NBN Co Fibre Access Service

UNI-V ELECTRICAL SPECIFICATION

~~2 MARCH~~29 August 2012

~~1.~~ This document forms part ~~of version 1.0~~ of NBN Co's Wholesale Broadband Agreement which is a Standard Form of Access Agreement for the purposes of Part ~~-~~XIC of the Competition and Consumer Act 2010.

NBN Co Limited

NBN Co Fibre Access Service – UNI-V Electrical Specification

~~02/03~~29/08/2012

Version: ~~1~~2.0

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Disclaimer

From time to time Customer may be able to access undocumented features and functionality of the UNI-V. Customer must not use features or functionality not explicitly described by the UNI-V specification. Such features or functionality may not operate as expected, will not be supported by NBN Co, and may change without any notice to Customer. Customer must not rely on those features and functionality continuing to be available unless expressly supported by NBN Co as described in a formal specification.

Environment

NBN Co asks that you consider the environment before printing this document.

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1. Scope and purpose

1.1. Purpose

The purpose of this document is to set out the electrical specifications for the NBN Co User Network Interface-Voice **(UNI-V)** which is available only on the Network Termination Device **(NTD)** used for the NBN Co Fibre Access Service **(NFAS)**.

1.2. Scope

This document applies in respect of the ~~first~~second release of the UNI-V features and capabilities only.

This document does not apply to the UNI-V deployed in the Tasmania Tri-Area Service zone.

This document should be read in conjunction with:

- the NFAS Product Technical Specification; and
- the UNI-V Functional Specification.

1.3. Intended Audience

This document is intended to be read by access seekers that wish to utilise the UNI-V for the provision of voice or voice-band data telephony services to an end user ~~and for equipment vendors who wish to understand the UNI-V's current technical capability~~.

1.4. Overview

The NBN Co UNI-V ~~is expected to~~has been designed with the intention that it will be compatible with a large proportion of customer premises equipment (**CPE**) and ~~customer~~ cabling commonly connected to the Australian PSTN. ~~It should be noted however that~~ However, there may be ~~existing Customer Premises Equipment (**CPE**)~~CPE (such as certain legacy equipment) with which the NBN Co UNI-V may not operate~~.~~ and NBN Co is continuing to work with industry ~~on these aspects~~to improve interoperability.

1.5. Definitions

The table in section 11 of this ~~specification~~document sets out the meaning of certain words, acronyms and abbreviations that are used throughout this document.

Any capitalised words used throughout this document that are not defined in section 11 of this document have the ordinary meaning commonly accepted in the industry.

1.6. Relevant Documents

References to an access seeker will be read as a reference to a Customer for the purposes of the Wholesale Broadband Agreement. This document is to be read subject to the latest versions of:

- the NFAS Product Description;
- the NFAS Product Technical Specification; and
- the UNI-V Functional Specification.

If there is any inconsistency between this document and any of the above documents, then that inconsistency will be resolved by giving precedence to documents in the order listed, with this document and the UNI-V Functional Specification to be given equal precedence.

2. UNI-V General Specification

This section describes the physical characteristics and operation of the UNI-V interface at the End User's Premises.

Where applicable, references to the "Communications Alliance AS/CA S003.1:2010 Customer Access Equipment for connection to a Telecommunications Network" standard assume an "on premises" local port.

2.1. Physical Interface Specification

There are two UNI-V 2-wire interfaces on each NFAS NTD, but for the second release of the UNI-V, only the first UNI-V 2-wire interface is enabled. For more information, please refer to the UNI-V Functional Specification.

The NTD has a miniature 6-position jack (as specified in section 6.1.1.2 of ANSI/TIA 968 A (2002)) for each UNI-V 2-wire interface. The UNI-V 2-wire interface jacks are wired according to RJ11C (as specified in section 6.2.2 of ANSI/TIA 968 A (2002)).

Outdoor NTDs have screw-down connections for each UNI-V 2-wire interface. The screw-down connections are wired to the RJ11 jacks by an adaptor cable.

Table 1 describes the UNI-V RJ11 jack pin-outs and the associated screw-down terminal colours. Additionally, the D.C. polarity for each of the connections is provided.

NTD miniature jack pin	Contact designation	Outdoor NTD (screw down connection)	Idle D.C. polarity
1	N.C.	N/A	
2	N.C.		
3	R1	Blue	-
4	T1	White	+
5	N.C.	N/A	
6	N.C.		

Table 1 - NTD UNI-V pin-out

The miniature 6-position plug (as specified in section 6.1.1.1 of ANSI/TIA 968 A (2002) can be connected to the UNI-V 2-wire interface jack. This plug may be of the 6P2C, 6P4C or 6P6C variety.

Figure 1 illustrates the Indoor NTD UNI-V and UNI-D physical port layout:

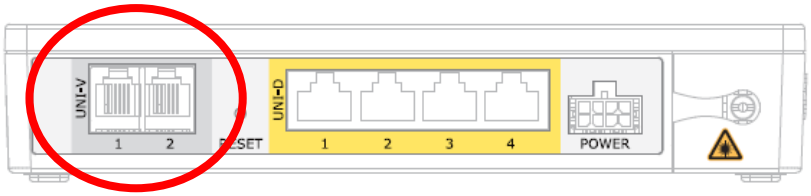


Figure 1 - Indoor NTD port layout

Figure 2 below illustrates the Outdoor NTD UNI-V and UNI-D physical port layout:

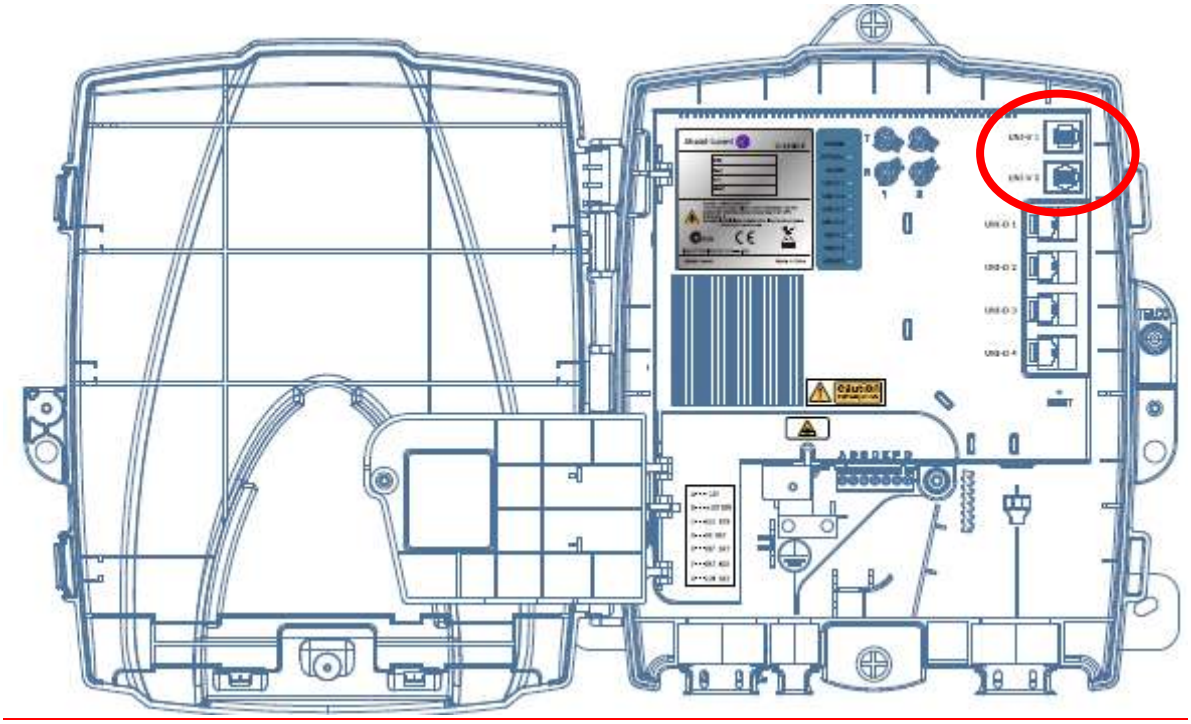


Figure 2 - Outdoor NTD port layout

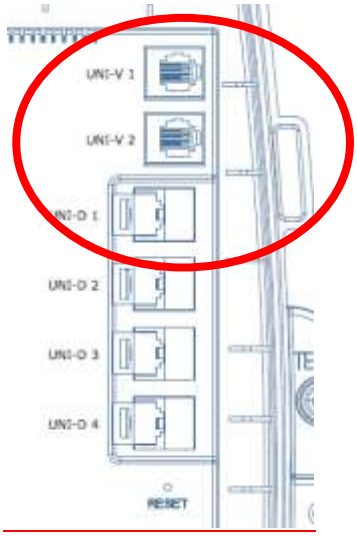


Figure 3 - Outdoor NTD port layout, close up

2.2. Electrical Interface Specification

The features and functions of the UNI-V have been developed in the context of current CPE standards including those set out below. In relation to the UNI-V specifications is important to note that the listed standards are CPE standards and not network standards.

- "Communications Alliance AS/ACIF S003.1:2010, Requirements for Customer Access Equipment for connection to a Telecommunications Network - Part 1: General" standard;
- "Communications Alliance AS/ACIF S003.3:2010, Requirements for Customer Access Equipment for connection to a Telecommunications Network - Part 3: Packet and cell based technologies" standard; and
- "Communications Alliance AS/ACIF S002:2010, Analogue interworking and non-interference requirements for Customer Equipment for connection to the PSTN" standards unless noted otherwise.

2.3. Line Signals

2.3.1. Ringing

The UNI-V Ring signal generation performance is specified in section 6.3 of this document.

The UNI-V supports Ring Cadence sequence types 0, 1, 3, 6 and 7 (as per AS/CA S002:2010 Appendix D2.4). Figure 4 describes the detail of the available Ring Cadences and the timing for On-Hook mode 1 CND signalling.

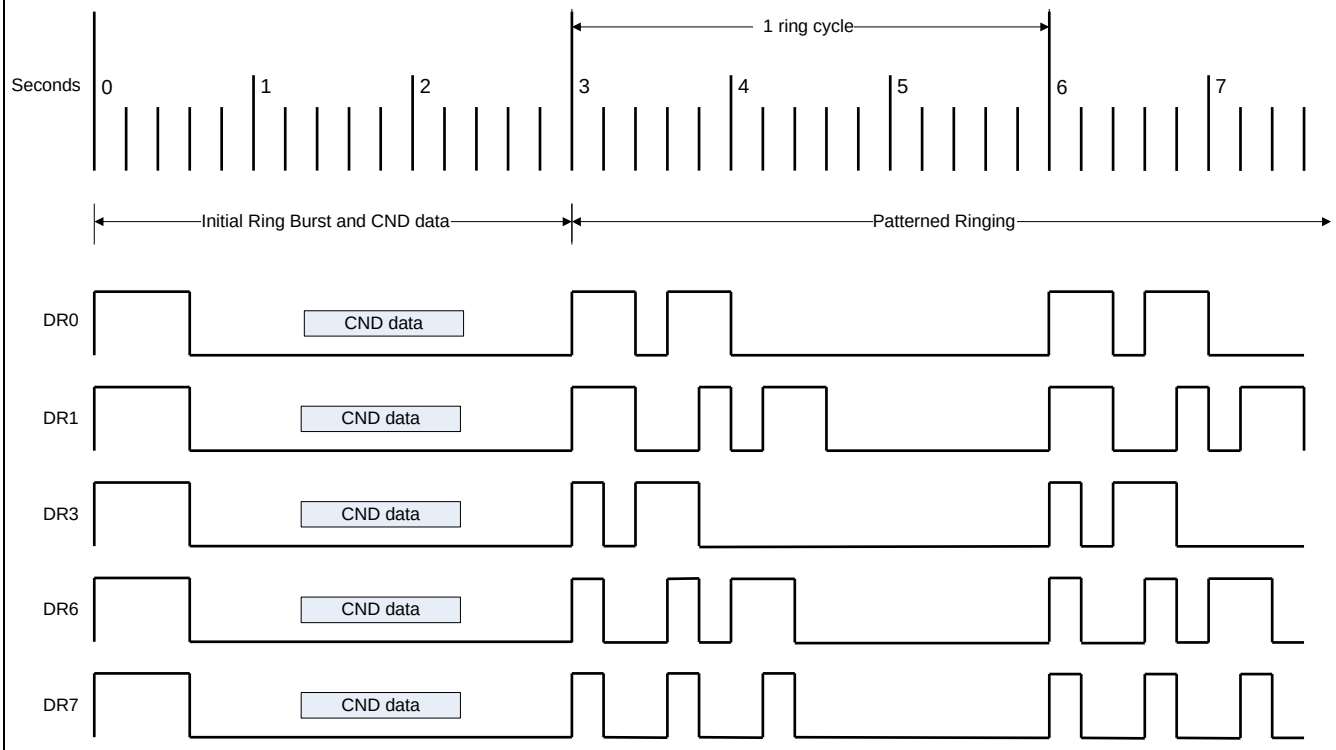


Figure 4 - Supported Ring Cadences

When CND is enabled, there is an initial burst of ringing for approximately 600ms followed by a period of up to 2300ms during which a burst of FSK signalling occurs and the requested cadence is initiated. Typically, the burst of FSK will be maintained for approximately 1000ms in duration. This will occur regardless if the network sends CND data or not.

