

**COMMUNICATIONS
ALLIANCE LTD**



AUSTRALIAN STANDARD
AS/CA S041.2:2015

Requirements for DSL Customer Equipment for
connection to the Public Switched Telephone
Network — Part 2: Modems for use in connection
with all DSL services

Australian Standard — Requirements for DSL Customer Equipment for connection to the Public Switched Telephone Network — Part 2: Modems for use in connection with all DSL services

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FOREWORD

General

This Standard was prepared by Communications Alliance and most recently revised by the WC58 : **VDSL2 and Vectoring** 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 the ACMA.

Communications Alliance was formed in 2006 and continues the functions previously fulfilled by ACIF.

This Standard is a revision of AS/ACIF S041:2009 **Requirements for DSL 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 or other Parts of this Standard.

AS/CA S041 consists of the following Parts under the general title **Requirements for DSL Customer Equipment for connection to the Public Switched Telephone Network**:

- Part 1: General
- Part 2: Modems for use in connection with all DSL services
- Part 3: Filters for use in connection with all DSL services

The Standard should be read in conjunction with AS/CA S041.1 [3]

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

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Australian Standards (AS/ACIF and AS/CA Standards) developed by the Communications Alliance are updated according to the needs of the industry, by amendments or revision. Users of these Standards should make sure that they possess the latest amendments or editions. Representations concerning the need for a change to this AS/CA Standard should be addressed to—

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 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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Law Courts PO
Melbourne VIC 8010
Australia

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Email: info@acma.gov.au

Introduction

This introduction for the AS/CA S041.2 **Requirements for DSL Customer Equipment for connection to the Public Switched Telephone Network – Part 2: Modems for use in connection with all DSL services** 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, 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 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 ACMA website at www.acma.gov.au.

The objective of this Standard is to provide the technical requirements and test methods for Customer Equipment (CE), or the parts of CE that are designed or intended for connection to a DSL service that shares the metallic local loop with 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 update to the current template at the same time that revisions were being made to other parts of AS/CA S041.

The principal differences between this edition of AS/CA S041.2 and the previous edition of AS/ACIF S041.2 are:

- (i) Editorial updates.
- (ii) An update to the current document template for Communications Alliance.

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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**'. 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.

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 DSL Modem Customer Equipment (CE), or the DSL Modem parts of the CE that are designed or intended for connection to a DSL service that shares the metallic local loop with an analogue PSTN two-wire service.
- 2.2 This Standard does not apply to CE or the parts of CE designed or intended for connection only to an analogue PSTN two-wire service.
- 2.3 CE that is designed or intended to operate in an all digital mode does not need to meet the requirements of this Standard for that particular mode.

Note: CE which operates in an all digital mode is in relation to a service provided over a metallic local loop not shared with an analogue PSTN service.
- 2.4 CE is not excluded from the scope of this Standard by reason only that it is capable of performing functions additional to those listed in this Standard.

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

Note 2: AS/CA S002 [2] specifies the technical requirements for connection to an analogue PSTN two-wire service.

3 REFERENCES

Publication	Title
Australian Standards	
[1]	AS ISO 1000-1998 The international System of Unit (SI) and its application. http://infostore.saiglobal.com/store/details.aspx?ProductID=341659
AS/CA Standards	
[2]	AS/CA S002:2010 Analogue interworking and non-interference requirements for Customer Equipment for connection to the Public Switched Telephone Network http://commsalliance.com.au/Documents/all/Standards/s002
[3]	AS/CA S041 Requirements for connection to an air interface of a telecommunications network AS/CA S041.1:2015 Part 1: General http://commsalliance.com.au/Documents/all/Standards/s041
ETSI Standards and Reports	
[4]	ES 202 913 V1.2.1 (2004-05) Access and Terminal (AT); POTS requirements applicable to ADSL modems when connected to an analogue presented PSTN line. http://www.etsi.org/deliver/etsi_es/202900_202999/202913/01.02.01_50/es_202913v010201m.pdf
ITU-T and CCITT Recommendations	
[5]	G.992.1 (07/1999) Asymmetric digital subscriber line (ADSL) transceivers http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=4718
[6]	O.9 (03/1999) Measuring arrangements to assess the degree of unbalance about earth http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=4632

	Publication	Title
[7]	O.41 (10/1994)	Psophometer for use on telephone-type circuits http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=1702

4 ABBREVIATIONS AND DEFINITIONS

For the purposes of this Standard, the following abbreviations and definitions and those of Part 1 apply:

4.1 Abbreviations

ACA	Australian Communications Authority
ACIF	Australian Communications Industry Forum
ACMA	Australian Communications and Media Authority
ADSL	Asymmetric Digital Subscriber Line
AS	Australian Standard
CE	Customer Equipment
DC	Direct Current
DSL	Digital Subscriber Line
ITU-T	International Telecommunications Union – Telecommunications
PSTN	Public Switched Telephone Network
SI	International System
TRC	Telecommunications Reference Conductor
VF	Voice Frequency

4.2 Definitions

4.2.1 Carrier

Refer to the *Telecommunications Act 1997*.

