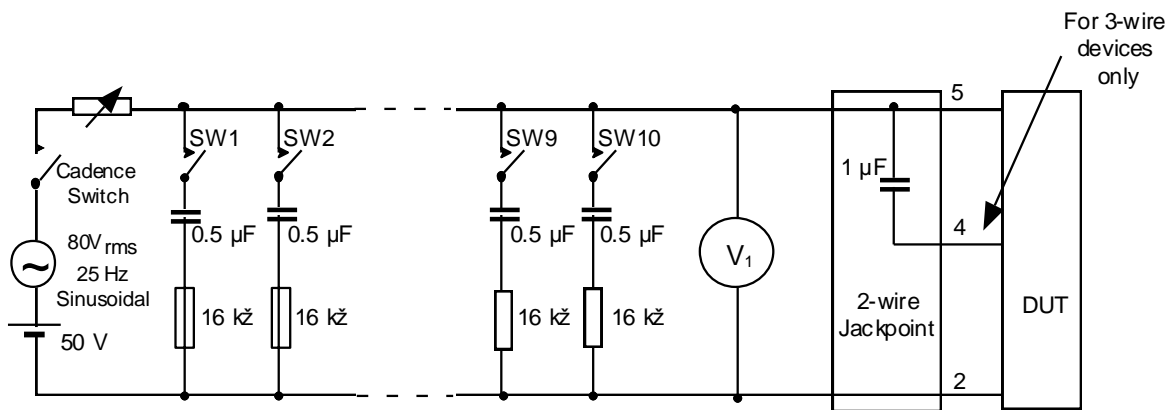
- (i) Close switches Sw1 to Sw10.
- (ii) Adjust the variable resistor until  $V_1 = 107 V_{p-p}$ .

• It is important that this  $V$  is a true peak to peak measurement and not calculated from an r.m.s. measurement, as most ringers only conduct over part of the waveform.

#### (b) Sensitivity test procedure

Connect the device and close all switches. The ringing source is switched on and off in accordance with the cadence (DA1 - DA4) under test. If the ringer does not operate reliably (see (2) below), the switches are opened one by one until the ringer does operate reliably. The Ringer Sensitivity number (RS) is derived as follows:-

$$RS = (10 \text{ minus the number of loads switched in}) \div 2$$



All component tolerances to be  $\pm 1\%$

**FIG. A6 RINGING TEST SET-UP**

The above shall be repeated for each of the four Distinctive Alert cadences (DA1-DA4) and the following recorded:-

- (a) Determine the codes to which the equipment does, or can be programmed to, respond to.
- (b) Confirm that, when programmed for a specific code, the device does not respond to any other.
- (c) Determine which codes the equipment responds to when:-
  - (i) it is not programmable, or,
  - (ii) is programmable, but not programmed for any specific code.
- (d) Determine the functions which each code invokes.

(2) The ringer is tested for operation when the voltage across the ringer is reduced to  $30 V_{p-p}$ . The test set-up is as per Fig. A6 with all 10 loads switched in and the variable resistor adjusted accordingly.

(3) To test response of the ringer to short ringing bursts, the test arrangement shown in Fig. A6 calibrated as in (1)(a) above should be used. Switches Sw1 to Sw10 should then be opened and the cadence switch operated to apply 40 ms bursts of ringing.

(4) To test impulse immunity, the equipment is connected to the test set-up shown in Fig. A7. Sw1 is switched on for 35 ms, off for 65 ms 10 times followed by a break of 750 ms. This sequence is repeated 10 times. Record whether or not the ringer operates when this sequence is applied.

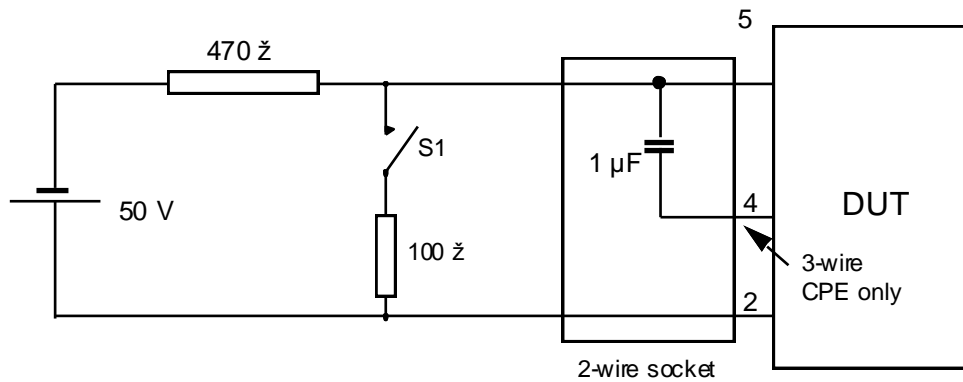


FIG. A7 IMPULSE IMMUNITY TEST SET-UP

### 7.5.3

#### Ringer Loading

Connect the Device under Test (DUT) as in Fig. A6, calibrate as per clause 7.5.2 (1)(a) and open switches Sw1 - Sw10.

- (a) If the measured voltage falls below  $107 V_{p-p}$  when connected, the ringer loading and the resultant RN is to be assessed as greater than 5 and the ringer is failed for excessive loading.
- (b) If the measured voltage is above  $107 V_{p-p}$  when connected, then switches Sw1 - Sw10 are to be closed one by one until the it falls below  $107 V_{p-p}$ . One switch is then opened again. The Ringer Loading number (RL) is defined as follows:-

$$RL = (10 \text{ minus the number of loads switched in } ) \div 2$$

### 7.6

#### Ringling Number (RN)

The “Ringling Number (RN)” is defined as the higher of the Ringer Loading Number (RL), the Ringer Sensitivity Number (RS). If the resultant RN is zero, then it shall be rounded up to a value of 0.5.