2.4. Dial and Service Tones

Dial and service tones are available on the UNI-V.

The tones generated by the NBN Co NTD are designed to conform to those described in "AS/CA S002:2010 Appendix A, PSTN Service Tone Characteristics" for maximum compatibility with CPE which conforms with AS/CA S002:2010.

The dial tone (or special dial tone) is presented for 12 seconds or until a digit is pressed.

If a digit is not pressed, the UNI-V presents the busy tone for sixty seconds before transitioning to Howler tone for 60 seconds followed by silence. The sequence is terminated if the user places the CPE in an On-Hook state.

Call waiting is presented for up to 60 seconds or until the calling (3rd) party terminates the call or the called party executes a recall sequence.

Refer to section 4.1 of this document for service tone specifications.

2.5. Feature Signals

2.5.1. Calling Number/Name Display

The UNI-V uses FSK signalling to convey the CND and other information to compatible CPE.

CND signalling operates in one of two modes depending on whether the line is in On-Hook or Off-Hook state. Each of the modes is described below.

On-Hook reception associated with an incoming call during ringing (Mode 1)

- Used for CND for a new incoming call when the line is in the On-Hook (idle) state.
- CPE receives information during the first long silent period between two ringing patterns. A ringing pattern may consist of one or more ringing pulses separated by short silent periods (Ring Cadence).

Off-Hook reception during conversation phase of the call (Mode 4)

- Used for CND during Call Waiting.
- The CPE should be able to reliably detect the CPE Alerting Signal (**CAS**) in the presence of voice signals in accordance with the procedures specified in Telcordia GR-30 CORE [7].

The Multiple Data Message Format (**MDMF**) is used to convey Messages for call setup and the Visual Message Waiting Indication.

Table 2 describes the supported Message Types:

Message type	Value (Hexadecimal)
Call setup	0x80
Visual Message Waiting Indication	0x82

Table 2 - CND message types

Table 3 describes the level of support for the standard Parameter Types:

Value (Hex)	Meaning	Supported
0x01	Parameter Type - Date and Time	No
0x02	Parameter Type - Calling Number	Yes
0x07	Parameter Type - Calling Name	Yes
0x0B	Parameter Type - Visual Message Waiting Indicator	Yes

Table 3 - CND Parameter Types

2.5.2. Visual Message Waiting Indication

The UNI-V can also convey the Visual Message Waiting Indication status using the FSK signalling and message format described above. There is a special message type reserved for this purpose and is conveyed when the line is in the On-Hook state.

2.6. Fax and Modem Support

This section describes the capabilities and behaviours on the UNI-V for the carriage of facsimile and VBD services.

The performance of facsimile and VBD services is very much dependent on the performance of the end-to-end telephony connection. In particular, the negotiated (and renegotiated) sync rates and stability of any connection will be dependent on the performance of the end-to-end connection and the capabilities and behaviours of the modems themselves.

The UNI-V may be capable of sustaining fax and modem speeds in excess of those listed in section 9.

2.6.1. VBD triggers

VBD mode is triggered upon detection of any of the tones in Table 4.

Trigger	Freq.	Notes
ANS	2100 Hz	ANS is defined in ITU-T Rec V.25
/ANS	2100 Hz	ON for 1.0 seconds (phase reversals each 450ms) ANS is defined in ITU-T Rec V.25
ANSam	2100 Hz	amplitude-modulation ANSam is defined in ITU-T Rec V.8
/ANSam	2100 Hz	phase reversal and amplitude-modulation /ANSam is defined in ITU-T Rec V.8
T.30 CNG	1100Hz	ON for 0.5 seconds, OFF for 3 seconds As per ITU-T Rec T.30
T.30 CED	2100Hz	As per ITU-T Rec T.30
T.30 Preamble	N/A	Series of FLAGs (01111110) as per ITU-T Rec T.30

Table 4 - VBD transition triggers

In order to trigger VBD mode, the answer tone should be presented by the connected CPE to the UNI-V within 3000ms of answering.

2.6.2. Modem/fax pass-through support

Negotiation of the audio mode and handling answer tones are implemented during call setup. When transitioning to VBD mode the UNI-V disables the echo canceller and locks the jitter buffer size to its maximum of 100ms.

G.711A codec is required for services using the VBD mode (Clear Channel).

2.6.3. T.38 Fax support

T.38 is not supported by the UNI-V.

2.7. Configuration of Electrical interface parameters

In general, the UNI-V electrical parameters and the behaviours of the UNI-V described above are fixed and not configurable by the access seeker, with the following exception:

> Tx and Rx gain can be modified, but only by NBN Co. Access seeker may request that NBN Co change the Tx and Rx settings by raising a UNI-V trouble ticket.

Table 5 sets out the default gain settings implemented on the UNI-V and the configurability range supported.

Line gain	Default value	Range	Notes / standards
Tx path (input gain)	-3 dB(i.e. +3dBr)	-12dB to +3dB	AS/CA S003.2:2010 5.3.2.2, Table 1
Rx path (output gain)	-9 dB(i.e. -9dBr)	-12dB to -3dB	AS/CA S003.2:2010 5.3.2.2, Table 1

Table 5 - Receive and Transmit Level

Service tones and detection levels (e.g. DTMF signal detection levels) do not automatically adjust for changes in gain configuration.

2.8. NTD UNI-V LED behaviours

The UNI-V LEDs behave differently for indoor and outdoor NTDs. Table 6 describes the behaviour of each.

SIP registration state	Port status	LED state for indoor NTD	LED state for outdoor NTD
Not registered	On-Hook	Off	Off
	Off-Hook	Off	Off
Registered	On-Hook	Off	On
	Off-Hook	On (flashes if Off-Hook for more than one hour)	Flashing

Table 6 - NTD UNI-V LED status indication

2.9. UNI-V DC Voltage Feed Interruption

The UNI-V will temporarily suspend the loop DC feed voltage during certain maintenance operations such as software updates and NTD reboots.

Activity	DC Loop voltage interruption (seconds)
General maintenance (software upgrade, remote reset etc.)	<60s

Table 7 - UNI-V DC Loop Voltage Interruption due to NTD maintenance

A battery back-up power supply is available in respect of the UNI-V on the NTD (but not in respect of any UNI-Ds on the NTD) as described in the NFAS Product Description. It is designed to ensure that DC loop voltage is maintained in respect of the UNI-V for approximately 5 hours during power outages, subject to the capacity, condition and status of the battery installed within the battery back-up unit for the NTD. Please refer to the NFAS Product Description for further information in relation to the battery backup power supply. Information in relation to battery run-time is set out in section 2.10.

2.10. Battery run-time

The run-time of the battery during a mains power outage is directly related to, among other things, the power consumption of the NTD and the environment in which the battery back-up unit is located. Despite the fact that only the UNI-V is supplied with battery backup power, overall service configuration and usage patterns will influence the power consumption of the NTD and affect run-time of the battery.

Factors which will influence the battery run-time include (without limitation):

- the number of UNI-V services in use on the NTD;
- the usage patterns of each UNI-V during the mains power outage – including the amount of time spent in an active call and the number of inbound calls which cause the telephone handsets to ring; and
- the environment the battery is located within (for example, temperature extremes will reduce battery run time.)

The battery back-up unit features an "emergency" power reserve. The battery back-up unit will turn off the NTD when approximately 30-40% of battery capacity remains. By pressing an "emergency" button located on the battery back-up unit, End Users can re-activate the NTD and access the emergency power reserve if required. After this reserve is exhausted, the battery will be completely flat. As a lead acid battery, if the battery is left in this state for an extended period it may be damaged.

It is not possible to provide an accurate battery run-time as the overall service configuration and usage patterns will vary for each End User. Table 8 provides indicative run-time figures based on "typical" usage scenarios.

The scenarios and results will be affected by a number of factors including (without limitation):

- service configuration and usage patterns (as noted above);
- battery age;
- battery average temperature over its lifetime;
- time (hours) since last discharge of the battery;
- number of discharges of the battery from new; and
- temperature during discharge of the battery.

Usage scenario	Approximate power consumption	Approximate run-time*
Low usage – occasional short telephone calls	6 Watts	8 Hours
High usage – regular telephone calls of short duration	7 Watts	6 Hours
Upper limit usage – single UNI-V in use (long held calls)	9 Watts	5 Hours

Table 8 - Typical Battery Run Time

* Note: The approximate run-time is inclusive of the emergency battery capacity, which requires the End User to press the 'Battery Emergency Use' button to access the last 30% - 40% of capacity.

~~2.~~3. UNI-V 2-wire interface capability

~~2.1.~~3.1. Background

The UNI-V 2-wire interface ~~should~~is designed to allow analogue CPE compliant with AS/CA S002:2010 to interwork reliably with the network delivering ~~the~~a telephony service through the UNI-V.

~~2.2.~~3.2. Regulatory Requirements

The UNI-V 2-wire interface complies with ~~the following regulatory requirements:~~specifications in Table 9.

Item	Regulatory item	Specification
1	**Safety**	AS/NZS 60950.1:~~2001~~2011 (Refer to ~~clause in~~ section 3.3 ~~below~~of this document)
2	**EMC**	AS/NZS CISPR22:2009 Class B
3	**MEPS**	AS/NZS 4665:2006

Table 9 - Regulatory Requirements

~~2.3.~~3.3. Wiring connected to the UNI-V

The specification and the behaviour of the UNI-V outlined in this document and the UNI-V Functional Specification are contingent upon the access seeker cabling and any End User cabling complying with the following requirements:

~~a)~~(a) ~~The~~the UNI-V must never be connected to ~~the end user~~ cables or a cabled network (~~end user~~End User or otherwise) that extends beyond the building's external walls, either aerially or underground;

~~b)~~(b) ~~The~~the UNI-V and ~~end user~~connected cabling must not be exposed to the elements;

~~c)~~(c) ~~The~~the maximum DC resistance of the cabling loop from UNI-V to any item of equipment must not exceed 50 ~~Ohm~~Ω;

~~d)~~(d) ~~Cables~~cables must be twisted pair or twisted quad, with a minimum of 13 twists per metre;

~~e)~~(e) ~~Cables~~cables must meet all applicable regulatory obligations including:

~~(i)~~a. the requirements of AS/CA S008:2010; and

~~(ii)~~b. installation in accordance with the requirements of AS/ACIF S009:2006; and

~~(iii)~~(f) ~~Cable~~cable length must not exceed 150 metres (300 metre loop) of 0.5mm diameter CAT3 cable.

