

COMMUNICATIONS ALLIANCE LTD



AUSTRALIAN STANDARD

AS/CA S002:2010

Analogue interworking and non-interference
requirements for Customer Equipment for
connection to the Public Switched Telephone
Network

Australian Standard – Analogue interworking and non-interference requirements for Customer Equipment for connection to the Public Switched Telephone Network

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FOREWORD

General

This Standard was prepared by the CECRP/WC5 : *General Standards for Customer Equipment* Working Committee and most recently revised by the WC23 : *PSTN Customer Equipment Revision* Working Committee. It is one of a series of Telecommunication Standards developed under the Memorandum of Understanding between the Australian Communications Authority (ACA) and the Australian Communications Industry Forum.

Note: On 1 July 2005 the ACA became the Australian Communications and Media Authority (ACMA) and the Memorandum of Understanding continues in effect as if the reference to the ACA were a reference to ACMA.

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This Standard is a revision of the AS/ACIF S002:2005 *Analogue interworking and non-interference requirements for Customer Equipment for connection to the Public Switched Telephone Network*.

This Standard is the result of a consensus among representatives on the Communications Alliance Working Committee to produce it as an Australian Standard.

The requirements in this Standard are consistent with the aims of s376 of the *Telecommunications Act 1997*. Specifically these aims are—

- (a) protecting the integrity of a telecommunications network or facility;
- (b) protecting the health and safety of persons;
- (c) ensuring access to emergency services; and
- (d) ensuring interoperability with a standard telephone service.

It should be noted that some Customer Equipment (CE) may also need to comply with requirements in other Standards.

Applicable electrical safety Standards, EMC and EMR Standards may apply under Commonwealth or State/Territory laws, or both.

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The Project Manager
Customer Equipment and Cable Reference Panel
Communications Alliance
PO Box 444
Milsons Point NSW 1565

Regulatory notice

This document will be submitted to the ACMA, for making as a technical standard under s376 of the *Telecommunications Act 1997*. Until it is made by the ACMA compliance with this Standard is voluntary.

The Standard as made by the ACMA will commence on the day after it registered under the *Legislative Instruments Act 2003* (LIA) and it will be a disallowable instrument within the meaning of s46A of the *Acts Interpretation Act 1901*.

The ACMA is a Commonwealth authority with statutory powers to impose requirements concerning telecommunications Customer Equipment and Customer Cabling.

The ACMA requires Australian manufacturers and importers, or their Australian agents, of specified items of Customer Equipment and Customer Cabling to establish compliance with Standards such as this. Items are required to be labelled in accordance with the applicable labelling notices.

Details on current compliance arrangements can be obtained from the ACMA website at <http://www.acma.gov.au> or by contacting the ACMA below at:

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Introduction

This introduction for the AS/ACIF S002:2010 **Analogue interworking and non-interference requirements for Customer Equipment for connection to the Public Switched Telephone Network** Standard is not an authoritative section of this Standard and is only provided as guidance for the user of the Standard to outline its objectives and the factors that have been taken into account in its development and to list the principal differences between the new and the previous edition.

The reader is directed to the clauses of this Standard for the specific requirements and to the Australian Communications and Media Authority (ACMA) for the applicable telecommunications labelling and compliance arrangements.

Note: Further information on the telecommunications labelling and compliance arrangements can be found in *The Telecommunications Labelling (Customer Equipment and Customer Cabling) Notice* (the TLN). The TLN can be obtained from the Australian Communications and Media Authority (ACMA) website at www.acma.gov.au.

The objective of this Standard is to provide the requirements and test methods for customer equipment (CE) and in the case of compound CE the parts of the compound CE that are designed or intended for connection to an analogue PSTN two-wire service in order to meet the regulatory arrangements for such equipment in Australia.

The objective of this revision is to bring the Standard into alignment with other Customer Equipment Standards and with the services provided on Australian telecommunications networks.