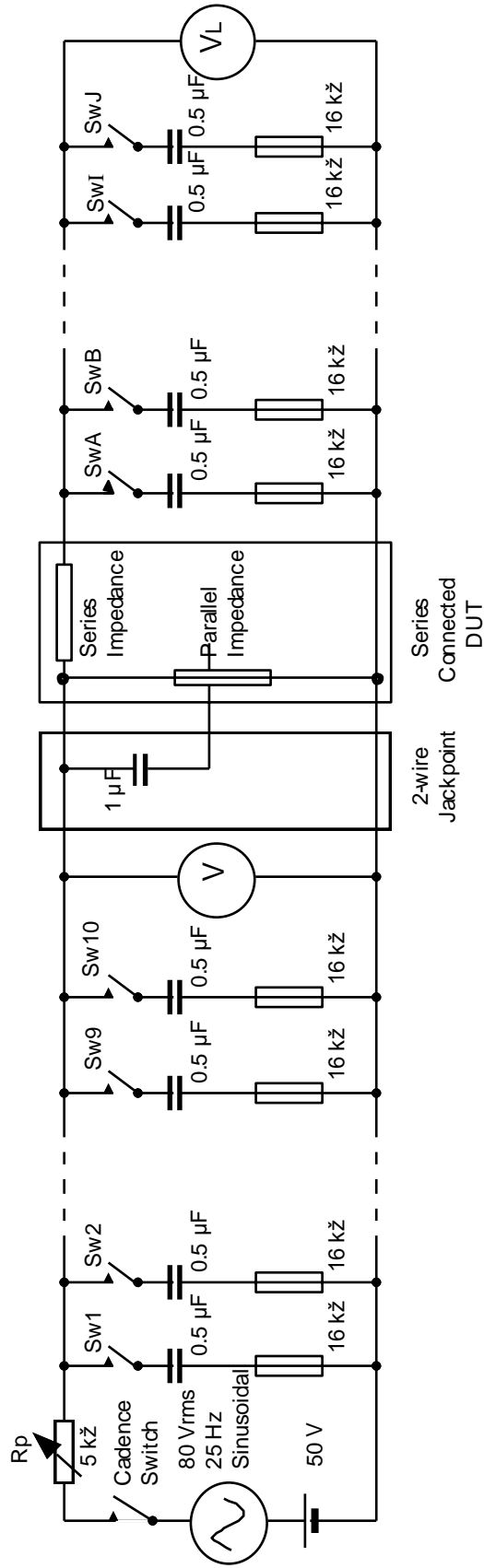


Fig. A8 TEST SET-UP FOR SERIES RINGING DEVICES

## 7.7

### Series connected devices

#### 7.7.1

##### General requirements

See clause 7.5.1

When measuring ringing parameters of a series device, the aim is to assign an RN to the device in such a way that the rules for adding RNs up to a maximum of 5 still apply. This means that the maximum applies to devices on both the load side and the network side of the device, plus the RN of the series device itself.

#### 7.7.2

##### Devices without terminating facility

(1) (a) The test set-up for determining the RN is shown in Fig. A8. The set-up shall be calibrated as follows:-

(i) Close all switches Sw1 to Sw10, leaving switches SwA to SwJ open.

(ii) Adjust the variable resistor until  $V = 107 V_{P-P}$ .

• *It is important that this V is a true peak to peak measurement and not calculated from an r.m.s. measurement, as most ringers only conduct over part of the waveform.*

(b) Open all switches Sw1 to Sw10. Close switches SwA to SwJ one by one until the peak-to-peak voltage  $V_L$  falls below  $107 V_{P-P}$ , and then re-open one switch. The maximum load  $L_{RN}$  (which represents the total RN that can be connected to the terminal equipment port of the device) is determined as follows:-

$$L_{RN} = (\text{number of switches closed}) \div 2 \quad (\text{Result must equal no less than 4})$$

(2) - (4) For devices which do not incorporate a ring detector,  $RN_L$  is derived as follows:-

$$RN_L = RL = 5 - L_{RN}$$

Measure RN of the device with switches SwA to SwJ open as per clause 7.6. This value is defined as  $RN_O$ .

The RN of the device is defined as the higher of the values  $RN_L$  and  $RN_O$ . Ringing Numbers of zero are rounded up to 0.5.

(5) If a device incorporates a ring detector, RN is derived as follows:-

(a) For devices which switch to the load on the terminal equipment port only after analysis of ringing has been completed - e.g. distinctive alert decoders, RN shall be determined by assessing ringer sensitivity and loading as in 7.5 and 7.6 with the load disconnected (SwA to SwJ open).

(b) To determine the sensitivity of the ringer on devices which respond to ringing with the load connected to the terminal equipment port, check that it does operate with  $L_{RN}$  loads connected (as determined in (1) above). If not, reduce  $L_{RN}$  by opening switches SwA to SwJ one by one until the ringer operates according to the criteria of 7.5.1.

$RN_L$  is then derived as follows:-

$$L_{RN} = (\text{number of switches closed}) \div 2$$

$$RN_L = RS = 5 - L_{RN}$$

(c) Measure RN of the device with switches SwA to SwJ open as per clause 7.6. This value is defined as  $RN_O$ .

The RN of the device is defined as the higher of the values  $RN_L$  and  $RN_O$ . Ringing Numbers of zero are rounded up to 0.5.

• The following information will be indicated on the PTC label:-

(a) Maximum aggregated RN which can be connected to the terminating equipment port of the series connected device ( $L_{RN}$ ) as derived in 7.7.2(1)(b).

(b) RN for the series connected device as derived in 7.7.2(2).

### 7.7.3

#### Devices with terminating facility

For series connected devices with a terminating facility, test as in 7.5 and 7.6

### 7.7.4

#### Terminal equipment (or extension) ports

The requirements of this clause by observation and timing.

### 7.7.5

#### Locally generated ringing

(a) & (b) Ringing supplies to be tested against AS/NZS 3260.

(c) & (d) Ringing connection and cadence reproduction to be checked by observation and timing.

(e) & (f) Ringing waveform crest factor to be checked by examination using an oscilloscope.

(g) & (h) Use Test Set-up shown in Fig A8. Open all switches. Connect ringing source under test in place of the variable resistor, the cadance switch, the 80 V ringing source and the 50 V battery. Close switches SW1 to SW10 one at a time until the volatge falls below 107 Vpp. The number of switches closed is N. The RN that the ringing source can support is  $(N - 1)/2$ .

## 8

### AUTOMATIC CALL SET-UP, ANSWERING & RECORDING FUNCTIONS

The methods of testing for this Section will vary from product to product and can best be determined by the Testing Authority in each case. Mandatory requirements specified can be checked by observation and manual timing of events.

## 9.1

### Cordless devices (security)

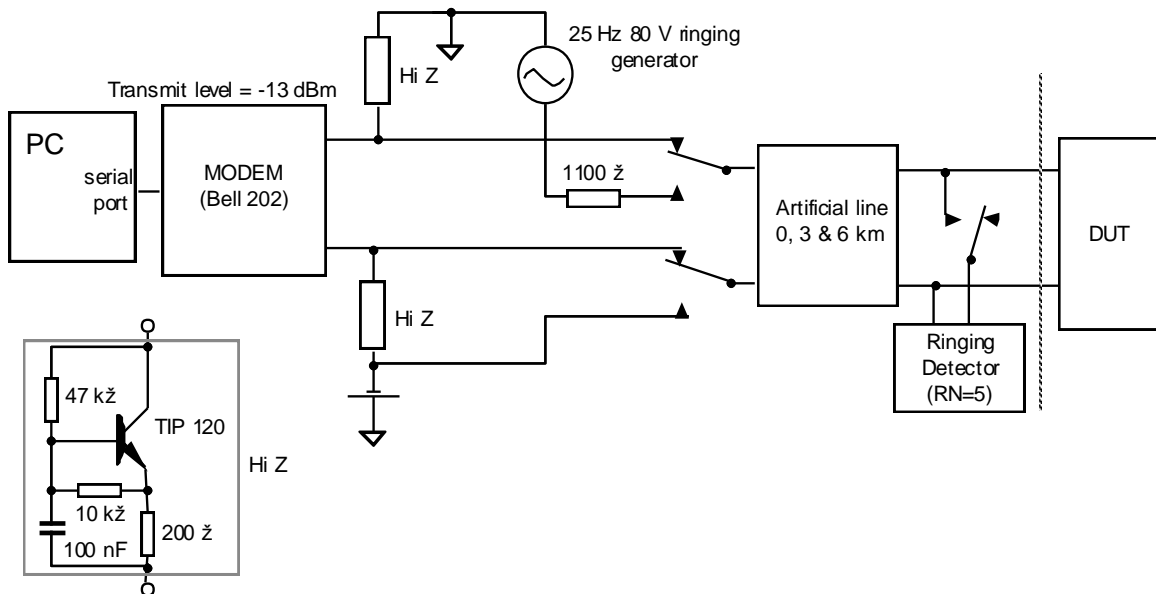
(2) Establish number of security codes available and methods of allocation and regeneration. Confirm by functional test that device cannot be operated without security code.