~~The access~~Access seeker must ensure that ~~end users and sub-contracted~~End Users, installers ~~are fully aware that~~and other contractors only connect the UNI-V ~~is to only be connected~~ to cabling and equipment in accordance with these requirements.

~~2.4.~~3.4. Off-Hook resistance budget

The general case is based on the ~~following~~ typical scenario for Off-Hook resistance budget~~:~~ set out in Table 10.

Component	Resistance	Notes
Standard CPE	500 ~~Ohm~~Ω	
One standard series device	~~150~~[1] ~~Ohm~~150 Ω [1]	A series device that complies with the electrical characteristics defined in AS/CA S002:2010
Cable 100m (200m loop) of 0.4mm diameter copper	27 ~~Ohm~~Ω	Or 150m (300m loop) of 0.5mm diameter copper
Margin	23 ~~Ohm~~Ω	
Total	700 ~~Ohm~~Ω	Off-Hook DC loop resistance

Table 10 - General budget for UNI-V premises wiring~~.~~

[1] Derived from AS/CA S002:2010 requirement for series device (3V @20mA)

For the purposes of the above calculations, it is assumed that standard solid copper wires are installed with 0.4mm copper wire having a DC resistance of 133.9 ~~Ohm~~Ω/km and 0.5mm copper wire having 84.22 ~~Ohm~~Ω/km.

~~2.5.~~3.5. Immunity to Overvoltage Conditions

The UNI-V 2-wire interface ~~generally complies with~~ meets the requirements of ITU-T Rec. K.21 "basic" and is for '*internal cabling*'~~.~~ only.

4. Provision of Service Tones

4.1. Tone Definitions

If service tones are generated by the UNI-V 2-wire port they should be in accordance with Table 11.

TONE	FREQUENCY (Hz)	CADENCE (sec)	Total Power Level (dBm0)	Total Power Level (dBm)
PREANSWER				
Default Dial Tone (Note 1)	400+425+450	Continuous	-10dBm0 ± 1.5	-19dBm ± 1.5
Distinctive Dial Tone [Message Wait]	400+425+450	100 ms on, 40 ms off	-10dBm0 ± 1.5	-19dBm ± 1.5
Ringing Tone	400+425+450	400 ms on, 2000 ms off, 400ms on, 2000ms off	-10dBm0 ± 1.5	-19dBm ± 1.5
Busy Tone	425	0.375 on 0.375 off	-10dBm0 ± 1.5	-19dBm ± 1.5
Number unobtainable	425	2500ms on, 500ms off	-10dBm0 ± 1.5	-19dBm ± 1.5
POST-ANSWER				
Call Waiting Tone	425	0.2 on 0.2 off 0.2 on 4.4 off (for 45 seconds)	-20dBm0 ± 1.5	-29dBm ± 1.5
Howler	1500 Hz to 2500Hz (Approx.)	Audible equivalent to: continuous, sweep/stepped frequency, graduated level	N/A	No tones less than -20dBm and no tones shall be greater than +10dBm

Table 11 - Tone Definitions

Notes:

1. Ideally, Dial Tone upper and lower frequencies should be 6dB below the level of the centre frequency.
2. Source: AS/CA S002:2010
3. The levels in Table 11 are referenced at the nominal -3dB/-9dB gain settings and may not apply when gain is configured otherwise.
4. The Busy tone is also presented when an incoming call is terminated by the calling party.

4.2. Pre-Answer Tone State Transitions

The following describes service tone presentation:

1. Dialling

   (a) Off-Hook state is initiated.

   (b) Dial tone should initially be provided for 12 seconds (±0.5s), followed by presentation of the Busy tone.

   (c) Should DTMF be received during the initial 12 seconds (±0.5s) of Dial tone, the maximum period between DTMF digits should be 6 seconds (±0.5s). This timer restarts after each digit release. The Busy tone should be presented for 60 seconds (±1.0s), followed by presentation of Howler tone.

   (d) Howler tone should be presented for 60 seconds (±1.0s), followed by presentation of silence.

2. Ringing Tone Condition

   (a) When receiving an incoming call and where no Off-Hook signal is detected, the NTD will provide ring signal to the UNI-V port for 60s before terminating that call.

3. Far-end Busy Condition

   (a) When a dialled destination is busy, the Busy tone will be presented for 60 seconds (±1.0s).

~~3.~~5. UNI-V 2-wire interface Electrical Characteristics

~~3.1.~~5.1. Idle Condition

The DC line voltage in the idle state should be 48V ± 3V (typically 48V +/- 5%) with 100 ~~k ohms~~kΩ connected across the UNI-V 2-wire interface lines.

~~3.2.~~5.2. UNI-V 2-wire interface impedance

The AC input impedance of the UNI-V 2-wire interface should be TN12 as described below.

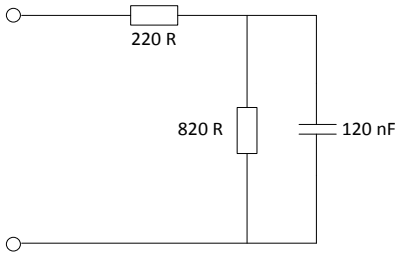


Figure 5 - TN12 impedance

~~3.3.~~5.3. UNI-V 2-wire interface Return Loss

The Return Loss measured against the TN12 impedance complies with AS/CA S003.1:2010 5.4.4 (ETSI ES 201 168).

~~The Return Loss measured against the TN12 impedance can be measured as per AS/CA S003.1:2010 and will be greater than those in the following table:~~

~~Frequency band (Hz)~~	~~Minimum Return Loss (dB)~~
~~300 - 500~~	~~20~~
~~500 – 2800~~	~~26~~
~~2800 – 3400~~	~~22~~

~~Table 3 - Return Loss~~

Note: When tested, Return Loss and TBRL should be measured using "Clear Channel" and with echo-cancellers disabled.

~~3.4.~~5.4. Terminal Balance Return Loss (TBRL)

The UNI-V 2-wire interface should provide Return Loss~~,~~ and Terminal Balance Return Loss (**TBRL**) values meeting the requirements of the masks specified in Figure 13 of ETSI ES 201 168 when measured using a TN12 reference impedance.

~~3.5.~~5.5. Output Noise – Power Spectral Density (PSD)

The PSD of noise emitted from the UNI-V 2-wire interface should comply with the requirements of AS/CA S003.1:2010 clause 5.5.1.3.

4.6. UNI-V 2-wire interface Signalling

4.1.6.1. DC Signalling

4.1.1.6.1.1. Line Seizure and Hold

a)(a) The UNI-V 2-wire interface should detect within 300 ms the application of a resistive termination up to 600700 Ω within 300 ms.

b)(b) Seizure signals of duration 250ms or less should be ignored.

c)(c) The UNI-V 2-wire interface should provide a DC current limit between 20mA and 25mA.

4.1.2.6.1.2. Line Release (Clear Forward)

The UNI-V 2-wire interface should recognise as a Line Release Signal, a resistive termination of 10kΩ for 300 ms and greater as a Line Release Signal. Release Signals of duration 250ms and less should be ignored.

4.1.3.6.1.3. Line Release (Clear Back)

At the completion of a call:

a)(a) The UNI-V 2-wire interface should recognise as a Clear Back Signal, the removal of the HOLD condition for 300 ms or greater as a Clear Back Signal.

b)(b) Removal of the HOLD condition for 250 ms or less should be ignored.

c)(c) Upon receipt of a valid Clear Back Signal, the UNI-V 2-wire interface should initiate the re-answer time supervision that will, on expiry, release the connection.

4.1.4.6.1.4. Re-Answer Signal

a)(a) The UNI-V 2-wire interface should recognise as a valid RE-ANSWER signal, the application of a valid Seize/Hold signal as perdescribed in section 6.1.1 of this document as a valid RE-ANSWER signal.

b)(b) Seize/Hold signals with duration 250ms or less should be ignored as a reRe-Answer Signal.

c)(c) The RE-ANSWER time supervision period should be 90 ± 1 seconds.

4.1.5.6.1.5. Facility Signal (Recall)

The UNI-V 2-wire interface should recognise a Facility Signal of 90 ± 50 ms
(*As per: AS/CA S003.1:2010*) and:

i.a) Itit should not recognise a Facility Signal when the duration of the Timed Loop Break is less than or equal to 35ms or greater than or equal to 145ms.; and

ii.b) Toto avoid hook-switch bounce being interpreted as a facility signalFacility Signal in going on hookOn-Hook, the action initiated by the facility signalFacility Signal should be cancelled if the start of the clear forward signal is within 500ms of the re-make from the Timed Loop Break.

~~4.2.~~6.2. Dual Tone Multiple Frequency (DTMF) Signalling Detection

The UNI-V 2-wire interface should detect the following DTMF signals:

a) Frequency tolerances of ±(1.5% + 2 Hz) from the nominal frequency.

b) DTMF signals with an individual tone level between -2dBm and -24dBm and difference in levels of no more than ±4dB.

c) A break between ~~to ne~~tone signals of 60 ms and greater, as an inter-digital pause.

d) A valid tone signal of 40 ms duration and greater.

The UNI-V 2-wire interface should reject (i.e. ignore) the following DTMF signals:

e) Signals with a frequency deviation of greater than or equal to ±3.5% from the nominal frequency.

f) DTMF signals with an individual tone level at or below -27dBm.

g) A break between tone signals of 25 ms duration and less.

h) A tone signal of 25 ms duration and less.

~~h)~~

~~4.3.~~6.3. Ring Signal

a) The UNI-V 2-wire interface ring generator should provide a minimum ringing voltage of 55 V rms across a 3 REN Load, at all 2-wire ports simultaneously, when each interface is loaded by a 3 REN load connected via a 100Ω resistor.

1 REN = A line termination of 1 µF in series with a ~~4k ohm~~4 kΩ resistor.

b) The ring frequency will be 25 ± 2.5 Hz.

c) The Ring Signal should be superimposed on a DC backing voltage (ring offset) of greater than 18V ±3V.

d) The UNI-V 2-wire interface should provide the following default ringing signal cadence (DR0):

400 ms ON, 200 ms OFF, 400 ms ON, 2000 ms OFF, REPEATED

e) The tolerance for each of the above timings, excluding the 2000 ms OFF period, should be better than ± 60 ms.

f) The tolerance for the overall ring cycle time (3000 ms) should be better than ± 120 ms.

g) The ringing voltage waveform should be generally sinusoidal and the harmonic content should not exceed 774 mV rms when measured with a psophometric set in the weighted mode for all loadings of the ringing signal generator.

h) The UNI-V 2-wire interface ring generator should be able to sustain at least 5 minutes of cadenced ring when loaded with 3 REN. The voltage at the end of this period should not drop below the minimum of 55 V rms.

i) There should not be any change in DC polarity during the ring cycle.

j) Distinctive Ring ~~cadences~~Cadences should be as specified in Table 12.

Ring	Application	On (ms)	Off (ms)	On (ms)	Off (ms)	On (ms)	Off (ms)
DR0	Normal Ring	400	200	400	2000	-	-
DR1	Call Forward	400	400	200	200	400	1400
DR3	Multiple Subscriber Number (MSN)	200	200	400	2200	-	-
DR6	Multiple Subscriber Number (MSN)	200	400	200	200	400	1600
DR7	Data Privacy (Fax/Data), Multiple Subscriber Number (MSN)	200	400	200	400	200	1600

Table 12 - Ring Cadence Definitions

~~Further details regarding ring signals can be found in the UNI-V Functional Specification.~~

~~4.4.~~6.4. Answer Signal (Ring Trip)

~~a)~~(a) The UNI-V 2-wire interface should recognise, within 300ms, a valid Line Seize/Hold signal as a valid Answer Signal in the case of an incoming call.

~~b)~~(b) Ring trip should be possible during both the active ringing period and the silent period.