4.2.2 Customer Equipment

Refer to the *Telecommunications Act 1997*.

4.2.3 Facility

Refer to Section 374(2) of the *Telecommunications Act 1997*.

4.2.4 Line Port

A port on CE for connection to the Metallic Local Loop.

4.2.5 Line Terminating Equipment

Line terminating equipment incorporates circuitry that applies an online condition to the PSTN line. CE incorporating this functionality 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.
- 4.2.6 Metallic local loop
Metallic twisted pair communications wire in a carrier's network that provides connectivity between a customer's premises and equipment in a Telecommunications Network.
- 4.2.7 Off-hook
See On-line.
- 4.2.8 On-line
The state of the Line Terminating Equipment when it has an electrical configuration that causes the current in the basic network loop to be at its maximum steady-state value. Can also be described as 'off-hook'.
- 4.2.9 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.
- 4.2.10 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.
- 4.2.11 Standard Telephone Service
Refer to Section 6 of the *Telecommunications (Consumer Protection and Service Standards) Act 1999*.
- 4.2.12 Telecommunications Network
Refer to Section 374(1) of the *Telecommunications Act 1997*.
- 4.2.13 Telecommunications Reference Conductor (TRC)
A low noise earthing system providing a zero voltage reference point for telecommunications signalling and other functional purposes which may include equipment reliability.
- 4.2.14 Voice Frequency (VF)
Those frequencies in the range of 300 Hz to 3.4 kHz.

4.2.15 **Voiceband**

Voiceband is a general term that may include frequencies from 200 Hz to 4.0 kHz.

5 REQUIREMENTS

5.1 General

Part 2 of AS/CA S041 lists specific requirements that apply to CE that perform the function of a DSL modem. General requirements are covered in Part 1 of AS/CA S041.

The following requirements apply to CE which is a DSL modem, or part of a CE performing the function of a DSL modem.

5.2 PSTN line properties

5.2.1 DSL Line Impedance

The impedance that DSL modem CE presents to the line **shall** have a modulus of impedance greater than or equal to the impedance limits defined in the Table 1 and Figure 1.

Note: Clause 5.2.1 is based on the requirements in ETSI ES 202 913 [4] with the limits from ITU-T Rec. G.992.1 [5].

TABLE 1
Impedance limits

Frequency (Hz)	Impedance (Ω)
200	10 000
440	10 000
4000	1100

Compliance with Clause 5.2.1 should be checked by using the method described in Clause 6.3.4

5.2.2 Impedance Balance (Longitudinal Conversion Loss)

With the modem powered up and in a quiet state, the impedance balance about earth of the CE:

- (a) **shall** be greater than 46 dB over the frequency range 50 Hz to 3.4 kHz; and
- (b) should be greater than 52 dB over the frequency range 50 Hz to 3.4 kHz.

Compliance with Clause 5.2.2 should be checked by using the method described in Clause 6.3.2. This test is to be applied with respect to the TRC terminal and the protective earth terminal separately, and also with both connected together, where provided.

5.2.3 Noise Performance

When the DSL modem is in an active state and transmitting maximum power, excluding transient start up or initialisation phases, the mean noise power **shall not** exceed –62 dBmp when measured across a 600 Ω termination and using a device compliant with ITU-T Rec. O.41 [7].

Compliance with Clause 5.2.3 should be checked by using the method described in Clause 6.3.3

6 TESTING

6.1 Verification of compliance with requirements

Compliance with all mandatory requirements in this AS/CA Standard is to be verified. This may be done by direct measurement, modelling and analysis, operation or inspection.

Methods for demonstrating compliance of CE with the requirements clauses specified in this Standard are described in Clauses 6.2 to 6.3.

Alternative methods of demonstrating compliance to those described may be used if the risk of passing non-compliant CE is not increased because of increased measurement uncertainty.