## 11 SUPPLEMENTARY SERVICES AND SPECIAL FEATURES

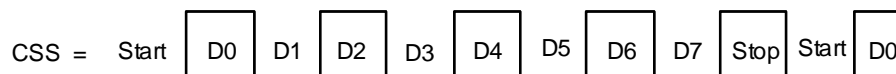
### 11.1

#### Analogue Calling Line Identification equipment

The test set-up for testing the additional requirements below (which are not covered elsewhere in this Specification) is shown in Fig. A9.



Set serial port: 8 bits data, 1 stop bit



D7		D0
0	1 0 1	0 1 0 1
=	5	5 (hex) (\$55)

Notes:

Checksum = 2's complement of the modulo 256 sum of all words from the message type onwards

Modulo 256 sum = exclusive OR of each word

2's complement (X) = \$00 - X

**FIG. A9 TEST SET-UP FOR ANALOGUE CALLING LINE IDENTIFICATION EQUIPMENT**

### 11.1.2

#### On-hook impedance

For this requirement, the method of testing can best be determined by the Testing Authority.

### 11.1.3

#### Ringling

The ringing detector (RN = 5) should respond to ringing with the DUT across the line.

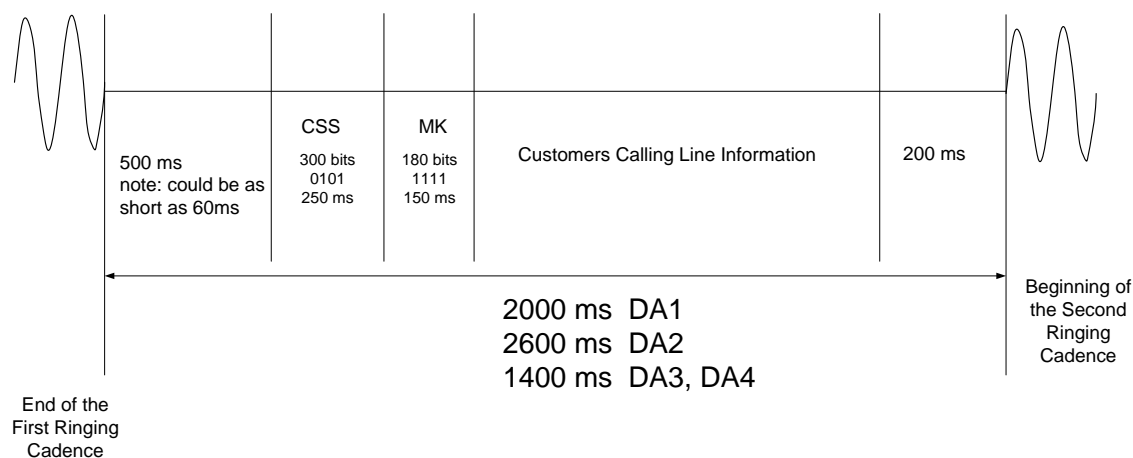
### 11.1.4

#### Data capture

(1) The CLI device shall be checked to ensure it responds to both SDMF and MDMF on hook data generated by the Bell 202 modem.

- The data format is described in Technical document TNA 102, Section 10.

- (2) Response shall be checked for all four DA ringing cadences. Timing requirements are given in Fig. A10.
- (3) Response shall be checked with and without the ringing detector connected for each of the 0 km, 3 km and 6 km lengths of artificial line. Ringing detector shall remain operational when connected.
- (4) Response shall be checked at 6km + ringing detector with CSS preamble beginning 60 ms after the end of the first ringing cadence
- (5) Send data to unit with incorrect checksum and confirm that information is discarded



**FIG. A10 TIMING DIAGRAM FOR ANALOGUE CLI SIGNALS**

### 11.1.6

#### Data display

Establish whether call back number displayed is identical to number to be dialled. In particular, check insertion of prefix digit '0' for toll calls.



<b>2.0</b>	<b>GENERAL:</b>	
§2.8	Electrical safety; - Compliance (as applicable) with AS/NZS 3260; <i>Limit: complies Yes/No</i>	Yes/No
§2.11.1 (6)(7)	Test procedure; Functional tests; does device perform basic functions satisfactorily? If answer is 'No', are functional limitations covered by warning notice in User Instructions?	Yes/No  Yes/No/NA
<b>4.0</b>	<b>TRANSMISSION REQUIREMENTS:</b>	
§4.1 (1a)	<u>General:</u> Number of samples Tested; - For electro-acoustic device; <i>Limit: 3 or N/A</i> - For other device; <i>Limit: 1 or N/A</i> Indicate No. tested;	.....
(1c)	Receive Volume Control; - tests carried out for all settings; <i>Limit: PTC200</i>	Yes/No/NA
(1f)	Ministry of Commerce Compliance; <i>Limit: RFS29</i>	Yes/No/NA
§4.2 (1a)	<u>Transmitted Power Limitations:</u> -Signals to line of more than 5 seconds; <i>Limit: ≤ -9dBm</i>	.....dBm
(1b)	-Signals to line of less than 5 seconds; <i>Limit: ≤ -4dBm</i>	.....dBm
(1c)	-The maximum instantaneous peak power; <i>Limit: ≤ 0dBm</i>	.....dBm
(2)	-Signal limitations to line on any acoustic stimulus; <i>Limit: +10dBV</i>	.....dBV
(3)	- Any recorded message or voice signal transmitted; <i>Limit: -6 to -16VU</i>	.....VU
(4)	Pre-recorded music, synthesised music or composite speech and music signals; <i>Limit: -12 to -25VU</i>	.....VU
§4.3	<u>Noise and Crosstalk:</u>	
§4.3.1 (1)	On-Hook Noise and Crosstalk; The psophometric noise power level to line in on-hook state; <i>Limit: ≤ -65 dBmp</i>	.....dBmp

(2)(b)	One minute mean on-hook noise power above 4 kHz <i>Limit: below limits in Fig 4.2</i>	
(3)	With room noise/background conversation at approx 65 dB SPL, is on-hook coupling to line $\leq$ -65 dBmp	Yes/No
§4.3.2 Off-Hook Noise and Crosstalk;		
(1a)	The psophometric noise power level to line in Off-hook state; <i>Limit: <math>\leq</math> -60 dBmp</i>	.....dBmp
(1b)	Signal-to-Noise Ratio of recorded speech or music in 0.1 -5 kHz band; <i>Limit: <math>\geq</math> 20 dB</i>	.....dB
(1d)	One minute mean off-hook noise power above 4 kHz <i>Limit: below limits in Fig 4.2</i>	
(2a)	The individual power level of any extraneous frequency in 0.3-5 kHz range, during signalling; <i>Limit: &gt; 20 dB below</i>	.....dB
(2b)	One minute mean Signal to noise Ratio during signalling; <i>Limit: &gt; 20 dB</i>	.....dB
§4.3.3	Crosstalk isolation for multi-line-device, in 0.3-3.4 kHz range; <i>Limit: &gt; 50 dB</i>	.....dB
§4.4 <u>Distortion:</u>		
(1b)	Total send harmonic distortion of recorded speech, in 0.3-3.4 kHz range; <i>Limit: <math>\leq</math> 10%</i>	.....%
(1c)	Total send harmonic distortion introduced by non-terminating serial device; <i>Limit: <math>\leq</math> 5%</i>	.....%
§4.5 <u>Line impedance of the device:</u>		
§4.5.1 OFF-HOOK line impedance;		
(2a)	Min. Return Loss in 0.3 -1 kHz range; <i>Limit: <math>\geq</math> 10 dB</i>	.....dB
(2c)	Min. Return Loss in 1-3.4 kHz range; <i>Limit: <math>\geq</math> 12 dB</i> (note Return loss figures from 300 Hz to 1000 Hz at 100 Hz intervals and 1000 to 3400 at 200 Hz intervals to be attached)	.....dB
(3)	Echo Return Loss; <i>Limit: <math>\geq</math> 14 dB</i>	.....dB
(4)	Is the warning notice required? <i>Limit: YES or NO</i>	Yes/No