~~c)~~(c) Ring trip should not occur when ring of maximum voltage is fed to a 5 µF capacitor in lieu of the resistive termination.

~~d)~~(d) Ring trip should occur without instability when the capacitor is replaced by a short circuit.

~~5.~~7. UNI-V 2-wire interface Transmission specification

~~5.1.~~7.1. General

Unless otherwise stated~~,~~ in section 7 of this document:

a) The transmission characteristics of the UNI-V 2-wire interface ~~have been assessed~~ in terms of the half-channel transmission performance (i.e. a test connection between the UNI-V 2-wire analogue interface and a digital 4-wire interface).

b) Test signals used for testing the UNI-V transmission capability ~~had~~have a nominal level of
-10dBm0 and a frequency of 1020Hz.

c) Termination impedance at the UNI-V 2-wire interface is TN12~~-F~~.

~~5.2.~~7.2. Relative Levels

The default nominal relative levels applying at the UNI-V 2-wire interface should be:

a) Preferred send relative level +3 ± 1 dBr (into the UNI-V 2-wire interface); however, +5 ± 1dBr is also acceptable.

b) Preferred receive relative level -9 ± 1 dBr (from the UNI-V 2-wire interface); however, -10 ± 1dBr is also acceptable.

c) The UNI-V should provide a method of adjusting both the above stated relative levels in 1dB increments by at least ± 3dB.

d) For the purposes of transmission testing, where applicable, test instruments used by NBN Co to assess the UNI-V have had their input and output dBr values set to the nominal values shown in paragraphs (a) and (b) above.

Note: The relative levels are assessed by measuring the insertion loss between the UNI-V 2-wire interface under test and a 0dBr digital interface.

~~5.3.~~7.3. Variation of Gain with Frequency

Variations of the attenuation with frequency should lie within the limits shown in the mask from ITU-T Rec. G.712, section 7, Figure 5~~/G.712 .~~.The reference frequency is 1020Hz.

~~5.4.~~7.4. Variation of Gain with Input Level

With a sine-wave test signal at the nominal reference frequency of 1020 Hz applied to the input interface of a channel (the PCM to UNI-V 2-wire interface and separately UNI-V 2-wire interface to PCM) at a level between –55 dBm0 and +3 dBm0, the gain variation at the output interface of the channel relative to the gain at an input level of –10 dBm0 should be within the limits of ITU-T Rec. G.712, section 13, Figure 14/G.712.

~~5.5.~~7.5. Total Distortion performance

With a sine-wave test signal at the nominal reference frequency of 1020 Hz applied to the input interface of a channel (the PCM to UNI-V 2-wire interface and separately UNI-V 2-wire interface to PCM), the ratio of signal-to-total distortion power, measured psophometrically, at the output interface of the channel should lie above the limits shown in ITU-T Rec. G.712 section 12 and Figure 12/G.712.

~~5.6.~~7.6. Idle Channel Noise performance

~~5.6.1.~~7.6.1. Weighted Noise

With the input and output ports of a test call terminated in their nominal impedances, the idle channel noise should not exceed the limits specified below:

Interface terminated	Interface measured	Weighted noise
UNI-V 2-wire interface (analogue)	Digital interface output	< –67 dBm0p
Digital interface input	UNI-V 2-wire interface (analogue)	< –75 dBmp

Table 13 - Weighted Noise Limits

Source: ITU-T Rec. G.712 section 9.1~~.~~

~~5.6.2.~~7.6.2. Single Frequency Noise

The level of any single frequency measured selectively in the range 0-102kHz at the UNI-V 2-wire interface (analogue output) should not exceed –50 dBm0. In the range 300-3400Hz psophometrically weighted, the level should not exceed –73 dBm0p.

Source: ITU-T Rec. G.712 section 9.2~~.~~

~~5.7.~~7.7. ~~-~~Crosstalk performance

a) **Injection at the UNI-V 2-wire interface (analogue):**

(i) Near-End crosstalk (**NEXT**): With a 0 dBm0, 1020 Hz sine-wave signal applied to the UNI-V 2 wire interface (analogue), the crosstalk level produced at the ~~neighboring~~neighbouring, similar UNI-V 2-wire interface must not exceed –73 dBm0.

(ii) Far-End crosstalk (**FEXT**): When the test signal from (i) is measured at an adjacent (but unrelated) digital interface the crosstalk level produced must not exceed –70 dBm0.

Source: ITU-T Rec. G.712 section 14.3.1 and Figure 17/G.712.

b) **Injection at the 4-wire digital interface:**

(i) NEXT: With a digitally simulated 0 dBm0, 1020 Hz sine-wave signal applied to the digital input, the crosstalk level received in any other digital channel should not exceed –70 dBm0.

(ii) FEXT: When the test signal from (i) is measured at an adjacent (but unrelated) 2-wire interface, the crosstalk level produced should not exceed –70 dBm0.

Source: ITU-T Rec. G.712 section 14.3.3 and Figure 20/G.712.

~~5.8.~~7.8. Spurious Out-of-Band Signals

With any sine-wave test signal in the frequency range of 300 Hz to 3400 Hz and at a level of 0 dBm0 applied to the digital input interface of a channel, the level of spurious out-of-band image signals measured selectively at the UNI-V 2-wire interface (analogue output) should be lower than –25 dBm0.

Source: ITU-T Rec. G.712 section 11.1.1~~.~~

~~5.9.~~7.9. Discrimination against Out-of-Band Signals

With any sine-wave signal of level -25dBm0 in the range 4600 Hz to 72 kHz applied to the UNI~~-~~-V 2-wire interface (analogue input) of the channel, the level of any image frequency produced at an output digital interface should be at least 25 dB below the level of the test signal.

Source: ITU-T Rec. G.712 section 10.1~~.~~

~~5.10.~~7.10. Absolute Group Delay

The one-way end-to-end delay between 2 analogue interfaces (e.g. UNI-V 2-wire interfaces) should not be greater than 150ms (Ref: ITU-T Rec. G.114).
Note: This only applies to national terrestrial networks. The NBN Co ~~network~~Network and access seeker networks, together with third party networks involved in each communication, each contribute a portion of the end-to-end delay.

~~5.11.~~7.11. Short-term Variation of Loss with Time

When a 1020 Hz sinusoidal test signal at a level of –10 dBm0 is applied to any voice-band frequency input, the level measured at the corresponding output should not vary by more than ± 0.1dB during any 10-minute interval.

Source: ITU-T Rec. G.712 section 4 and Table 2/G.712 for short-term variation only.

~~5.12.~~7.12. Balance About Earth

~~5.12.1.~~7.12.1. Longitudinal Conversion Loss (LCL)

The LCL should be greater than 46 dB in the frequency range 50 Hz to 3400 Hz.

LCL is defined as the ratio of the input transverse voltage arising from a balanced input longitudinal voltage of 3.0V rms, in the frequency range 50Hz to 3400Hz, applied between earth and the midpoint of two 0.1%, 300Ω resistors connected in series across the input terminals of the UNI-V 2 wire interface, to the input longitudinal voltage.

Source: AS/CA S003.1:2010 clause 5.5.1.4 (a)

~~5.12.2.~~7.12.2. Longitudinal Conversion Transfer Loss (LCTL)

The LCTL should be greater than 46 dB in the frequency range 50 Hz to 3400 Hz.

LCTL is defined as the ratio of the output transverse voltage arising from a balanced input longitudinal voltage of 3.0V rms, in the frequency range 50Hz to 3400Hz, applied between earth and the midpoint of two 0.1%, 300Ω resistors connected in series across the input terminals of the UNI-V 2-wire interface, to the input longitudinal voltage.

Source: AS/CA S003.1:2010 clause 5.5.1.4 (b)

~~5.13.~~7.13. End-to-End (Analogue-to-Analogue) performance

~~5.13.1.~~7.13.1. Composite Loss

The ~~default~~ end-to-end composite loss between two similar analogue interfaces (e.g. two UNI-V 2-wire interfaces) via a switched digital connection should be ~~12dB ± 0.5dB~~consistent with the levels described in section 7.2 of this document.

~~5.13.2.~~7.13.2. Voice Quality

The end-to-end voice quality between two similar analogue interfaces (e.g. two UNI-V 2-wire interfaces) via a switched digital connection should yield a MOS score at or above 4.0. Measurement of the end-to-end service should be in accordance with ITU-T Rec. P.862 with PESQ-LQO mapping according to P.862.1.

Note: On the UNI-V, this assumes the use of the default G.711 A-Law codec, 20ms packetisation and gain settings.

~~5.13.3.~~7.13.3. Spurious In-Band Signals at the output Ports

With any sine-wave test signal in the frequency range 700 Hz to 1100 Hz and at a level of 0 dBm0 applied to the UNI-V 2-wire interface, the output level at any frequency other than the frequency of the test signal, measured selectively in the frequency band 300 Hz to 3400 Hz at a similar 2-wire analogue interface (e.g. UNI-V 2-wire interface) should be less than –40 dBm0.

Source: ITU-T Rec. G.712 section 11.2.

6.8. Caller ID and Visual Message ~~Wait~~Waiting Indication capability

This section defines the technical conditions and performance requirements necessary to present Caller ID information from an access seeker, across the NBN Co ~~network~~Network to ~~customer equipment~~CPE connected to the UNI-V 2-wire interface

The purpose of defining these conditions is to ensure compatibility and interoperability of ~~customer equipment~~CPE with the UNI-V.

The UNI-V ~~provide~~provides On-Hook transmission associated with an incoming call or Visual Message Waiting Indication and Off-Hook reception during the conversation phase of a call.

6.1.8.1. General

This specification describes the minimum capabilities for the transmission of data for presentation of Calling ~~Line~~ Number, Calling Name and Visual Message Waiting Indication display from the UNI-V 2-wire interfaces on the UNI-V to the ~~CE~~CPE. These capabilities are based on Telcordia Specifications with the adaptation required for operation within the Australian ~~telephone network.~~PSTN.

The asynchronous protocol utilised provides efficient use of the available bit rate, reliable error detection, and flexibility. The protocol involves the transmission of a series of 8-bit data bytes that are each bounded by a start bit (~~space~~Space) and a stop bit (~~mark~~Mark). The data is sent in the order of the least significant bit (bit 0) first.

This document describes the minimum capabilities of the UNI-V for the transmission of data in either the On-Hook or Off-Hook states. The data transmission technique used is asynchronous frequency shift keying at 1200 bit/s, consistent with Telcordia Specifications. Note that the frequencies used are identical to Telcordia 202 modem frequencies.

The signalling allows simplex data transmission from the UNI-V to the ~~CE~~CPE. There are three required modes of data transmission:

- On-Hook data transmission following ring~~,~~;
- On-Hook data transmission without ring; and
- data transmission during the Off-Hook state.

~~It is necessary that the CE is~~The CPE must be ready to receive data at the time the UNI-V sends it.

~~6.1.1.~~8.1.1. Differences Between Telcordia and NBN Co capabilities

Whilst the UNI-V capability is modelled closely on the Telcordia Specifications, some modifications are required for satisfactory operation with ~~CE~~CPE currently deployed in the Australian PSTN ~~network~~.

Ring Cadences

In order to allow up to 3.5 ~~s~~seconds of time for transmission of data (as would be provided by US ring cadence), the capability described in this document provides for an initial burst of ring in the range 500 ms to 700 ms. This is followed by a silent interval of sufficient duration as will allow the transmission of data. When this has been completed, the particular ring cadence appropriate to the call ~~to the customer's service~~signalling is then applied.

Message Format

The Telcordia ~~specifies~~Specifications specify two message formats for Caller ID: Single ~~Messages~~Data Message Format and Multiple ~~Messages.~~
Data Message Format (**MDMF**).

For the Australian PSTN ~~network~~, only the ~~Multiple Message format~~MDMF is ~~required~~used.