The principal differences between this edition of AS/ACIF S002 and the previous edition are:

- (a) the references to other Standards have been updated.
- (b) a new recommendation has been added for keypad locks (Clause 5.1.8.5).
- (c) the table in Appendix A specifying PSTN service tone characteristics has been updated in line with technology changes.
- (d) the frequency range over which the voltage is specified for insertion loss has been reduced to 15.3 to 50 Hz (Clause 5.2.3.3.).
- (e) the 50 Hz meter signal detection requirements (Clause 5.5.1.3) and associated test methods have been removed.
- (f) the Loop-in PSTN line requirements (the former Clause 5.5.2 in the 2005 edition) and associated test methods have been removed.
- (g) the upper frequency limit of the Power Spectral Density mask has been extended to 30.175 MHz to align with other Customer Equipment Standards to cater for VDSL2 services (Clause 5.4.2.4).
- (h) new longitudinal power level requirements (Clause 5.4.6) and associated test methods have been added, now aligning with other Customer Equipment Standards.

- (i) a clarification to Clause 5.5.1.8 has been added noting that the implementation of decadic signalling in CE is not recommended; and
- (j) the Multifrequency Code (MFC) signalling scheme and transmission criteria have been removed (the former Appendix A in the 2005 edition).

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1 INTERPRETATIVE GUIDELINES

1.1 Categories of requirements

This Standard contains mandatory requirements as well as provisions that are recommendatory only. Mandatory requirements are designated by the words '**shall**' or '**shall not**'.

Clauses referring to STS CE identify requirements that are mandatory only for Customer Equipment (CE) interfaced to a Standard Telephone Service (STS) as defined by the *Telecommunications (Consumer Protection and Service Standards) Act 1999*.

All other provisions are voluntary.

1.2 Compliance statements

Compliance statements, in italics, suggest methodologies for demonstrating CE's compliance with the requirements.

1.3 Definitions, expressions and terms

If there is any conflict between the definitions used in this Standard and the definitions used in the *Telecommunications Act 1997*, the definitions in the Act take precedence.

1.4 Notes

Text denoted as 'Note' is for guidance in interpretation and is shown in smaller size type.

1.5 References

- (a) Applicable editions (or versions) of other documents referred to in this Standard are specified in Section 3: REFERENCES.
- (b) If a document refers to another document, the other document is a sub-referenced document.
- (c) Where the edition (or version) of the sub-referenced document is uniquely identified in the reference document, then that edition (or version) applies.
- (d) Where the edition (or version) of the sub-referenced document is not uniquely identified in the reference document, then the applicable edition (or version) is that which is current at the date the reference document is legislated under the applicable regulatory framework, or for a non-legislated document, the date upon which the document is published by the relevant standards organisation.
- (e) A number in square brackets '[]' refers to a document listed in Section 3: REFERENCES.

- (f) In the event of a discrepancy between this Standard and a referenced or sub-referenced document, this Standard **shall** take precedence.

1.6 Units and symbols

In this Standard the International System (SI) of units and symbols is used in accordance with Australian Standard AS ISO 1000 [1].

2 SCOPE

- 2.1 This Standard specifies the technical requirements for CE and in the case of compound CE the parts of the compound CE that are designed or intended for connection to an analogue PSTN two-wire service.
- 2.2 This Standard does not apply to CE or the parts of compound CE that are designed or intended for connection to a DSL service operating over a shared metallic local loop with an analogue PSTN two-wire service.
- 2.3 CE is not excluded from the scope of this Standard by reason only that it is capable of performing functions additional to those described in this Standard.

Note 1: For the purposes of this scope ADSL modems and filters are examples of CE designed or intended for connection to a DSL service operating over a shared metallic local loop with an analogue PSTN two-wire service.

Note 2: AS/ACIF S041 [8] specifies the technical requirements for ADSL modems and filters.

Note 3: AS/ACIF S040 [7] specifies the technical requirements for CE for use by persons with a disability.

3 REFERENCES

	Publication	Title
Australian Standards		
[1]	AS ISO 1000-1998	The international System of Unit (SI) and its application.
[3]	AS/NZS 3080:2003	Telecommunications installations - Generic cabling for commercial premises (ISO/IEC 11801:2002, MOD)
[3]	AS/NZS 60950.1:2003	Information technology equipment - Safety - General requirements
AS/ACIF and AS/CA Standards		
[4]	AS/CA S003:2010	Requirements for Customer Access Equipment for connection to a Telecommunications Network
[5]	AS/ACIF S004:2008	Voice frequency performance requirements for Customer Equipment
[6]	AS/CA S008:2010	Requirements for customer cabling products
[7]	AS/ACIF S040:2001	Requirements for general use Customer Equipment for use with the Standard Telephone Service— Features for special needs of persons with disabilities
[8]	AS/ACIF S041:2009	Requirements for DSL Customer Equipment for connection to the Public Switched Telephone Network
ANSI Standards		
[9]	ANSI/TIA-968-A-2002	Telephone Terminal Equipment Technical Requirements for Connection of Terminal Equipment to the Telephone Network
[10]	T1.601:1998	ISDN Basic Access Interface for Use on Metallic Loops for Application at the Network Side of NT, Layer 1 Specification
IEC Standard		
[11]	IEC 60603-7 Ed 3.0 (2008-07)	Connectors for electronic equipment - Part 7: Detail specification for 8-way, unshielded, free and fixed connectors