(5a)	Minimum Return Loss (BT3) - relaxed; <i>Limit: <math>\geq 8</math> dB or N/A</i>	.....dB
(5b)	Minimum Return Loss (600 $\Omega$ ) - relaxed; <i>Limit: <math>\geq 16</math> dB or N/A</i> (see note for §4.5.1(2))	.....dB
(5c)(i)	Minimum Return Loss (FRG) - relaxed, in 300 - 600 Hz range; <i>Limit: <math>\geq 10</math> dB</i> (see note for §4.5.1(2))	.....dB
(5c)(ii)	Minimum Return Loss (FRG) - relaxed, in 0.6 - 3.4 kHz range; <i>Limit: <math>\geq 15</math> dB</i>	.....dB
(6)	Minimum Return Loss for limited bandwidth products; <i>Limit: <math>&gt; 3</math> dB where signal is below -30 dBm</i> (show levels on return loss figures for §4.5.1(2))	.....dB
(7)	Echo Return Loss during Hold; <i>Limit: <math>&gt; 3</math> dB</i>	.....dB
(8)	Minimum Return Loss during DTMF signalling; <i>Limit: <math>&gt; 5</math> dB</i>	.....dB
§4.5.2	Minimum On - Hook Line Impedance over frequency range 300 - 3400 Hz; <i>Limit: <math>\geq 10</math> k<math>\Omega</math></i>	.....k $\Omega$
§4.6	<u>Port impedance - series connected CPE:</u>	
§4.6.1	Series connected terminating device;	
(1)	Minimum Return Loss of the PSTN line port vs (BT3), in 0.3 - 1kHz range; <i>Limit: <math>\geq 10</math> dB</i>	.....dB
	Minimum Return Loss of the PSTN line port vs (BT3), in 1 - 3.4kHz range; <i>Limit: <math>\geq 12</math> dB</i>	.....dB
	Echo Return Loss of the PSTN line port vs (BT3), <i>Limit: <math>\geq 14</math> dB</i>	.....dB
(2)	Minimum Return Loss of the terminal equipment 2-wire port vs (BT3), in 0.3 - 1kHz range; <i>Limit: <math>\geq 10</math> dB</i>	.....dB
	Minimum Return Loss of the terminal equipment 2-wire port vs (BT3), in 1 - 3.4kHz range; <i>Limit: <math>\geq 12</math> dB</i>	.....dB
	Echo Return Loss of the terminal equipment 2-wire port vs (BT3); <i>Limit: <math>\geq 14</math> dB</i>	.....dB

§4.6.2	Series connected non-terminating device;	
(a) (b)	Min. Return Loss of the PSTN port while the proprietary port is BT3 terminated; 20 mA 80 mA <i>Limit: <math>\geq 25</math> dB</i>	.....dB .....dB
§4.8	<u>Impedance Balance Ratio to Earth;</u>	
(1) (3)	Impedance Balance Ratio to Earth for all devices in 0.2-4 kHz range; On-hook: Off-hook: <i>On &amp; Off-Hook limits: <math>\geq 40</math> dB</i>	.....dB .....dB
§4.9	<u>Frequency Response;</u>	
§4.9.1 (3)	Send Frequency response; <i>Limit: plot within mask</i>	Yes/No
§4.9.2 (4)	Receive Frequency response; <i>Limit: plot within mask</i>	Yes/No
§4.9.3	For non-voice equipment;	
(3)	Capability of automatic reduction of the transmitted signal bandwidth (eg. fall-back); <i>Limit: successful operation</i> Warning notice in User Instructions?	Yes/No/NA Yes/No/NA
§4.9.4	For series-connected and bridging CPE;	
(a)	Minimum Insertion Loss for 2-wire series-connected device in non-terminating state, while the terminating device is off-hook; <i>Limit: <math>\leq 1</math> dB</i>	.....dB
(b)	Insertion Loss for 4-wire series-connected device in non-terminating state, while the terminating device is off-hook; <i>2 dB <math>\leq</math> Limit <math>\leq</math> 3 dB</i>	.....dB
(d)	Minimum Insertion Loss for series-connected device with line termination, but in through transmission state with the terminating device off-hook; <i>Limit: <math>\leq 3</math> dB</i>	.....dB
§4.9.5	Minimum Insertion loss of bridging device; <i>Limit: <math>\leq 1</math> dB</i>	.....dB

§4.10	<u>Send and Receive Loudness Rating:</u>	
(4a)	Send Loudness Rating vs current; 20 mA .....dB 45 mA .....dB 80 mA .....dB +8 dB ≤ Limit: ≤ +2 dB	
	Receive Loudness Rating vs current; Without Volume Cont. or with Vol. Cont. on min. setting; 20 mA: .....dB 45 mA: .....dB 80 mA: .....dB -3.5 dB ≤ Limit: ≤ -9.5 dB With Vol. Cont. on max. setting; 20 mA: .....dB 45 mA: .....dB 80 mA: .....dB Limit: ≤ -14 dB	
§4.11.3	<u>Sidetone:</u>	
(1)(2)	Sidetone Masking Rating (STMR); - against BT3: .....dB - against 600Ω: .....dB Limit (for BT3): ≥ 7 dB	
§4.12	<u>Instability:</u>	
(1)	Stability under operating conditions; Limit: stable behaviour	Yes/No
(2a)	Stability-terminated with 270Ω; Limit: compliant (YES or NO)	Yes/No
(2b)	Stability-terminated with 1.6kΩ+510nF; Limit: compliant (YES or NO)	Yes/No
§4.13	<u>Acoustic Shock Protection:</u>	
	The sound pressure at the earpiece; Limit: +118 dB +111 dBA (headsets)	.....dBA
§4.14	<u>Adjustable Volume Control:</u>	
(1)	§4.2 to §4.13 must be tested with the minimum and the maximum settings; Limit: compliant (YES or NO)	Yes/No
(5)	The volume control should not affect compliance with d.c. voltage or the send performance characteristics; Limit: compliant (YES or NO)	Yes/No
§4.15	<u>Telephony Security while on-hook:</u>	
(1)	On-hook coupling from the line. There shall be no evidence of coupling; Limit: compliant (YES or NO)	Yes/No