Message Timing

Historically, timing of some layer 1 signals required shorter or longer time intervals due to Australian network design as compared to the Telcordia recommendations. As NBN Co's NTD is located on site, without any intermediate exchange equipment or loop extending equipment, timing of some layer 1 signals has been adjusted as required by this ~~configuration~~network topology.

~~6.2.~~8.2. Physical Layer Description

The section describes the minimum electrical performance of the UNI-V 2-wire interface.

~~6.2.1.~~8.2.1. Modem Details

The data signalling interface will conform to the ~~following~~ minimum capability~~:~~ in Table 14.

Item	Minimum capability
Link type	Two wire, simplex
Transmission scheme	Analogue frequency shift keying
Logic 1 (Mark)	1200 ± 12 Hz
Logic 0 (Space)	2200 ± 22 Hz
Transmission rate	1200 ± 12 bits per second
Application of data	Serial, binary, asynchronous, least significant bit first
Maximum gap between two successive bytes	16.7 ms (20 bits)
Bit error rate	$< 10^{-5}$
Phase continuity of message	Maintained from initial service to end
On-Hook transmission level (measured at the UNI-V 2-wire interface)	1200Hz: -10dBm0 ± 2dB. 2200Hz: -10dBm0 ± 2dB. Termination: ~~10K ohm~~10 kΩ resistive. Level: Line level is measured in dBm – as if it were terminated in 600 Ω. i.e. voltage level will be similar for both ON and OFF hook. Twist: Low frequency should not be greater level than high frequency.
Off-Hook Transmission Level (measured at the UNI-V 2-wire interface)	1200Hz: -10dBm0 ± 2dB. 2200Hz: -10dBm0 ± 2dB. Termination: 600 ~~ohm~~Ω. Level: Line level is measured in dBm, terminated with 600 Ω and will reflect the UNI-V output dBr value. Twist: ~~low~~Low frequency should not be greater level than high frequency.
Character Format	1 start bit, 8 data bits, 1 stop bit
Character Set	ASCII 7 bit. 8 bits are transmitted with the most significant bit set to zero.

Table 14 - Data Transmission Parameters

Note: The time that lapses between the transmission of individual data bytes within ~~data messages~~Messages should not exceed the time period associated with the transmission of two bytes. An interruption that exceeds 8 ms will likely cause the received data to be treated as erroneous. An interruption of the Mark Signal for 8 ms or less (i.e., less than one byte period) may be ignored by the data receiver.

~~6.2.2.~~8.2.2. Subscriber Alerting Signal (SAS)

The ~~Subscriber Alerting Signal (~~SAS~~)~~ is used prior to data transmission during the Off-Hook state. ~~An~~The SAS (call waiting tone) is a tone that is intended to alert the ~~customer~~called party, but not necessarily to be detected by the ~~CE~~CPE.

~~6.2.3.~~8.2.3. ~~CAS~~Customer Equipment Alerting Signal (CAS)

A ~~CE Alerting Signal (~~CAS~~)~~ is a signal which is intended to be detected by the ~~CE~~CPE.

The dual tone CAS will conform to the ~~following~~ specifications~~:~~ in Table 15.

Item	Specifications
Dual tone frequencies	2130 ± 11 Hz and 2750 ± 14 Hz
Transmission level (at the UNI-V 2-wire interface into 600Ω)	2130Hz: -10 dBm0 ±2 dB and 2750Hz: -10dBm0 ±2 dB
Total harmonic distortion	The total power of harmonics and other extraneous frequency components in the CAS will be at least: -30 dB from each tone level
Total duration	80 - 85 ms
Individual tone timing	Both tones should start and end within 1 ms of each other and will be coincident for a period of 75 ms to 85 ms.

~~Note: The 600 Ω load specified in the table above is a resistive termination and it is for measurement purposes only.~~

Table 15 - ~~CE Alerting Signal~~CAS Parameters

Note: The 600 Ω load specified in the table above is a resistive termination and it is for measurement purposes only.

~~6.2.4.~~8.2.4. ACK Signal Acceptance (CAS response)

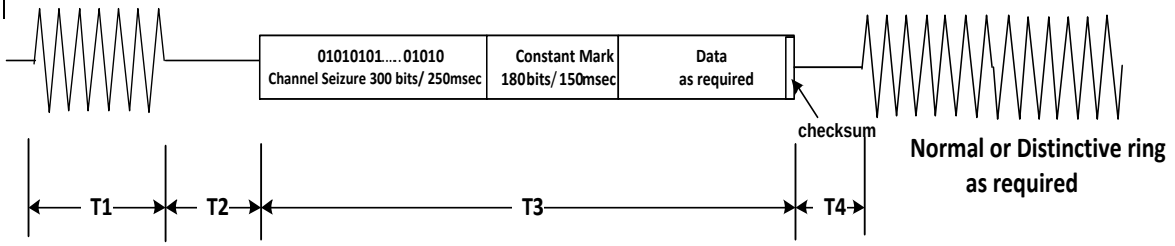
The Acknowledgment Signal (**ACK**) is a DTMF 'D' signal generated by the ~~CE~~CPE.

NOTE: ACK signal duration: 60ms ±5ms

~~6.3.~~8.3. Message Timing specification

~~6.3.1.~~8.3.1. On-Hook Data Transmission Following Ring

Data is transmitted during the period between the initial burst of the ringing signal and the cadenced ringing. The silent interval between the initial burst of ring and the commencement of the cadenced ring will be of sufficient duration to allow the UNI-V to transmit the necessary data to the ~~CE~~CPE.



~~Item~~	~~Duration~~	~~Description~~
~~T1~~	~~500 - 700 ms~~	~~The initial burst of ring.~~
~~T2~~	~~400 – 1000 ms~~	~~The pause immediately after the initial burst of ring.~~
~~T3~~	~~3.5 sec max.~~	~~The duration of the data transmission will be a function of the amount of data to be transmitted.~~
~~T4~~	~~200 – 1500 ms~~	~~The pause between the cessation of data transmission and the first burst of cadenced ring.~~

~~Note: If the CE answers prior to or during data transmission, the transmission will cease within the time necessary for the UNI-V to detect the off-hook state and the line placed into a state to allow the incoming call to proceed.~~

~~Table 8 - On-Hook Data Transmission following Ring Timing~~

Item	Duration	Description
T1	500 - 700 ms	The initial burst of ring.
T2	400 – 1000 ms	The pause immediately after the initial burst of ring.
T3	3.5 sec max.	The duration of the data transmission will be a function of the amount of data to be transmitted.
T4	200 – 1500 ms	The pause between the cessation of data transmission and the first burst of cadenced ring.

Note: If the CE answers prior to or during data transmission, the transmission will cease within the time necessary for the UNI-V to detect the off-hook state and the line placed into a state to allow the incoming call to proceed.

Table 16 - On-Hook Data Transmission following Ring Timing

~~6.3.2.~~8.3.2. On-Hook Data Transmission without Ring

This signalling case is intended for transfer of data for applications requiring a Visual Message Waiting Indication.

~~It is not intended that the~~The UNI-V will not present pre or post data transmission signal (Line Polarity Reversal or an Open Switching Interval). ~~They~~References to pre or post data transmission signals have been included in this ~~discussion~~document for ~~informative~~contextual information and background ~~should other~~. The access seeker may consult the provided references to third party documents for further information about pre and post data transmission signals that may be ~~consulted~~used by a Customer Product which relies on the UNI-V functionality described in this document.

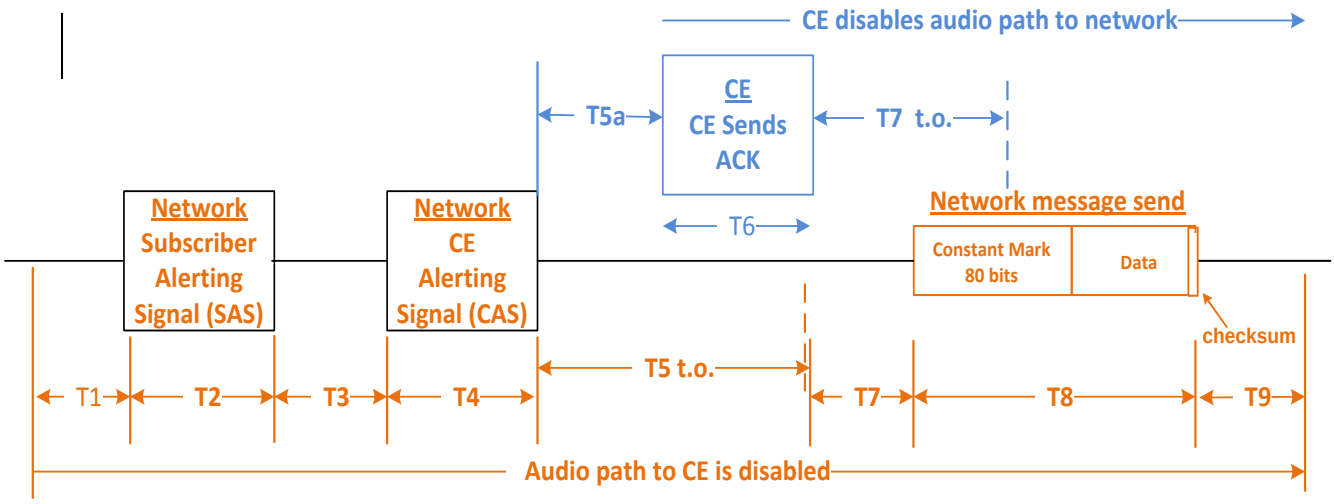
~~6.3.3.~~8.3.3. Data Transmission during Off-Hook State

For data transmission to occur while the ~~CE~~CPE is in an Off-Hook state, the audio path ~~should~~must be disabled within the ~~CE~~CPE to allow the UNI-V to communicate with the modem contained ~~therein~~in the CPE. This is achieved by using the ~~CE Alerting Signal~~CPECAS to initiate a modem session and control of the telephony connection as described below.

The sequence of events for Off-Hook data transmission is as follows:

a) The UNI-V disables the audio path in both directions.
b) The UNI-V applies a SAS to the local ~~CE~~CPE.
c) The UNI-V applies a CAS to the ~~CE~~local CPE.
d) The ~~CE~~local CPE responds by muting its audio path in both directions and then transmitting an ACK signal.
e) The UNI-V receives the ACK, then applies the data sequence and enables the audio path at completion.
f) The ~~CE~~CPE receives the data sequence and enables the audio path at completion.

Note: For a single line service with multiple ~~CE~~CPE connected in parallel ~~it is assumed that~~, the UNI-V will only support one of the multiple parallel ~~CEs~~CPEs is engaged in the call. Thus ~~only the CE in the Off-Hook state should~~CPE may send the ACK signal in response to receiving a CAS whilst only in the Off-Hook state.



Item	Duration	Description
T1	0 - 60 ms	Pause from the UNI-V disabling the audio path to the CE and the commencement of the SAS.
T2	250 - 1000 ms	Duration of the SAS.
T3	0 - 80 ms	Pause between SAS and CAS.
T4	80 - 85 ms	Duration of CAS.
T5a	0 - 100 ms	Note: This is a CE specification requirement ACK~~)~~ delay from CE receiving the CAS tone.
T5 t.o.	165ms max	Time out of UNI-V waiting for CE to ACK. If the UNI-V has not received the ACK by this time out, the audio path will be enabled.
T6	55 – 65 ms	Note: This is a CE specification requirement ACK duration.
T7	25 - 100 ms	Pre-data transmission pause. The UNI-V should commence data transmission within this time limit.
T7 t.o.	100 – 200 ms 200 – 500 ms	Note: This is a CE specification requirement Time out of CE waiting for Message Data. CE can stop waiting for data and can enable the CE audio path. CE must stop waiting for data and must enable the CE audio path.
T8	3.5 sec max	Data transmission – duration is feature dependent.
T9	0 – 120 ms	Enable audio path time to distant – Network and CE.