	Publication	Title
	ITU-T and CCITT Recommendations	
[12]	Annex to ITU Operational Bulletin Nr. 781 – 1.II.2003	Various tones used in national networks (According to ITU-T Recommendation E.180)(03/1998)
[13]	E.161 (02/2001)	Arrangement of digits, letters and symbols on telephones and other devices that can be used for gaining access to a telephone network
[14]	E.164 (02/2005)	The international public telecommunication numbering plan
[15]	G.122 (03/1993)	Influence of national systems on stability, talker echo, and listener echo in international connections
[16]	G.223 (11/1988)	Assumptions for the calculation of noise on hypothetical reference circuits for telephony
[17]	O.9 (03/1999)	Measuring arrangements to assess the degree of unbalance about earth
[18]	O.41 (10/1994)	Psophometer for use on telephone-type circuits
[19]	O.71 (11/1988)	Impulsive noise measuring equipment for telephone-type circuits
[20]	Q.23 (11/1988)	Technical features of push-button telephone sets
[21]	V.18 (11/2000)	Operational and interworking requirements for DCEs operating in the text telephone mode
[22]	V.25 (10/1996)	Automatic answering equipment and/or parallel automatic calling equipment on the general switched telephone network including procedures for disabling of echo control devices for both manually and automatically established calls

4 ABBREVIATIONS AND DEFINITIONS

For the purposes of this Standard, the following abbreviations and definitions apply:

4.1 Abbreviations

AC	Alternating Current
ACA	Australian Communications Authority
ACIF	Australian Communications Industry Forum
ACMA	Australian Communications and Media Authority
ACTE	Automatic Call Transfer Equipment
ADSL	Asymmetric Digital Subscriber Line
AGC	Automatic Gain Control
AS	Australian Standard
CE	Customer Equipment
CLI	Call Line Identification
CSS	Customer Switching System
DC	Direct Current
DSL	Digital Subscriber Line
DTMF	Dual Tone Multifrequency
DUT	Device Under Test
EMC	Electromagnetic Compatibility
ITU-T	International Telecommunications Union – Telecommunications
NU	Number unobtainable
NZS	New Zealand Standard
PCM	Pulse Code Modulation
PE	Protective Earth
PSD	Power Spectral Density
PSTN	Public Switched Telephone Network
REN	Ringer Equivalence Number
RMS	Root Mean Square
RVA	Recorded Voice Announcement
SI	International System
STS	Standard Telephone Service
STS CE	Standard Telephone Service Customer Equipment
TRC	Telecommunications Reference Conductor
TTY	Telephone Typewriter
VF	Voice Frequency
VU	Volume Unit
TN12	Termination Network 12

4.2 Definitions

4.2.1 Automatic call transfer equipment

Equipment associated with two or more exchange lines which, on detecting an incoming call on one exchange line, automatically originates a call, using another line, to a predetermined number.

4.2.2 Carrier

Refer to the *Telecommunications Act 1997*.

4.2.3 Carriage Service Provider

Refer to the *Telecommunications Act 1997*.

4.2.4 Compound CE

For the purposes of this standard Compound CE means CE that is designed and intended for connection to:

- (a) an analogue PSTN Ring-In/Loop Out two wire service; and
- (b) a DSL service that shares the metallic local loop with an analogue PSTN Ring-In/Loop Out two wire service.

4.2.5 Customer Equipment

Refer to the *Telecommunications Act 1997*.

4.2.6 Customer Switching System

A switching system for use on the customer side of the boundary of a Telecommunications Network that can switch voice, digital data, images, video or any other information.

Note 1: A CSS connection is established under user control using some form of access signalling.

Note 2: Examples include, but are not limited to, a PABX or Key system.

4.2.7 Decadic signalling

A system for transmitting address information by a succession of loop-disconnect pulses which momentarily interrupt the established direct current in a PSTN line.