§4.16	<u>Recorded Message Quality:</u>	
(1)	Intelligibility of recorded message to the distant party; <i>Limit: suitably intelligible (YES or NO)</i>	Yes/No
<b>5.0</b>	<b>SIGNALLING REQUIREMENTS:</b>	
§5.1	<u>Signalling Types:</u>	
(3)	Decadic signaling disabled or suitable warning provided; <i>Limit: compliant (YES or NO)</i>	
(4)	On-hook signalling should not be possible; <i>Limit: compliant (YES or NO)</i>	Yes/No Yes/No
§5.2	<u>Transmission of DTMF signalling:</u>	
§5.2.1	DTMF Frequencies;	
(1) (2)	The Low Group frequencies shall be as follows (line current 80 mA);	
	697 Hz:	.....Hz
	770 Hz:	.....Hz
	852 Hz:	.....Hz
	941 Hz:	.....Hz
	<i>Limit: ± 1.5 %</i>	
	The High Group frequencies shall be as follows (line current 80 mA);	
	1209 Hz:	.....Hz
	1336 Hz:	.....Hz
	1477 Hz:	.....Hz
	1633 Hz:	.....Hz
	<i>Limit: ± 1.5 %</i>	
	The Low Group frequencies shall be as follows (line current 20 mA);	
	697 Hz:	.....Hz
	770 Hz:	.....Hz
	852 Hz:	.....Hz
	941 Hz:	.....Hz
	<i>Limit: ± 1.5 %</i>	
	The High Group frequencies shall be as follows (line current 20 mA);	
	1209 Hz:	.....Hz
	1336 Hz:	.....Hz
	1477 Hz:	.....Hz
	1633 Hz:	.....Hz
	<i>Limit: ± 1.5 %</i>	
(3)	10 numeric digits plus '*' and '#' symbols shall be supported; <i>Limit: complies (YES or NO)</i>	Yes/No
§5.2.2	DTMF signalling requirements;	
(1)	DTMF requirements shall comply in the current range of 20mA to full current; <i>Limit: complies (YES or NO)</i>	Yes/No
2(a)	Return Loss during signalling shall comply with §4.5.8; <i>Limit: not less than 5 dB</i>	.....dB

2(b)	DTMF power level (detailed test results to be attached); <i>-13dBm ≤ Limit: ≤ -4dBm</i>	
2(d)	DTMF pre-emphasis (detailed test results to be attached); <i>1 dB ≤ Limit: ≤ 3 dB</i>	
2(e)	DTMF intermodulation (detailed test results to be attached); <i>Limit: ≥20dB below</i>	
§5.2.3	Signal timing;	
(a)	Minimum tone - ON duration; <i>Limit: 60 milliseconds</i>	.....ms
	Minimum interdigital pause; <i>Limit: 60 milliseconds</i>	.....ms
§5.2.4	Series connected equipment;	
(1)	Harmonic distortion of DTMF signals introduced by series connected device; <i>Limit: ≤ 5%</i>	.....%
(2)	DTMF Signalling facility for series conne- cted terminating devices shall comply with §5.2.1 to §5.2.3; <i>Limit: complies (YES or NO)</i>	Yes/No
§5.2.5	Speech circuit suppression during DTMF keying; <i>Limit: ≥ 30 dB</i>	.....dB
§5.3	<u>DTMF Receivers:</u>	
(1a)	DTMF receiver signal level range; Minimum level: <i>Limit: ≤ -30dBm</i>	.....dB
	Maximum level: <i>Limit: ≥ -5dBm</i>	.....dB
(1b)	DTMF receiver frequency tolerance; <i>Limit: ± 3 % of nominal (Yes/No)</i>	Yes/No
(2)	DTMF receiver timing recognition; <i>Limit: at least 40 ms (Yes/No)</i>	Yes/No
§5.5	<u>Automatic Dialling Devices:</u>	
§5.5.1	General requirements	
(1)	Automatic dialling feature without pre- recorded message. Shall only be activated manually; <i>Limit: complies (YES/NO)</i>	Yes/No
(2a)	No more than 10 calls to same number for each manual operation; <i>Limit: complies (YES/NO)</i>	Yes/No

(2b)	No less than 30 secs between call attempts; <i>Limit: complies (YES/NO)</i>	Yes/No
(3)	Warning notice prohibiting automatic voice calls to '111'; <i>Limit: complies (YES/NO)</i>	Yes/No
(4)	Facility provided to reprogramme called numbers; <i>Limit: complies (YES/NO)</i>	Yes/No
§5.5.2	Caller display equipment;	
(5)	Adjunct caller display unit without associated keypad;	
(a)	Is digit "0" inserted on numbers of 8-9 digits received from the network?	Yes/No
(b)	Are no digits inserted on numbers of 7 digits or less?	Yes/No
§5.5.4	Manual insertion of digits;	
(2)	Warning notice for adjunct automatic dialling unit which requires associated telephone for inserting dialling prefixes; <i>Provided: Yes/No</i>	Yes/No
§5.5.5	User Instructions;	
(1)	Are clear user instructions provided?	Yes/No
(3)	Do user instructions explain:-	Yes/No
(a)	Dialling procedures adequately?	Yes/No
(b)	Impact of "non-code access"?	Yes/No
(4)	Warning notice about local call charges; <i>Provided: Yes/No</i>	Yes/No
§5.6	<u>Keypad layout:</u>	
§5.6.1	International standard layout;	Yes/No
(1) - (3)	<i>Complies? Yes/No</i> If 'No', state details of layout	
<b>6.0</b>	<b>DC CHARACTERISTICS:</b>	
§6.2	<u>Function of D.C. line feed:</u>	
(3)(4)	Is the device polarity dependent? <i>Limit: Yes/No</i>	Yes/No
§6.3	<u>OFF-Hook d.c. line characteristics:</u>	
(1)	The d.c. Voltage at various currents shall not exceed the upper mask;	
	d.c Voltage at 15 mA	.....V
	<i>Limit: ≤ 9V</i>	
	d.c Voltage at 20 mA	.....V
	<i>Limit: ≤ 9V</i>	
	d.c Voltage at 45 mA	.....V
	<i>Limit: ≤ 20V</i>	
	d.c Voltage at max current	.....V

(2)	Is the d.c. Voltage at any current below the lower mask? <i>Limit: Yes/No</i>	Yes/No
(3)	If the answer to the above is YES, is the hand-over warning notice provided? <i>Limit: Yes/No</i>	Yes/No
(4)	All devices shall fully operate down to 20 mA; <i>Limit: Yes/No</i>	Yes/No
§6.4	<u>Supervisory conditions:</u>	
(1)	Line seizure should be initiated by going OFF- Hook and drawing d.c. current;  <i>Complies? (Yes or No)</i>	Yes/No
(2)	Ring trip shall be initiated upon answering an incoming call by going OFF-Hook and drawing d.c. current; <i>Complies? (Yes or No)</i>	Yes/No
(3)	Call release shall be initiated by going ON-Hook and breaking the line current; <i>Complies? (Yes or No)</i>	Yes/No
(5)	Does the device comply with the mandatory requirements of §6.3? <i>Complies? (Yes or No)</i>	Yes/No
(6)	In case of power failure of locally powered CPE, the call shall be released;  <i>Limit: ≤ 5 sec.</i>	.....sec
§6.5	<u>Hold condition:</u>	
(1a,b)	What type of Hold facility-in-use indicator is provided? <i>Limit: comment required</i>	
(c)	Hold condition time-out; <i>Limit: ≤ 3 min.</i>	.....min
(2)	Hold current on 24V/400Ω feed; <i>Limit: ≥ 15mA</i>	.....mA
(3)	Hold release shall occur within 500 ms under the following conditions;	
(a)	- 450Ω resistive shunt <i>Complies? (Yes or No)</i>	Yes/No
(b)	- Another device connected; <i>Complies? (Yes or No)</i>	Yes/No
(c)	- Disconnection of line current source; <i>Complies? (Yes or No)</i>	Yes/No
(5)	On series-connected auto-dialling devices, handover to associated device shall occur within 1 sec of last digit sent; <i>Limit: ≤ 1000 ms.</i>	.....ms