Table 17 - Off-Hook Data Transmission Timing

~~Table 9 - Off-Hook Data Transmission Timing~~

~~6.4.~~8.4. Message Structure Description

~~6.4.1.~~8.4.1. Multiple Data Message ~~Data~~ Format

~~Only Multiple Data Message Format (~~Messages will be transmitted in the MDMF~~) is required~~. MDMF allows several Parameter Messages for different features to be transmitted to the ~~CE~~called party CPE within the same Message.

~~The MDMF~~Each Message consists of a Message Header ~~followed by~~and a Message Body. The Message ~~Body consists of one or more Parameter Messages. The Message~~ Header is a two~~-~~byte field consisting of a Message Type and a Message Length. ~~Both~~Each of the Message Type and Message Length ~~are~~is one byte in length. The Message Type identifies the feature that is in use (e.g. call setup). The Message Length indicates the number of bytes in the Message Body. The Message Body consists of one or more Parameter Messages.

Message element	Content
Message Type	Message Type identification
Message Length	Total bytes in ~~this~~the Message Body
Parameter Type	Parameter Type identification
Parameter Length	Total bytes in ~~this parameter~~the Parameter Body
Parameter ~~Data~~ Body	Data (words) as required (variable length)
Parameter Type	Parameter Type identification
Parameter Length	Total bytes in ~~this~~the Parameter Body
Parameter ~~Data~~Body	Data (words) as required (variable length)
Continued…. (Parameter Messages as required)	
~~Check Sum~~Checksum	Error control – Checksum

Table 18 - Multiple Data Message ~~Data~~ Format

~~The Message Length indicates the total number of Message bytes contained in the Message Body.~~

~~The Message Body may contain several Parameter Messages.~~ Each Parameter Message ~~has a header and a body. The~~ consists of a Parameter Header ~~consists of~~ and a Parameter Body. The Parameter Header is a two-byte field consisting of a Parameter Type and a Parameter Length. Each of the Parameter Type and the Parameter Length~~. Both Parameter Type and Parameter Length are~~ is one byte ~~each.~~

~~The Parameter Length indicates the number of bytes in the Parameter Body.~~

in length.

The Parameter Type identifies the feature ~~that is in use~~ (e.g. the Calling Number Display feature~~) and its individual parameters (e.g. the time parameter). Each feature is assigned unique values for these Parameter Types.~~).

The Parameter Length indicates the number of bytes in the Parameter Body. The Parameter Body comprises data values and can be of variable length.

~~6.4.2.~~8.4.2. Error Control~~.~~

The UNI-V will generate a ~~checksum~~Checksum which is transmitted as the last byte of the ~~data message~~Message. A ~~checksum~~Checksum is appended to a ~~message~~Message to enable the ~~CE~~called party's CPE to detect any error in ~~a~~the received ~~message. The checksum consists of the two's complement of the modulo 256 sum of all the bytes in the message (i.e. from the first byte of the Message Header to the last byte of the last Parameter Data Message).~~Message.

~~The receiving equipment calculates~~Called party's CPE may calculate the modulo 256 sum of all bytes received in the ~~data message~~Message (including the Checksum value). Any result other than zero for this ~~addition shows~~calculation indicates that the ~~data message~~Message was not received correctly.

If the ~~CE~~called party's CPE detects an error, no messages are sent to the UNI-V ~~indicating,~~ which indicates that an error was detected.

8.4.3. ~~Required~~ Message Types

The Message Types in Table 19 are the Message Types which the UNI-V may use to send to the CPE.

Message type	Value (Hexadecimal)
Call setup	80
Visual Message ~~waiting notification~~Waiting Indication	82

Table 19 - ~~Required~~ Message ~~Types for MDMF~~Type Identifiers

~~6.4.3.~~8.4.4. ~~Required~~ Parameter ~~Type Messages~~Types

The following Parameter ~~Messages~~Types are ~~only used in~~those which the ~~MDMF type messages.~~ UNI-V may use to send to the CPE.

Note 1: Each byte consists of 8 bits with bit "0" being the least significant bit.
Note 2: Each character is to be coded in accordance with 8 bit ASCII with no parity.

Byte number	Value (Hexadecimal)	Meaning
1	01	Parameter Type - ~~date~~Date and ~~time~~Time
2	02	Parameter Type - Calling Number
3	04	Parameter Type - Reason for Absence of Calling Number
4	07	Parameter Type - Calling Name
5	08	Parameter Type - Reason for Absence of Calling Name
6	0B	Parameter Type - Visual Message Waiting Indicator

Table 20 - Parameter Type Identifiers

Parameter Type: Date and Time ~~and Date~~

The purpose of the Date and Time ~~and Date parameter~~Parameter Type is to indicate to the called party the time and date of the calling party's call.

The month is coded from 01 to 12. The day is coded from 01 to 31. The hour is coded in accordance with a 24 hour clock from 00 for midnight to 23 for 11 pm and the minute is coded from 00 to 59.

The Date and Time ~~and Date parameters~~Parameter Type should provide the time relevant to the UNI-V location, including allowance for daylight-saving.

~~Byte number~~	~~Value (Hexadecimal)~~	~~Meaning~~
~~1~~	~~01~~	~~Parameter Type - Date and Time~~
~~2~~	~~08~~	~~Number of bytes in parameter~~
~~3~~	~~3x~~	~~ASCII for - Tens digit of the month~~
~~4~~	~~3x~~	~~ASCII for - Units digit of the month~~
~~5~~	~~3x~~	~~ASCII for - Tens digit of the date~~
~~6~~	~~3x~~	~~ASCII for - Units digit of the date~~
~~7~~	~~3x~~	~~ASCII for - Tens digit of the hour (24 hour)~~
~~8~~	~~3x~~	~~ASCII for - Units digit of the hour (24 hour)~~
~~9~~	~~3x~~	~~ASCII for - Tens digit of the minute~~
~~10~~	~~3x~~	~~ASCII for - Units digit of the minute~~
6	3x	ASCII for - Units digit of the date
7	3x	ASCII for - Tens digit of the hour (24 hour)
8	3x	ASCII for - Units digit of the hour (24 hour)
9	3x	ASCII for - Tens digit of the minute
10	3x	ASCII for - Units digit of the minute

~~Code~~	~~Month~~
~~01~~	~~January~~
~~02~~	~~February~~
~~03~~	~~March~~
~~04~~	~~April~~
~~05~~	~~May~~
~~06~~	~~June~~
~~07~~	~~July~~
~~08~~	~~August~~
~~09~~	~~September~~
~~10~~	~~October~~
~~11~~	~~November~~
~~12~~	~~December~~
06	June
07	July
08	August
09	September
10	October
11	November
12	December

Table 21 - Parameter Type: ~~Time~~Date and ~~Date~~Time

Parameter Type: Calling ~~Line Identification (CLI)~~Number

The purpose of the ~~CLI~~Calling Number Parameter Type is to convey to the called party the CLI of the calling party.

~~CE is to~~CPE must be capable of recognising and accepting any number length transmitted from the access seeker network up to a maximum of 64 digits.

The CLI is coded as shown in Table 22.

The number transmitted should be ~~according to the~~in a form which can be used to make a return call, i.e. a "dialable" number.

Byte number	Value (Hexadecimal)	Meaning
1	02	Parameter Type – Calling Number
2	nn	Parameter Length – Number of bytes in ~~parameter~~ Parameter Body Note: max of 64 digits
3	3x	ASCII for – first digit
4	3x	ASCII for – second digit
5	3x	ASCII for – third digit
n+2	3x	ASCII for – n^{th} digit

Table 22 ~~– Calling Line Identification~~ - Parameter Type: Calling Number

Parameter Type: Reason for Absence of Calling Number

The purpose of the Reason for Absence of the Calling Number ~~parameter~~Parameter Type is to convey to the called party the reason why the Calling Number is not available for display.

The delivery of the Calling Number and the Reason for Absence of Calling Number are mutually exclusive, that is, if the Calling Number ~~Parameter~~ is contained in the ~~message~~Message, the Reason for Absence of Calling Number ~~parameter will~~must not be contained in the ~~message~~Message and vice versa.

~~Byte number~~	~~Value (Hexadecimal)~~	~~Meaning~~
~~1~~	~~04~~	~~Parameter Type – Reason for Absence of Number~~
~~2~~	~~01~~	~~Number of bytes in parameter~~
~~3~~	~~see table~~	~~ASCII for – "O" or "P"~~

~~Hex~~	~~Meaning~~
~~4F~~	~~Unavailable~~
~~50~~	~~Private~~

Byte number	Value (Hexadecimal)	Meaning
1	04	Parameter Type – Reason for Absence of Number
2	01	Parameter Length – Number of bytes in Parameter Body
3	see table	ASCII for – "O" or "P"

Hex	Meaning
4F	Unavailable
50	Private

Table 23 - ~~The~~Parameter Type: Reason for Absence of Calling Number ~~Parameter~~

Parameter Type: Calling Name ~~Parameter~~

The purpose of the Calling Name Parameter Type is to convey to the called party the name of the calling party ~~making the call.~~. This Parameter Type may also be used for other information when the Calling Name is not available, for example payphone, international call, ring-back call etc. Typically, the Calling Name ~~parameter~~ has a maximum of 15 characters, however more characters may be provided, bounded only by the 3.5 second maximum message time.

The UNI-V ~~should~~will transmit all 8-bit ASCII codes as provided by the ~~retail service provider. It should be noted that~~ access seeker.
CLI-capable ~~CE are required to~~CPE should accept all ASCII characters, however they are only required to display ASCII codes in the range 20h to 7Eh (i.e. the printable characters, including ~~space~~spaces).

Byte number	Value (Hexadecimal)	Meaning
1	07	Parameter Type – Calling Name
2	nn	Parameter Length – Number of bytes in ~~parameter~~ Parameter Body
3	xx	ASCII for – first character
4	xx	ASCII for – second character
5	xx	ASCII for – third character
n+2	xx	ASCII for – n^{th} character

Table 24 - Parameter Type: Calling Name ~~Parameter~~

Parameter Type: Reason for Absence of Calling Name ~~Parameter~~

The purpose of the Reason for Absence of Calling Name Parameter Type is to convey to the called party the reason why the calling party's name was withheld. This Parameter Type may be sent for one the following reasons:

(a) ~~The Calling Party~~the calling party withholds the delivery of their name;
(b) ~~The~~the Calling ~~Party~~ Name is not available; or
(c) ~~The~~the Calling ~~Party~~ Name has not been delivered to the called party.

The delivery of the Calling Name and ~~The~~the Reason for Absence of Calling Name are mutually exclusive. That is, if the Calling Name ~~Parameter~~ is contained in the ~~message~~Message, the Reason for Absence of Calling Name ~~Parameter~~ is not contained in the ~~message~~Message and vice versa.

Byte number	Value (Hexadecimal)	Meaning
1	08	Parameter Type – Reason for Absence of Name
2	01	Parameter Length – Number of bytes in ~~parameter~~Parameter Body
3	see table	Parameter value

~~Hex~~	~~Meaning~~
~~4F~~	~~ASCII "O" unavailable~~
~~50~~	~~ASCII "P" private~~

Hex	Meaning
4F	ASCII "O" unavailable
50	ASCII "P" private

Table 25 - ~~The~~Parameter Type: Reason for Absence of Calling Name ~~Parameter~~

Parameter Type: Visual Message Waiting Indicator ~~parameter~~

The purpose of the Visual Message Waiting Indicator Parameter Type is to switch on or off the ~~CE~~CPE Visual Message Waiting Indicator (i.e. to indicate the presence of a waiting ~~messages~~voicemail message).

Note: Stuttered Dial Tone may be provided by the UNI-V in association with the Visual Message Waiting Indicator feature.