4.2.8 Dialling

The terms 'dials' and 'dialling' refer to the generation of Decadic Pulse or DTMF address information and the transmission of those signals to line by the CE.

4.2.9 DTMF (Dual-tone multifrequency signalling)

A system for transmitting address and other information using dual tone voice frequency signals.

- 4.2.10 Emergency call person
Refer to the *Telecommunications Act 1997*.
- 4.2.11 Facility
Refer to Section 374(2) of the *Telecommunications Act 1997*.
- 4.2.12 Fleeting test reversal
A short duration (40 ms to 200 ms) reversal of line potential that may be applied at any time during outgoing call set-up.
- 4.2.13 Hold state
CE is in the 'hold' state at any time from the completion of seizure state (following the application of a loop) until release (removal of the loop), provided that no other DC signalling activity is occurring.
- 4.2.14 Line Terminating Equipment
Line terminating equipment incorporates circuitry that applies an Online condition to the PSTN line.
- 4.2.15 OFF-LINE
The state of the CE when it has an electrical configuration that enables the current in the basic network loop to be at its minimum steady-state value.
- 4.2.16 ON-LINE
The state of the CE when it has an electrical configuration that enables the current in the basic network loop to be at its maximum steady-state value.
- 4.2.17 Post dialling delay
The delay period between completion of dialling and receipt of a service tone.
- 4.2.18 Public Switched Telephone Network (PSTN)
That part of the Telecommunications Network which enables any customer to establish a connection for voice frequency communication with any other customer either automatically or with operator assistance.

Note: The PSTN has a nominal transmission bandwidth of 3 kHz.
- 4.2.19 Relative level
An indication of the power handling capacity at a particular point of a connection. Relative level is denoted by dBr. The nominal mean absolute power level at a zero relative level point of -15 dBm (or 31.6 μ W) is specified in ITU-T Rec. G.223 [16].

Note: Relative level is not a definition of the level of test tone which should be applied or measured at the point.

- 4.2.20 Ring-in/Loop-out PSTN line
A both-way call set-up line connection with the PSTN. Incoming signalling to CE is by the application of a ring signal at the PSTN exchange. Outgoing signalling from CE is by the application of a DC loop at the CE.
- 4.2.21 Ringer Equivalence Number (REN)
An approximate value of loading presented to the line during the ringing state, and based on the capacitance applied to the line when the CE is OFF-LINE.
- 4.2.22 Seizure state
The initial period after the CE enters the ON-LINE condition.
- 4.2.23 Standard Telephone Service
Refer to Section 6 of the Telecommunications (Consumer Protection and Service Standards) Act 1999.
- 4.2.24 Standard Telephone Service Customer Equipment
Customer Equipment designed or intended to interface with a standard telephone service.
- 4.2.25 Tandem operation
Tandem operation refers to the ability of CE to present an interface modelling a PSTN interface to third party CE (referred to as terminating CE).
- 4.2.26 Telecommunications Network
Refer to Section 374(1) of the *Telecommunications Act 1997*.
- 4.2.27 Telecommunications Reference Conductor (TRC)
A conductor that can be used for signalling and other functional purposes which may include equipment reliability. Integral surge suppression devices within Customer Equipment may be connected to the TRC.
- 4.2.28 Telephone typewriter
Customer Equipment primarily used by people who are deaf or hearing impaired to communicate using text. Also known as TTY or text telephone.
- 4.2.29 Twist
The greatest loss differential between any two frequencies within one of the bands (upper and lower) of a tone signalling scheme.
- 4.2.30 Voice Frequency (VF)
Those frequencies in the range of 300 Hz to 3.4 kHz.

5 REQUIREMENTS

5.1 General

5.1.1 Fail-safe operation

5.1.1.1 CE **shall not** cause harm or damage to a Telecommunications Network or Facility if any of the following events occur:

- (a) Failure of any mechanical or electrical component in the CE.
- (b) Failure of any power supplies resulting in total or partial loss of power to the CE.
- (c) Discharge or partial discharge of any battery supply associated with the CE.
- (d) Incorrect manual operation of the CE.

5.1.1.2 CE should not cause harm or damage to a Telecommunications Network or Facility when CE is operated outside the range of operating voltage and environmental conditions specified by the manufacturer.