§6.6	<u>Line breaks:</u> The duration of any undefined line break; <i>Limit: <math>\leq 9\text{ ms}</math></i>	.....ms
§6.7	<u>ON-Hook line current:</u> (2) The total ON- Hook d.c. current drawn by the device from the line; <i>Limit: <math>\leq 120\ \mu\text{A}</math>.</i>	..... $\mu\text{A}$
§6.8	<u>Recall &amp; Call Waiting:</u> (2) Is separate Call Waiting key provided? If 'Yes' , what is length of break when invoked? <i><math>300 \leq \text{Limit} \leq 800\text{ ms}</math></i>	Yes/No .....ms
	(3) The Timed Break Recall (TBR) invoked; <i><math>300 \leq \text{Limit} \leq 800\text{ ms}</math></i>	.....ms
	(5) Is the warning notice regarding TBR and/or Call Waiting provided, if less than 500 ms?	Yes/No/NA
§6.9	<u>Series connected equipment:</u>	
§6.9.1	D.C. line characteristics of series CPE;	
	(1) Port -to-port voltage drop via each leg; <i>Limit: <math>\leq 3\text{ V at } 0 - 30\text{mA}</math></i> <i>Limit: <math>\leq 6\text{ V at } 100\text{ mA}</math></i>	.....V .....V
	(2) The line current measured at the line port during ringing with 50V/400 $\Omega$ connected to the line port and 5 $\mu\text{F}$ /1800 $\Omega$ connected to the terminal equipment port; <i>Limit: <math>\leq 5\text{ mA}</math></i>	.....mA
	(3) Is each terminal port on multi-port device compliant with §6.9.1(1,2)? <i>Yes/No/NA</i>	Yes/No/NA
	(4) In conjunction with any other terminating CPE, is the series connected device compliant with §6.3 to §6.8? <i>Yes/No/NA</i>	Yes/No/NA
§6.9.4	Is line grabbing function provided? If so;	Yes/No
(1)	(a) How long is clear signal applied before initiating next call? <i>Limit: <math>\geq 2\text{ sec}</math></i>	.....sec
	(b) Does equipment comply with §8.1.2(1)?	Yes/No
	(2)(3) Is warning notice in User Instructions?	Yes/No
§6.10	<u>D.C. line feed to other devices:</u>	
	(1) All ports of a device, for series connected CPE, shall provide d.c. line feed;	Yes/No/NA

(3)	Any restrictions on the loop resistance for series connected device in order to establish OFF-Hook condition;	Yes/No/NA
(4)	Ripple components psophometric limit for series connected port; <i>Limit: <math>\leq 2mV</math></i>	.....mV
(5a)	OFF-Hook d.c. feed current, for series connected port and load of 10K $\Omega$ ; <i>Limit: <math>\geq 15 mA</math></i>	.....mA
(5b)	ON-Hook d.c. feed current, for series connected port and load of 10K $\Omega$ ; <i>Limit: <math>\leq 5 mA</math></i>	.....mA
(6a)	Is the series connected port capable of supplying continuous ON-Hook d.c. current for CPE with memory functions?  If 'Yes', is current in excess of 150 $\mu A$ ? <i>Limit: <math>\geq 150 \mu A</math></i>	Yes/No/NA  ..... $\mu A$
(6b)	If the answer to §(6.a) is 'No', then the warning note, regarding a potential memory loss shall be provided; <i>Complies: Yes/ No/N/A</i>	Yes/No/NA
(7)	If answer to §(6a) is 'Yes', indicate how many devices this port can cater for, also allowing for limitation of clause 7.7.2;	.....
§6.11	<u>Fail-safe requirements:</u>	
§6.11.1	All customer equipment;	
(1a,b)	On restoration of a.c. mains from power failure, the device shall maintain an ON-Hook state; <i>Complies Yes/No</i>	Yes/No
(2a,b)	A failure of a battery powered CPE shall be prevented from harming Telecom Network in any way; <i>Complies Yes/No</i>	Yes/No
(3)	Warning notice required if telephony function lost under power fail conditions;  <i>Complies Yes/No</i>	Yes/No
§6.11.2	Series connected device - additional;	
(1)	The basic telephony service shall be maintained when serial device fails; <i>Complies Yes/No</i>	Yes/No
(2a)	For multi-port devices, at least one port of a serial device shall be connected to line if power fails; <i>Complies Yes/No</i>	Yes/No
(2b)	In case of operational failure, a multi-port device shall revert to a predetermined state with details in the user manual; <i>Complies Yes/No</i>	Yes/No

(3b)	In case of operational failure on a single-port device, details of any failsafe connection arrangements shall be stated in the user manual; <i>Complies Yes/No</i>	Yes/No
§6.12	<u>PABX call waiting:</u> PABXs providing 100 V d.c. signal for call waiting shall comply with the requirements of Specification PTC101; <i>Complies: Yes/No</i>	Yes/No
<b>7.0</b>	<b>RINGING:</b>	
§7.1	<u>General:</u>	
(4)	Is the device Equipped with Type1, Type2 or both decoder functions?  <i>Specify or N/A</i>	Type 1..... Type 2..... N/A.....
§7.2	<u>Stand-alone ringers and alerting devices:</u>	
(3a)	The stand-alone ringer for interior use shall be capable of BT-plug connection; <i>Complies: Yes/No</i>	Yes/No
(3d)	If fitted with integral capacitor, is BT plug wired across pins 2 & 5. If Shunt wire used, plug shall be wired to pins 2 & 4; <i>Complies: Yes/No</i>	Yes/No
§7.3	<u>Externally mounted devices:</u>	
	All new equipment mounted externally shall incorporate the following;	
(a)	2-wire connection with a capacitor of value not greater than 1uF; <i>Complies: Yes/No</i>	Yes/No
(b)	Screw or IDC terminals; <i>Complies: Yes/No</i>	Yes/No
(c)	Weather resistant cable access; <i>Complies: Yes/No</i>	Yes/No
§7.4	<u>Audible characteristics:</u>	
(1)	The sound level of the audible sounder 1 m away from the ringer source; <i>Limit: ≥ 50 dBA</i>	.....dBA
§7.5	<u>Ringer sensitivity and loading:</u>	
§7.5.1	General operation of the ringer;	
(2)	Is the sensitivity and loading (clauses 7.5.2 & 7.5.3) satisfactory for all four cadences, DA1-4?; If 'No' is this indicated by a warning notice in the User Instructions?	Yes/No  Yes/No