Note: Visual Message Waiting Indicator (ON or OFF) may periodically be sent by the access seeker softswitch, via the UNI-V to the ~~CE in order~~CPE. This is done to ensure synchronization of the ~~status of the~~ Visual Message Waiting Indicator~~.~~ on the CPE, with the access seeker softswitch

Byte number	Value (Hexadecimal)	Meaning
1	0B	Parameter Type – Visual Message Waiting Indicator
2	01	Parameter Length – Number of bytes in ~~parameter~~Parameter Body
3	see table	Parameter value

~~Hex~~	~~Meaning~~
~~FF~~	~~Indicator ON~~
~~00~~	~~Indicator OFF~~

Hex	Meaning
FF	Indicator ON
00	Indicator OFF

Table 26 - Parameter Type: Visual ~~Indication Parameter~~Message Waiting Indicato

Example 1:

Call from 0123456789 at 6:30pm on 1 July

Byte number	Value (Hexadecimal)	Value (ASCII)	Comment
1	80		Call setup
2	16		Message Length
3	01		Time & date
4	08		Parameter Length
5	30	0	July
6	37	7	
7	30	0	~~1'st~~1st
8	31	1	
9	31	1	6 pm
10	38	8	
11	33	3	30 minutes
12	30	0	
13	02		Calling Number
14	0A		Parameter Length
15	30	0	
16	31	1	
17	32	2	
18	33	3	
19	34	4	
20	35	5	
21	36	6	
22	37	7	
23	38	8	
24	39	9	
25	B4		Checksum

Table 27 - CND Example 1

Example 2:

Call from a restricted number at 6:30pm on 1 July.

Byte number	Value (Hexadecimal)	Value (ASCII)	Comment
1	80		Call setup
2	0D		Message Length
3	01		Time & date
4	08		Parameter Length
5	30	0	July
6	37	7	
7	30	0	~~1'st~~1st
8	31	1	
9	31	1	6 pm
10	38	8	
11	33	3	30 minutes
12	30	0	
13	04		Reason for Absence of Number
14	01		Parameter Length
15	50	P	Restricted (Private)
16	81		Checksum

Table 28 - CND Example 2

Example 3:

Call with name and number at 6:30pm on 1 July.

Byte number	Value (Hexadecimal)	Value (ASCII)	Comment
1	80		Call setup
2	22		Message Length
3	01		Time & date
4	08		Parameter Length
5	30	0	July
6	37	7	
7	30	0	~~1'st~~1st
8	31	1	
9	31	1	6 pm
10	38	8	
11	33	3	30 minutes
12	30	0	
13	02		Calling Number
14	0A		Parameter Length
15	30	0	
16	31	1	
17	32	2	
18	33	3	

19	34	4	
20	35	5	
21	36	6	
22	37	7	
23	38	8	
24	39	9	
13	07		Calling Name
14	0A		Parameter Length
15	46	F	
16	72	r	
17	65	e	
18	64	d	
19	20	space	
20	4A	J	
21	6F	o	
22	6E	n	
23	65	e	
24	73	s	
25	F7		Checksum

Table 29 - CND Example 3

Example 4:

VMWI ON Message

Byte number	Value (Hexadecimal)	Value (ASCII)	Comment
1	82		Call setup
2	03		Message Length
3	0B		Visual Message Waiting Indicator
4	01		Parameter Length
5	FF		Indicator ON
6	70		Checksum

Table 30 - CND Example 4

~~7.~~9. Fax and Modem capability

This section describes the ~~capability of the~~ UNI-V functionality for ~~the~~ carriage of facsimile and voice-band modem services.

~~It should be noted that the~~The performance of these services is ~~also~~ very much dependent on the performance of the end-to-end telephony service which includes both NBN Co and ~~customer~~access seeker networks, as well as third party service provider networks. In particular, the negotiated (and renegotiated) sync rates and stability of any connection will be dependent on the performance of the end-to-end connection and the capabilities and behaviours of the modems themselves.

~~7.1.~~9.1. Answer Tone Detection

The answer tones indicate to equipment in the call path to disable echo suppressors and echo cancellers. An uninterrupted 2100Hz tone is used to disable echo suppressors, while a 2100Hz tone with phase reversals is used to disable echo suppressors and echo cancellers.

The presence of low frequency amplitude modulation is used to indicate between ~~DCE's~~DCEs the need for ITU-T Recommendation V.8: 2000 features. The presence of this amplitude modulation within the ITU-T Recommendation V.8: 2000 specification should not affect the detection of echo suppressor or echo canceller disabling signals.

~~7.1.1.~~9.1.1. Echo Suppressor Disabling

The UNI-V ~~should~~will recognise an answer tone with the following characteristics and configure echo suppressors accordingly:

Parameter	Should disable echo suppressors	May disable echo suppressors
Frequency	2079Hz to 2121Hz	1900Hz to 2350Hz
Level	0dBm0 to -31dBm0	-31dBm0 to -35dBm0
Duration	400ms to 4000ms	Not specified
Off-Hook to answer tone delay	0 to 3000 ms	Not specified

Table 31 - Answer Tone Characteristics

~~7.1.2.~~9.1.2. Echo Canceller Disabling

The UNI-V ~~should~~will recognise an answer signal with the following characteristics and disable any echo cancellers and echo suppressors present:

a) The same frequency, level and timing characteristics as the answer signal in section 9.1.1~~,~~ ~~and,~~ of this document with the addition of phase reversals of the 2100Hz signal at intervals of 450ms ± 25ms.
b) The phase reversals must be detected in the range of 180º ± 25º while phase reversals in the range of 0º ± 110º ~~must~~will not be detected.
c) The detector should operate correctly with white noise less than or equal to 11dB below the level of the 2100Hz signal.

The UNI-V ~~should~~will not disable any echo cancellers until it has recognised at least two consecutive phase reversals.

9.2. V-Series Modem Base Level Support

The following V-Series modem protocols are supported by the NTD UNI-V interface:

Modem technology	Bit rates (bps)
V.21	300
V.22	1200
V.22bis	1200, 2400
V.23 (for FSMS)	1200
V.32	4800, 9600
V.32bis	Up to 14400
V.34	Up to 14400

Table 32 ITU-T V-Series Modem Base Level Support

9.3. T.30 Fax Support Base Level Support

The UNI-V supports fax machines that are compliant with ITU-T T.30 using the following V-Series modem technologies and bit rates:

Modem technology	Bit rates (bps)[1]
V.21 (for protocol signalling)	300
V.27	2400, 4800
V.29	7200, 9600
V.17	9600
V.34	9600

Table 33 - ITU-T Fax V-Series Modem Support

1. Note: If connection at these speeds is unsupported by CPE, the UNI-V allows successful negotiation to a lower speed.

~~8.~~10. REFERENCES

Australian Standards		
~~[1]~~	Australian Standards AS 1000-1979	The International System of Units (SI) and its application
~~[1]~~	AS/CA S002:2010	Analogue interworking and non-interference requirements for Customer Equipment for connection to the Public Switched Telephone Network
~~[1]~~	AS/NZS 60950.1:2011	Information technology equipment - Safety - General requirements
~~[1]~~	AS/NZS CISPR22:2009	Information technology equipment - Radio disturbance characteristics
~~[1]~~	AS/NZS 4665.1 and AS/NZS 4665.2	Performance of external power supplies
~~[1]~~	AS/CA S003.1:2010~~,~~ AS/CA S003.2:2010~~,~~ AS/CA S003.3:2010	Requirements for Customer Access Equipment for connection to a Telecommunications Network
ITU-T		
~~[1]~~	ITU-T Rec. Q.23 (11/88)	Technical features of push-button telephone sets
~~[1]~~	ITU-T Rec. G.712 (1101)	Transmission performance characteristics of pulse code modulation channels
~~[1]~~	ITU-T Rec. P.862 and P.862.1	Perceptual evaluation of speech quality
Telcordia (IP owner of Bellcore Standards)		
~~[1]~~	GR-30-CORE	Voice band Data Transmission Interface
~~[1]~~	GR-31-CORE (formally TR-NWT-000031)	CLASS^{SM} Feature: Calling Number Delivery
~~[1]~~	GR-575-CORE (formally TR-NWT-000575)	CLASS^{SM} Feature: Calling Identity Delivery on Call Waiting -
~~[1]~~	GR-1188-CORE	CLASS^{SM} Feature: Calling Name Delivery Generic Requirements
~~[1]~~	GR-1401-CORE	Visual Message Waiting Indicator Generic Requirements
Broadband Forum		
	TR-069 Amendment 1	CPE WAN Management Protocol v1.1
	TR-104	DSLHome^{TM} Provisioning Parameters for VoIP CPE

~~9.~~11. Definitions

The following words, acronyms and abbreviations are referred to in this document.

Term	Definition
AC	Alternating Current
ACK	Acknowledgment
ACS	Auto-Configuration Server
AS	Australian Standard
CAS	Customer Equipment Alerting Signal
~~CE~~CPE	Customer Premises Equipment
CND	Caller Number/Name Display
DC	Direct Current
DCE	Data Communications Equipment
DTMF	Dual Tone Multi Frequency
EMC	Electromagnetic Compatibility
ETSI	European Telecommunications Standards Institute
FSK	Frequency-Shift Keying
MDMF	Multiple Data Message Format
MOS	Mean Opinion Score
PSD	Power Spectral Density
PSTN	Public Switched ~~Telephony~~Telephone Network
REN	Ringer Equivalence Number
RMS	Root Mean Squared
SAS	Subscriber Alerting Signal
VBD	Voice-Band Data
VMWI	Visual Message Waiting Indicator

Technical Definitions

Term	Definition
~~Alerting Signal~~	~~Subscriber alerting signal (SAS) or CE alerting signal (CAS)~~
Answer Signal	A signal indicating that the called party has answered the call.
Caller ID	A method for conveying the number/name details of the calling party.
~~Calling Line Number~~	~~A method for conveying the number of the calling party~~
Calling Name	A ~~method for conveying the name of~~Parameter Type used to convey the calling party name.
Calling Number	A ~~method for conveying the number of~~Parameter Type used to convey the calling party number.
~~Calling Party~~	~~Originating party details~~
Carrier	~~Carrier means a~~A carrier as defined in the Telecommunications Act 1991, and includes both fixed and mobile carriers.
Checksum	A ~~Checksum is a appended to a message to enable~~calculation and its corresponding value, used for the ~~receiver (e.g. the CE) to detect any~~ purpose of error ~~in the transmitted message. The Checksum consists~~detection, consisting of the two's complement of the modulo 256 sum of all the bytes in ~~the~~a Message (i.e. from the first byte of the Message Header to the last byte of the last Parameter ~~Data~~ Message).
Clear Back Signal	A method of registering the clearing/releasing of a connection.
Customer Equipment Alerting Signal (CAS)	A signal sent to the CPE from its serving carrier's exchange equipment for the purpose of being detected by the CPE to initiate certain actions.
Customer Premises Equipment (~~CE)~~ CPE)	~~Customer~~ Equipment ~~means equipment~~ that is, or is intended to be, connected to a telecommunications network operated by a carrier, other than equipment that is used, or intended for use, within the boundaries of such a network.
~~Customer Equipment Alerting Signal (CAS)~~	~~Customer Equipment Alerting Signal (CAS) is a signal sent to the CE from its serving carrier's exchange equipment for the purpose of being detected by the CE to initiate certain actions.~~
Facility Signal	Recall / hookflash functionality.
Hold	A method for temporarily suspending a call in progress.
Line Polarity Reversal	A method for signalling used in specialised applications~~-~~.
Line Release Signal	A method of registering the clearing/releasing of a connection.
Mark	A ~~Mark is a~~ single bit set to the logic value '1'.
Mark Signal	~~A Mark Signal is a~~A string of mark bits sent immediately before the message starts to alert the ~~CE~~CPE.