5.1.1.3 The power fail mechanism of the CE should cause the CE to revert to the OFF-LINE condition and remain in that condition for the duration of the failure. In addition, the CE may incorporate an automatic line change-over facility as a response to power failure.

5.1.1.4 On restoration of power after a power failure, the CE **shall** remain in the OFF-LINE condition until another call sequence is commenced. This requirement applies following the first 30 seconds after power is restored.

Compliance with Clause 5.1.1 should be checked using the method described in Clause 6.3.

5.1.2 Line polarity

5.1.2.1 The operation of CE **shall** be independent of exchange line conductor polarity.

5.1.2.2 CE **shall** be unaffected by—

- (a) a permanent line reversal; or
- (b) a short term line reversal of 40 to 200 ms;

which occur while the CE is in either the OFF-LINE or the ON-LINE states.

Compliance with Clause 5.1.2 should be checked by applications of polarity reversals.

5.1.3 Transmitted voltages

Voltages transmitted to a Telecommunications Network from CE, in any line condition, are not to exceed the limits for Telecommunications Network Voltages (TNV), as specified in AS/NZS 60950.1 [3].

Note: AS/NZS 60950.1 [3] specifies applicable safety requirements of CE.

5.1.4 Line-powered CE

The current drawn by CE when connected to a source of—

- (a) 100 V d.c.; and
- (b) 50 V d.c.

shall not exceed that which would be drawn by 1 MΩ resistor replacing the CE. This requirement applies 30 seconds after voltage has been applied.

Note: On some carrier network equipment, CSS and other CE, the nominal OFF-LINE feedbridge voltage may be as low as 24 V.

Compliance with Clause 5.1.4 should be checked by using the test circuit of Figure 2 with the CE in the OFF-LINE condition with the battery voltage set as above.

5.1.5 Line connection

CE should terminate on and be supplied with—

- (a) an insulation displacement system frame, internal or external to the CE;
- (b) a cable complying with AS/CA S008 [6] and which is able to be terminated on an insulation displacement system frame;
- (c) a socket on the CE complying with AS/CA S008 [6]; or
- (d) a plug on the end of a line cord, where both the plug and cord comply with the requirements of AS/CA S008 [6] and the plug is one of the following types:
 - (i) Plug Type 605;
 - (ii) Plug Type 606;
 - (iii) ANSI/TIA-968-A-2002 [9] (six-position); or
 - (iv) ANSI/TIA-968-A-2002 [9] (eight-position).

Note 1: The PSTN is normally terminated on one of the following connectors:

- (i) Insulation displacement or solder termination MDF; or
- (ii) Compliant sockets including:
 - a. Socket Type 610.

- b. Socket Type 611.
- c. Socket Type 612.
- d. Miniature 6-position socket as specified in ANSI/TIA 968 A 2002 [9].
- e. Miniature 8-position socket as specified in ANSI/TIA 968 A 2002 [9].

The PSTN allocations for the various socket types are shown in Figure 3.

Note 2: The miniature 8-position socket specified in ANSI/TIA 968 A 2002 [9] is also specified in IEC 60603 7 [11]

Compliance with Clause 5.1.5 should be checked by inspection.

5.1.6 Keypads and dials

5.1.6.1 The requirements of Clause 5.1.6 only apply to CE with a keypad or rotary dial where the keypad or rotary dial has the primary function of dialling for the purposes of call set-up.

5.1.6.2 CE intended for connection to a CSS may have other alpha characters or alphanumeric relationships associated with the keypad digits. Such CE are also exempt from the requirements of Clause 5.1.6 but the CE **shall** carry markings which clearly indicate that the CE may only be connected to the extension or system integral ports of a CSS.

5.1.6.3 The arrangement of numerals (and/or */#, if used), appearing on keypads or rotary dials, **shall** be in accordance with the layouts in ITU-T Rec. E.161 [13].

Table 1 and Table 2 are taken from ITU-T Recommendation E.161 [13] and are the preferred arrangements for keypads.

TABLE 1
Standard ten-pushbuttons keypad arrangement and numbering

1	2	3
4	5	6
7	8	9
	0	

TABLE 2
Standard ten-pushbuttons keypad arrangement and numbering

1	2	3
4	5	6
7	8	9
*	0	#

Note: The '*' and '#' symbols are commonly known as 'star' and 'hash' respectively.