(3)	The DA1-4 cadence decoding duration from the moment the ringing is applied; <i>Limit: <math>\leq 3</math> sec.</i>	.....secs
(4)	The compliance to ringing cadence ON period; <i><math>360\text{ ms} \leq \text{Limit} \leq 440\text{ ms}</math></i>	.....ms
(4i)	Is the ringer compatible with 20% ringing signal deviation (320 to 480 ms)? <i>Yes/No/N/A</i>	Yes/No/NA
(4ii)	Is the ringer compatible with 30% ringing signal deviation (280 to 520 ms)? <i>Yes/No/N/A</i>	Yes/No/NA
§7.5.2	Ringer sensitivity;	
(1)	Ringer sensitivity (RS) for 2/3 wire CPE; <i>Limit: <math>0 \leq RS \leq 5</math></i>	RS = .....
(2)	Ringer minimum operate voltage; <i>Limit: <math>\geq 30\text{ V}_{p-p}</math></i>	..... $V_{p-p}$
(3)	Does ringer respond to ringing of 40 ms duration? If 'Yes', is there a warning notice in the User Instructions?	Yes/No Yes/No
(4)	Is there 'bell tinkle' from parallel connected device? If 'Yes', is there a warning notice in the User Instructions?	Yes/No Yes/No
§7.5.3	Ringer loading;	
	Ringer loading (RL) for 2/3 wire CPE; <i>Limit: <math>0 \leq RL \leq 5</math></i>	RL = .....
§7.6	<u>Ring number (RN) for 2/3 wire CPE;</u>	
(1)(2)	Ring number (RN) shall be the highest value of RS or RL as in §7.5.2 or §7.5.3; <i>Limit: <math>0.5 \leq RN \leq 5</math></i>	RN = .....
(3)	Is the device intended for stand-alone connection and not in parallel with other CPE? <i>Yes/No</i> If 'Yes', is statement in User Instructions?	Yes/No Yes/No
§7.7	<u>Series connected devices;</u>	
§7.7.1	General requirements (as for §7.5.1);	

§7.7.2	Series connected device without a terminating facility;	
(3)	Ringing Load ( $L_{RN}$ ) supported at terminal equipment port; <i>Limit: <math>\geq 4</math></i>	$L_{RN} = \dots\dots$
	Ringer loading (RL) of the device itself; (derived from $RL = 5 - L_{RN}$ ) <i>Limit: <math>0 \leq RL \leq 5</math></i>	$RL = \dots\dots$
(4)	For series connected, non-terminating device not responding to ringing, then $RN = RL$ ;	$RN = \dots\dots$
(5a)	Series connected, non-terminating device which <u>does</u> respond to ringing but has its terminal ports <u>disconnected</u> during the first ringing cadence, RS and RN to be assessed as in §7.5.2 & §7.6:	$RS = \dots\dots$ $RN = \dots\dots$
(5b)	Series connected, non-terminating device which <u>is</u> responding to ringing but has its terminal ports <u>connected</u> during the first ringing cadence, shall be tested for RS and RN: <i>Limit: <math>0 \leq RS \leq 5</math></i> <i>Limit: <math>0.5 \leq RN \leq 5</math></i>	$RS = \dots\dots$ $RN = \dots\dots$
§7.7.3	Series connected devices with terminating facility (eg. answering a call) shall comply with §7.5 & §7.6; <i>Complies Yes/No/NA</i>	Yes/No/NA
§7.7.4	Terminal Equipment (Extension) Ports:	
(1)	Series connected device shall not connect ringing to an extension port when the port is in OFF-Hook state; <i>Complies Yes/No/NA</i>	Yes/No/NA
(2)	Series connected device extending the call to an extension port via 4-wire path, shall reproduce PSTN ringing cadence within $\pm 5\%$ in timing distortion; <i>Complies Yes/No/NA</i>	Yes/No/NA
(3)	Terminal ports shall support ringing for 2 & 3 wire CPE; <i>Complies Yes/No/NA</i>	Yes/No/NA
§7.7.5	Locally generated ringing;	
(a)	The ringing supply shall comply with electrical safety requirements of AS/NZS 3260; <i>Complies Yes/No/NA</i>	Yes/No/NA
(b)	The ringing voltage and duration shall comply with the requirements of AS/NZS 3260; <i>Complies Yes/No/NA</i>	Yes/No/NA
(c)	The ringing supply extended to a port shall be connected to one wire with the second wire serving as a ring return path; <i>Complies Yes/No/NA</i>	Yes/No/NA
(d)	Ringing supply frequency <i>Limit: <math>25 \pm 1</math> Hz</i>	$\dots\dots$ Hz

(e) & (f)	Is 'crest factor' between 1.2 and 1.6?  If 'No', then warning notice required in User Instructions; <i>Complies Yes/No/NA</i>	Yes/No  Yes/No/NA
(g)	Maximum ringing load (RN)	.....RN
(h)	With twice the value of RN determined in (g), in parallel with a 10KΩ resistor and connected in parallel with the device, does it cause ring trip? <i>Complies Yes/No</i>	Yes/No
(l) & (j)	Ringing cadence should preferably comply with the requirements of TNA 102, clause 6.4 with a tolerance of ± 10%; If 'No', then warning notice required in User Instructions; <i>Complies Yes/No/NA</i>	Yes/No Yes/No/NA
<b>8.0</b>	<b>AUTOMATIC CALL SET-UP, ANS. &amp; RECORDING FUNCTIONS</b>	
§8.1	<u>Automatic Call Set-up &amp; Repeat Calls</u>	
§8.1.2	Call Initiation:	
(1)	Equipment designed for automatic calling shall either;	
(a)	Detect dial tone;	Yes/No
(b)	Introduce delay before commencement of dialling; <i>1 sec ≤ Limit ≤ 7 secs</i>	.....secs
(2)	Equipment shall only go off-hook automatically for call attempt or;	
(a)(b)	On no more than two occasions for 1-5 secs each, and only within 30 min period following call or call attempt; <i>Complies Yes/No</i>	Yes/No
§8.1.3	Automatic Re-attempts to Same Number:	
(1a&b)	No more than 10 attempts with at least 30 secs between each attempt; <i>Complies Yes/No</i>	Yes/No
(2)	If requirements of (1) above are determined by other device (e.g. PC), warning notice required in User Manual; <i>Complies Yes/No/NA</i>	Yes/No/NA
§8.1.4	Automatic Calls to Different Numbers:	
(1)	Equipment programmed to call different numbers shall go on-hook for minimum of 2 secs between calls; <i>Complies Yes/No/NA</i>	Yes/No/NA
(2)	If requirements of (1) above are determined by other device (e.g. PC), warning notice required in User Manual; <i>Complies Yes/No/NA</i>	Yes/No/NA

§8.1.5	Termination of Failed Call Attempts:	
(1)	If not answered in 90 secs, equipment shall terminate call; <i>Complies Yes/No</i>	Yes/No
§8.1.6	Call Identification Phase:	
(1a&b)	Recorded message shall identify caller and be repeated at least once; <i>Complies Yes/No</i>	Yes/No
(2)	Audio monitor provided;	Yes/No
(3)	If fax machine, provision of CNG tone is mandatory;	Yes/No/NA
§8.1.7	User Instructions:	
(a)(b)	Warning notice(s) required to indicate that device shall not be set-up to become a nuisance to other customers and/or automatically call '111' Emergency Service; <i>Complies Yes/No</i>	Yes/No
§8.1.8	Call Logging:	
(a)(b)	Devices with logging facilities shall either log all calls initiated or include warning notice that log may not agree with Telecom account; <i>Complies Yes/No/NA</i>	Yes/No/NA
§8.2	<u>Automatic Answering Equipment</u>	
§8.2.1	Call Answering;	
(1)(b)	Incoming calls shall be answered within 3 - 30 secs for all DA's;  $3sec \leq Limit \leq 30\ secs$	DA1.....secs DA2.....secs DA3.....secs DA4.....secs
(c)	In all cases where requirements of (b) are not met, detailed reasons shall be supplied;	
(2)	If requirements of (1) above are determined by other device (e.g. PC), warning notice required in User Manual; <i>Complies Yes/No/NA</i>	Yes/No/NA
§8.2.2	Voice Announcements & Recognition Tones:	
(1)	Voice announcement or tone provided within 5 secs of answering call; <i>Complies Yes/No</i>	Yes/No
(3)	If device automatically switches call, voice announcement to be provided, and ring tone must be distinctively different to Telecom ring tone; <i>Complies Yes/No/NA</i>	Yes/No/NA