6.2 Standard test conditions

6.2.1 Unless this Standard provides otherwise, testing for compliance with this Standard should be conducted at the nominal supply voltage of the CE and within the following ranges of atmospheric conditions:

- (a) An ambient temperature in the range of 15°C to 25°C inclusive.
- (b) A relative humidity in the range of 45% to 75% inclusive.
- (c) An air pressure in the range of 86 kPa to 106 kPa inclusive.

6.2.2 Where elements in a test configuration are variable, the test should be carried out over the indicated range for that element.

6.2.3 Unless indicated elsewhere within this Standard:

- (a) the accuracy level of all measurements should be better than $\pm 2\%$ for voltage and current, $\pm 0.25\%$ for frequency and $\pm 0.5\%$ for time; and
- (b) the tolerance of the nominal 48 V d.c. test source should be $\pm 0.5\text{ V}$.

6.2.4 Unless indicated elsewhere within this Standard for an individual test, all component values in the test configuration should have a tolerance of:

- (a) $\pm 1\%$ for resistance;
- (b) $\pm 1\%$ for capacitance; and
- (c) $-0\%, +25\%$ for inductors.

6.3 Parameters to be tested

6.3.1 Power supply

Modem under test is to be powered during the test by the power supply intended for use in the Australian market.

6.3.2 Impedance balance (Longitudinal Conversion Loss)

Impedance balance is defined as the ratio U/V measured as shown in Figure 3. The test should be carried out by injecting a signal of 3 V r.m.s. between the earth and the midpoint of two resistors connected in series, in accordance with ITU-T Rec. O.9 [6]. Earth should be either TRC or protective earth termination, or both.

CE without an earth connection should be placed on an earthed metal plate of sufficient size.

Note: Impedance balance = $20 \log (U/V) \text{ dB}$.

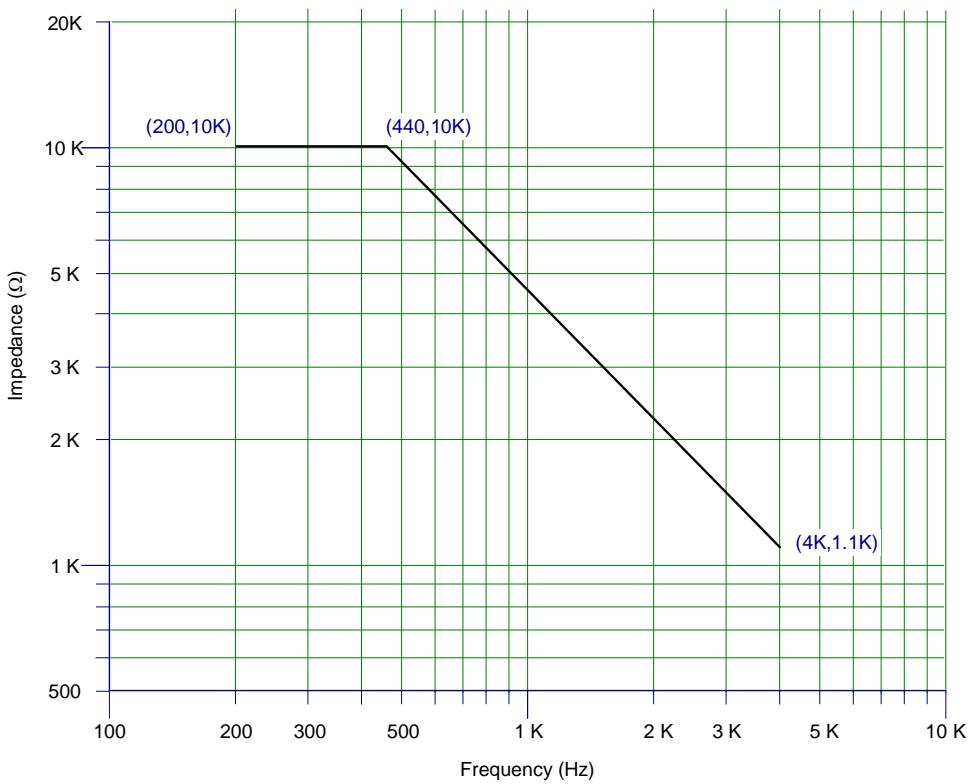
6.3.3 Noise performance

Appropriate noise measurement equipment should be used as shown in the test circuit of Figure 2.