5.1.6.4 Where letters, in addition to numerals, appear on a keypad or rotary dial, or its surround, the Letters and numerals **shall**—

- (a) conform to the associations given in Table 3;
- (b) be unambiguously associated with the relevant keys; and
- (c) have a distinct difference in style between the numeric zero and the letter 'O'.

Note: The inclusion of a slash across numeric zero is optional.

Compliance with Clause 5.1.6 should be checked by inspection.

TABLE 3
Alphanumeric mapping

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

Note: Inclusion of alphabetic characters on keypads/dials is optional.

5.1.7 Insulation resistance of ring-in/loop-out PSTN lines

5.1.7.1 CE in the OFF-LINE state, except as provided for in Clauses 5.1.7.2 and 5.1.7.3, **shall** have an insulation resistance of not less than 1 MΩ between—

- (a) the two line conductors;
- (b) each line conductor and TRC terminal, if equipped; and
- (c) each line conductor and PE terminals, if equipped

when tested with 250 V d.c. of each polarity, in series with a 600 kΩ resistance.

Compliance should be checked by measuring the DC resistance between the line conductors and between each line conductor and the TRC terminal and the power supply protective earth

*termination separately, if provided. Any internal protective devices **shall** remain connected for each test.*

5.1.7.2 CE incorporating a message wait indicator that is intended for connection to a customer switching system are to comply with the requirements of Appendix B.

5.1.7.3 CSS are to comply with the requirements of AS/CA S003 [4].

5.1.8 Emergency services access

5.1.8.1 General

The following requirements apply to CE used to establish connections for voice communication or to establish TTY communication in accordance with ITU-T Recommendation V.18 [21]:

- (a) CE with a dialling capability and used for voice communication **shall** support the dialling of emergency service number '000'.
- (b) CE with a handset and with a dialling capability **shall** support the dialling of emergency service numbers '000' and '106'.
- (c) TTY terminals that can be connected to a Telecommunications Network **shall** support the dialling of emergency service number '106'.
- (d) Data modems that can be used in conjunction with a Data Terminal Equipment to provide the functionality of a TTY terminal **shall** support the dialling of emergency service number '106'.

5.1.8.2 Access barring

CE should not support access barring of emergency service numbers '000' and '106'.

5.1.8.3 Loss of mains power

Mains-powered CE should continue to support the dialling of emergency service numbers for at least 30 minutes following the loss of mains power.

5.1.8.4 Provision of power-fail advice

CE that does not continue to support emergency dialling for at least 30 minutes after loss of mains power, **shall** have an appropriately worded warning notice included in or with the CE documentation. The warning notice should also be placed on the outside surface of the CE's packaging. A suggested wording for the warning notice is as follows:

Warning

This equipment will not operate when mains power fails

Compliance with Clause 5.1.8 should be checked by using the method described in Clause 6.4.

5.1.8.5 Keypad Locks

CE for voice communications incorporating a keypad lock for the purpose of minimizing accidental dialling of the emergency number 000 should be provided with clear instruction for the user, either via electronic display or labelling on the CE to unlock the keypad when required to make an emergency call.

5.2 Classification of CE

5.2.1 General

5.2.1.1 CE intended for connection to the PSTN is classified as one or more of the following types:

- (a) Line terminating equipment.
- (b) Series equipment.
- (c) Bridging equipment.

Note: All CE effectively performs a bridging function when in the OFF-LINE state and is subject to the bridging requirements found in Clause 5.2.4.

5.2.1.2 Line terminating equipment may be used either singularly or in conjunction with series or bridging equipment.

Note: CE may incorporate both series and bridging elements which function alternatively for DC/AC and OFF-LINE/ON-LINE modes.

5.2.2 Line terminating equipment

5.2.2.1 Line terminating equipment incorporates circuitry that applies an Online condition to the PSTN line. CE with this function may be associated with the line as—

- (a) the only line terminating equipment connected to a line, to provide the sole termination of that line; or
- (b) one or more parallel items of line terminating equipment, one or all of which can be used to terminate the line; or
- (c) one of a number of items of line terminating equipment, which can be used alternatively to terminate the line, e.g. for alternative voice/data applications.

5.2.2.2 The following tandem operation requirements apply to CE operating in tandem mode with other STS CE that complies with this Standard:

- (a) If the CE applies ring to the terminating STS CE, then the CE **shall** meet the requirements for Ring signal of Standard analogue telephone Local Port (On Premises and Off Premises) in AS/CA S003 [4].