§8.4	<u>Call Release</u>	
(1)	Equipment capable of initiating or answering calls shall release such calls as follows:	
(a)	Within 60 secs of carrier failure or lack of activity; <i>Limit ≤ 60 secs</i>	.....secs
(b)	Within 15 secs of completion of intended function; <i>Limit ≤ 15 secs</i>	.....secs
(c)	Within 5 secs of power supply failure <i>Limit ≤ 5 secs</i>	.....secs
(3)	If device automatically switches call after answering, call shall be released if extension not off-hook within 60 secs of call being initially answered; <i>Limit ≤ 60 secs</i>	.....secs
(4)	Automatic answering devices with no supervisory capability shall release within 2 mins of going off-hook; <i>Complies Yes/No/NA</i>	Yes/No/NA
§8.5	<u>Recording Functions</u>	
(3)	Warning notice about legal requirements for recording devices shall be provided in User Instructions <i>Complies Yes/No</i>	Yes/No
<b>9.0</b>	<b>BILLING SECURITY</b>	
§9.1	<u>Cordless Devices:</u>	
(2)	Security process shall be provided; <i>Complies Yes/No</i>	Yes/No
§9.2	<u>Security Codes for Cordless Devices:</u>	
(1)	Manufacturers assurances that security codes provided between handset and base. <i>Complies Yes/No</i>	Yes/No
(a)	There shall be a minimum of 8000 codes available;	No. of codes .....
(b)	Number of codes available to device to be stated in User Instructions; <i>Complies Yes/No</i>	Yes/No
(c)	Description of how security codes allocated shall be supplied, and written assurance that allocation results in random spread of codes over units to be marketed; <i>Complies Yes/No</i>	Yes/No
(d)	If security code 'lost', is reallocation truly random? <i>Complies Yes/No</i>	Yes/No
(e)	Description provided on how codes are transferred between portable and base to ensure security <i>Complies Yes/No</i>	Yes/No

(g)	On originated calls, security code shall be automatically transmitted by portable, and base only seizes line after code received; <i>Complies Yes/No</i>	Yes/No
<b>10.0</b>	<b>NETWORK CONNECTION</b>	
§10.2	<u>Connection Methods:</u>	
(6)	Connection method compliant with 10.2(1) - (5) <i>Complies Yes/No</i>	Yes/No
§10.3	<u>Series Connected Devices:</u>	
§10.3.1 (1)	Line Grabbing Connections; Line grabbing devices shall be supplied with detailed instructions of connection: <i>Complies Yes/No</i>	Yes/No
§10.3.2 (2)	Handover; Any break in d.c. loop during handover to another device shall not exceed 9 ms;	.....ms
(3)	Device shall comply with either (a) or (b);	
§10.3.3 (2)	Fault Clearance; If device is likely to use secondary fixed wiring on the terminal equipment side, a warning notice on fault procedure shall be included in the User Instructions; <i>Complies Yes/No/NA</i>	Yes/No/NA
§10.4	<u>Connection Method for Externally Mounted Devices:</u> Devices designed for external use shall:-	
(1)	Not be plug connected; <i>Complies Yes/No/NA</i>	Yes/No/NA
(3)	Have terminals suitable for connection of heavier weather resistant cable; <i>Complies Yes/No/NA</i>	Yes/No/NA
<b>11.0</b>	<b>SUPPLEMENTARY SERVICES &amp; SPECIAL FEATURES</b>	
§11.1	<u>Analogue Calling Line Identification (CLI) Equipment:</u>	
§11.1.2	On-hook Impedance;	
(1)	If on-hook impedance is changed from that required by §4.5.2 during reception of data, the following shall apply:-	
(a)	Impedance shall be restored to that required by §4.5.2 for the second ringing cadence; <i>Complies Yes/No</i>	Yes/No

(b)	If coded ringing is used, unit shall decode the ringing to determine when the impedance should be applied and removed; <i>Complies Yes/No</i>	Yes/No
(2)	At all times other than that covered by (1) above, the impedance shall be as stated in §4.5.2; <i>Complies Yes/No</i>	Yes/No
§11.1.3	Ringing;	
(3)	On-hook data transmission receivers shall be compatible with the requirements of Section 7; <i>Complies Yes/No</i>	Yes/No
§11.1.4	Data Capture;	
(1)	On-hook data transmission receivers shall be capable of receiving data in the format described in Technical Document TNA 102, Section 10, in both SDMF & MDMF message formats; <i>Complies Yes/No</i>	Yes/No
(2)	If receiver is not capable of receiving data during all four DA codes, a warning notice shall be included clearly stating which DA codes device is compatible with; <i>Complies Yes/No</i>	Yes/No
(3)	Receivers shall perform satisfactorily over zero, 3 km and 6 km artificial lines. In each case, test shall be carried out with and without a ringer built out to RN of 5, and ringer shall remain operational for all tests. <i>Complies Yes/No</i>	Yes/No
(4)	Receivers shall perform satisfactorily on a 6km line in parallel with an RN of 5, with time between ringing and CSS = 60ms <i>Complies Yes/No</i>	Yes/No
(5)	All on-hook data messages containing corrupted data shall be discarded; <i>Complies Yes/No</i>	Yes/No
§11.1.6	Data Display;	
(2)	Where the display does not correspond exactly with the number to be called back, the need to insert prefix(es) for manual dialling shall be explained in the User Instructions (ref §5.6.5); <i>Complies Yes/No</i>	Yes/No

§11.1.7	Data Storage;		
(3)	If data storage is incorporated, the CLI device shall discard any corrupted data; <i>Complies Yes/No</i>	Yes/No	
§11.1.8	Dial Back Considerations;		
(2)	Display units with no dial back facility shall be provided with clear instructions to users such that wrong numbers are minimised. This particularly applies to units which do not display precisely the digits to be dialled; <i>Complies Yes/No</i>	Yes/No	
<b>12.0</b>	<b>PHYSICAL CONSTRUCTION &amp; MODIFICATIONS</b>		
§12.2	Switches & Connectors; All connectors, switches, keys, relays, etc, shall function reliably & positively at all times; <i>Complies Yes/No</i>	Yes/No	
§12.3	Modifications;		
(1)	Full details of all modifications carried out by applicant prior to testing shall be supplied to the Testing Laboratory and furnished with the application; <i>Complies Yes/No</i>	Yes/No	
(2) (3)	Full details of all modifications carried out in association with the Testing Laboratory to achieve compliance shall be recorded as part of the Test Report; <i>Complies Yes/No</i>	Yes/No	
§12.4	Photographs;		
(a)	Detailed colour photographs shall be supplied with each application: Photographs should preferably be taken by the Testing Laboratory and included as part of the Test Report, or; <i>Complies Yes/No</i>	Yes/No	
(b)	If supplied by the applicant, photographs shall be verified by the Testing Laboratory; <i>Complies Yes/No</i>	Yes/No	
<b>13.0</b>	<b>USER DOCUMENTATION</b>		
§13.2			
(1)	Installation Instructions	Yes/No	
(2)	Operating Instructions	Yes/No	
(3)	Special Conditions All applicable warnings to be listed	List of warnings	