Term	Definition
Message	A Message ~~consists of a Message~~ Header and a Message Body~~.~~ (together).
Message Body	~~Only MDMF will be provided. For the MDMF, the Message Body consists~~Data consisting of one or more Parameter Messages.
~~Message Frame~~	~~A Message Frame consists of Channel Seizure Signal, the Mark Signal, the Message, the Checksum Word and any possible filler mark bits.~~
Message Header	A ~~Message Header consists~~two-byte field consisting of a Message Type and a Message Length.
Message Length	~~Message Length is~~A one-byte field with a value which identifies the number of ~~Message~~ bytes in a Message Body.
Message Type	~~Message Type is~~A one-byte field with an assigned value used to identify how the remainder of the ~~message~~Message is to be interpreted by the ~~CE~~CPE.
~~Multiple Data Message Format~~	~~The Multiple Data Message Format consists of a Message Header and a Message Body containing Parameter Messages.~~
~~Multiple Message~~	~~Caller ID protocol~~
Off-Hook	~~Off-Hook is the~~The state of the equipment when the ~~CE~~CPE has an electrical configuration that enables the current in the basic network loop to be at its maximum steady-state value.
On-Hook	~~On-Hook is the~~The state of the equipment when the ~~CE~~CPE has an electrical configuration that ~~enables~~disables the current in the basic network loop ~~to be at its minimum steady-state value.~~
Open Switching Interval	A Disconnection supervision signal.
Parameter Body	~~A Parameter Body consists~~Data consisting of Parameter bytes ~~for the Multiple Data Message Format only~~.
Parameter Header	A ~~Parameter Header consists~~two-byte field consisting of a Parameter Type and a Parameter Length.
Parameter Length	~~Parameter Length is~~A one-byte field with a value which identifies the number of bytes in the Parameter Body.
Parameter Message	A Parameter ~~Message consists of a Parameter~~ Header and a Parameter Body (~~for MDMF only~~together).
Parameter Type	A ~~Parameter Type is~~ one-byte field with an assigned value used to identify ~~an individual parameter to~~ how the ~~feature generating~~remainder of the ~~message.~~ Parameter Body is to be interpreted by the CPE.
~~Physical Layer~~ Reason for Absence of Calling Name	~~The Physical Layer specifies the electrical properties and capability for analogue transmission and special signalling.~~ A Parameter Type used to indicate the reason for the absence of the calling party name.
Reason for Absence of Calling Number	A ~~parameter for indicating~~Parameter Type used to indicate the reason ~~of~~for the absence of the ~~Calling Line name or~~calling party number.

Term	Definition
Return Loss	The loss of signal power because of a discontinuity between mismatched terminating loads.
Ring Signal	A signal for indicating an incoming call.
Seize	A signal for initiating the transition from idle to seized state.
Signal	~~Signal is a~~A physical phenomenon one or more of whose characteristics may vary to represent information.
~~Single Message~~	~~Caller ID protocol~~
Space	A ~~space is a~~ single bit set to the logic value '0'.
Stuttered Dial Tone	An interrupted audible dial tone for indicating a voicemail message waiting.
Subscriber Alerting Signal (SAS)	~~A Subscriber Alerting Signal (Call Waiting Tone) is a~~A tone that is intended to alert the ~~customer~~called party, but not necessarily to be detected by the ~~CE~~CPE.
Timed Loop Break	A method for invoking a hookflash for a predetermined period (~~Ege.g~~. Recall/Flash button~~)~~).
Visual Message Waiting Indication	A visual method of indicating the presence of a waiting voicemail message ~~is waiting~~.
Visual Message Waiting Indicator	~~The visual indicator (Eg. LED) indicating~~A Parameter Type used to indicate the presence of a waiting voicemail message ~~is waiting~~by visual means (e.g. by activating an LED on CPE).
Wholesale Broadband Agreement	An agreement entered into between NBN Co and the access seeker for the purpose of the access seeker acquiring services by NBN Co, including the NFAS.

~~10.~~12. Known issues

~~A number of minor issues / non-compliances pertaining~~The features and functionality described in this document are subject to the ~~first release UNI-V have been observed.~~ following known issues.

NBN Co intends to ~~rectify~~address these known issues in future releases of the UNI-V.

1) **Overmodulation of ~~dialtone~~Dial tone, service tone levels non-compliant**

Overview

~~Dialtone~~Dial tone is presented to ~~end users~~End Users and ~~CE~~CPE to denote the readiness of the telephony service to accept ~~dialing~~dialling.

Issue

A slight overmodulation and hence minor imperfection to the ~~dialtone, ringing~~Dial tone, Ringing (ringback) tone and ~~stutter~~Stutter dial has been observed. This overmodulation can be observed on an oscilloscope as an additional sidelobe. Discerning users might notice a minor difference compared to ~~dialtone~~Dial tone they receive on other networks within the Australian PSTN. ~~Additionally, it has been observed that:~~

- ~~'Busy tone' is approximately 1.9dB louder than specified;~~
- ~~'Number unobtainable tone' is approximately 2.4dB louder than specified; and~~
- ~~Call waiting beeps are approximately 1.1dB louder than specified.~~

Additionally, it has been observed that service tones were non-compliant and generally louder than required.

Assessment

NBN Co has investigated the issue and as a result of that investigation rates this issue as a low impact issue. NBN Co expects a high level of compatibility of the current ~~dialtone~~Dial tone with CPE.

Potential solution / work-around

There is no workaround for this issue at present; however, NBN Co intends to address this issue ~~is intended to be rectified~~ in a future release of the UNI-V.

2) **Recall timer**

Overview

As per the AS/CA S002:2010 standard, recall timing should be detected by the UNI-V within a window of ~~no less than 35ms and no greater than 145ms~~40ms and 140ms.

Issue

The ~~first~~second release UNI-V can detect recall functionality between ~~85ms~~46ms and ~~145ms.~~154ms (indoor NTD) and 56ms to 161ms (outdoor NTD). Some ~~CE~~CPE may not be able to invoke recall functionality because of this reduced timing window.

Assessment

~~Some CE~~This is a significant improvement on the first release of the UNI-V, reducing the impact such

that NBN Co considers it unlikely that issues will occur. In the event that an issue does occur, the CPE or manual use of the telephone hook switch may not invoke recall functionality because the recall timing is too short.

Potential solution / work-around

There is no workaround for this issue~~,~~; however, NBN Co intends to address this issue ~~has been remedied for the next~~in a future release of the UNI-V.

3) **Calling Number Display Timing**

Overview

Calling ~~number display~~Number Display is used by ~~end users~~End Users and ~~CE~~CPE to identify the ~~originating caller's telephone~~calling party's number.

Issue

The timing of the signals between the UNI-V and the ~~end user's~~End User's handset do not fully comply with NBN Co's specification and hence the UNI-V does not mute the far-end caller during the Calling Number Display interaction in the call waiting case. This may result in the ~~NBN Co end user~~called party not hearing the first call waiting pips. The ~~end user~~called party will however hear the subsequent call waiting pips.

There is a small chance that the calling number signal to the handset is corrupted by signals (voice etc.) generated by the far-end user.

Assessment

NBN Co has investigated the issue and has determined the issue to be of low impact.

Potential solution / work-around

There is no workaround for this issue; however, NBN Co intends to address this issue ~~is intended to be remedied~~ in a future release of the UNI-V.

4) Calling Number Display time and date

Overview

During calling number signalling exchange, time and date is provided by the UNI-V to ~~customer equipment~~CPE.

Issue

Calling number time and date is not delivered to ~~customer~~the called party in a reliable manner.

Assessment

NBN Co has investigated the issue and as a result of that investigation rates this issue as a low impact issue.

Potential solution / work-around

There is no workaround for this issue, however NBN Co intends to address this issue in a future release of the UNI-V.

5) Line Release (Clear Forward) – release timer out-of-spec.

Overview

When a call is originated from a UNI-V port it has been found that a line release signal of greater than 420ms is required to release the call.

Issue

Where an End User utilising a UNI-V is terminating an originating call the handset must be replaced

(or the hook switch depressed) for a minimum of 420ms if an immediately subsequent call is to be made.

It is clear to the subscriber if the line release has not been successful because dial tone will not be presented and, possibly, the original call will still be in effect due to a re-answer timer. In this case the End User can attempt to release the call again.

Assessment

NBN Co has investigated the issue and as a result of that investigation rates this issue as a low impact issue.

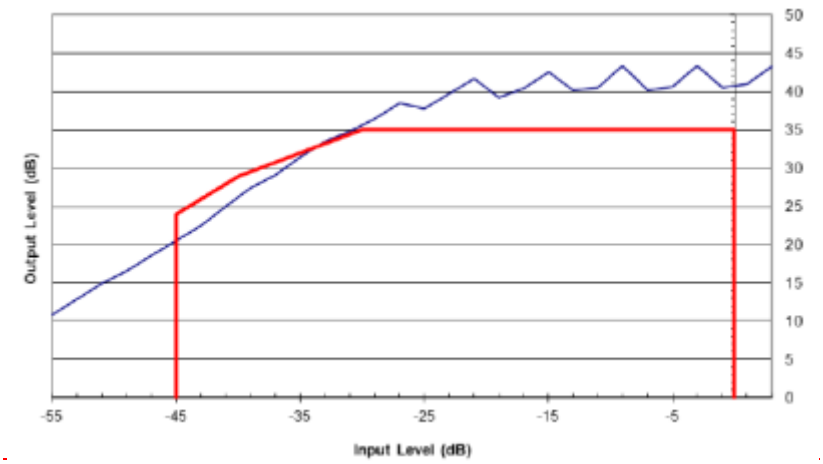
~~***Potential solution / work-around***~~

~~There is no workaround for this issue, however this issue is intended to be remedied in a future release of the UNI-V.~~

~~**5) Total Distortion**~~

~~***Issue***~~

~~A minor distortion occurs in the digital to analogue path of the UNI-V (network to UNI-V). There is a slight cross inside the allowable mask.~~



Potential solution / work-around

An End User utilising a UNI-V may need to hold the hook button down (or replace the handset) for a little longer than implied by the specifications if wishing to make another call after terminating the original call – this applies only in the case of where the End User is originating calls. In other cases the re-answer timer is in force.

If the line is not released successfully, it is obvious to the End User because dial tone is not presented, and the End User can try again.

6) Noise Test results (Single Freq and Idle Channel)

Overview

The idle channel performance has been found to be marginally outside the specified performance in some cases.

Issue

The testing of the UNI-V has revealed that the UNI-V has some minor impact non-compliances for Idle Channel noise.

Single Frequency Noise (Wideband): <2dB Out-of spec on Indoor NTD only.

Single Frequency Noise (Narrowband): Measured -68.11 dBm0p on Outdoor NTD only

Idle Channel Weighted Noise: Measured -70.5 dBmp for D->A half channel on Outdoor NTD only.

Assessment

NBN Co has investigated the issue and as a result of that investigation rates this issue as a low impact issue.

~~Independent testing has shown no effect to MOS calculations or modem performance and that the distortion is not audible to the ear.~~

Potential solution / work-around

There is no workaround for this issue, however this issue is ~~being investigated by NBN Co~~under investigation.

~~**Service**~~

~~6)~~7) G.168 Answer Tones Sensitivity

Overview

~~Service~~The UNI-V Answer Tone Detector sensitivity has been found to be outside the specified sensitivity with respect to G.168.

Issue

Operation failed at 0dBm0 but worked correctly at or below -4dBm0. Despite typical installations consisting of near-zero line length, it would be unlikely for fax/modem equipment to output answer tones at such a high signal level as ~~dial, ringing, ring back, busy and number unobtainable.~~ to cause mis-operation (eg. output levels around -10dBm [i.e. -13dBm0] would be more typical).

~~***Issue***~~

~~Calling number time and date is not delivered to customer in a reliable manner.~~

Assessment

NBN Co has investigated the issue and as a result of that investigation rates this issue as a low impact issue.

Potential solution / work-around

There is no workaround for this issue~~;~~, however~~,~~ NBN Co is investigating how it may address this issue ~~is intended to be remedied in a future release of the UNI-V~~.