6.3.4 Test for DSL Line Impedance

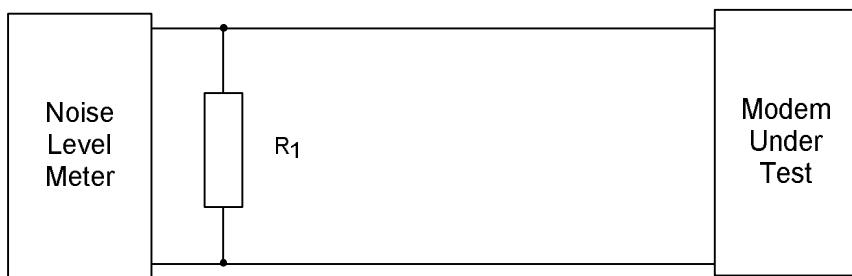
This measurement should be performed by connecting a Vector Impedance meter or VF Level Tracer to the DSL modem Line port while the modem is in the powered up quiet state.

Note: Equipment suppliers should provide details of a method for placing the CE in the On-line condition with no signal being applied to line for a period of not less than 10 minutes.



Note: Between 440 Hz and 4 KHz the log of the impedance decreases linearly with the log of the frequency.

Figure 1
Minimum impedances in the Voiceband



Termination provided by Noise Level Meter, or external resistor $R1 = 600 \Omega \pm 1\%$

Figure 2
Noise measurements psophometric

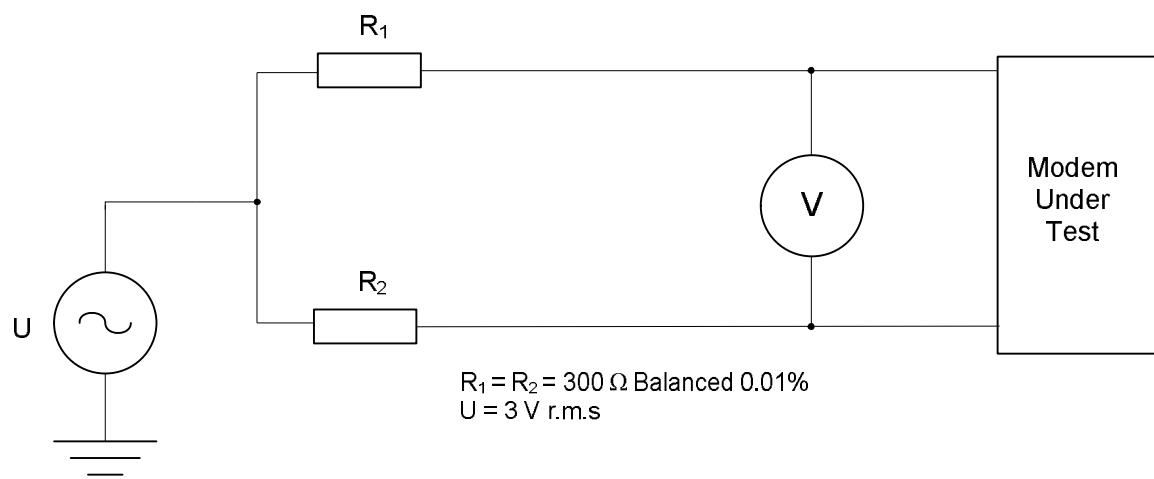


Figure 3
Impedance balance test circuit

PARTICIPANTS

The Working Committee responsible for the revisions made to this Standard consisted of the following organisations:

Organisation	Membership
AAPT	Voting
Adtran Networks	Voting
Advanced Circuits and Systems	Voting
Alcatel-Lucent	Voting
Corning Systems	Voting
Huawei	Voting
iiNet	Voting
International Copper Association (ICAA)	Voting
Layer10	Voting
NBN Co	Voting
Netcomm Wireless	Voting
OneAccess	Voting
Optus	Voting
M2	Voting
Telstra	Voting
ACCC	Non-voting
ACMA	Non-voting

This Working Committee was chaired by Peter Cooke. James Duck of Communications Alliance provided project management support.

Communications Alliance was formed in 2006 to provide a unified voice for the Australian communications industry and to lead it into the next generation of converging networks, technologies and services.

In pursuing its goals, Communications Alliance offers a forum for the industry to make coherent and constructive contributions to policy development and debate.

Communications Alliance seeks to facilitate open, effective and ethical competition between service providers while ensuring efficient, safe operation of networks, the provision of innovative services and the enhancement of consumer outcomes.

It is committed to the achievement of the policy objective of the Telecommunications Act 1997 - the greatest practicable use of industry self-regulation without imposing undue financial and administrative burdens on industry.



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