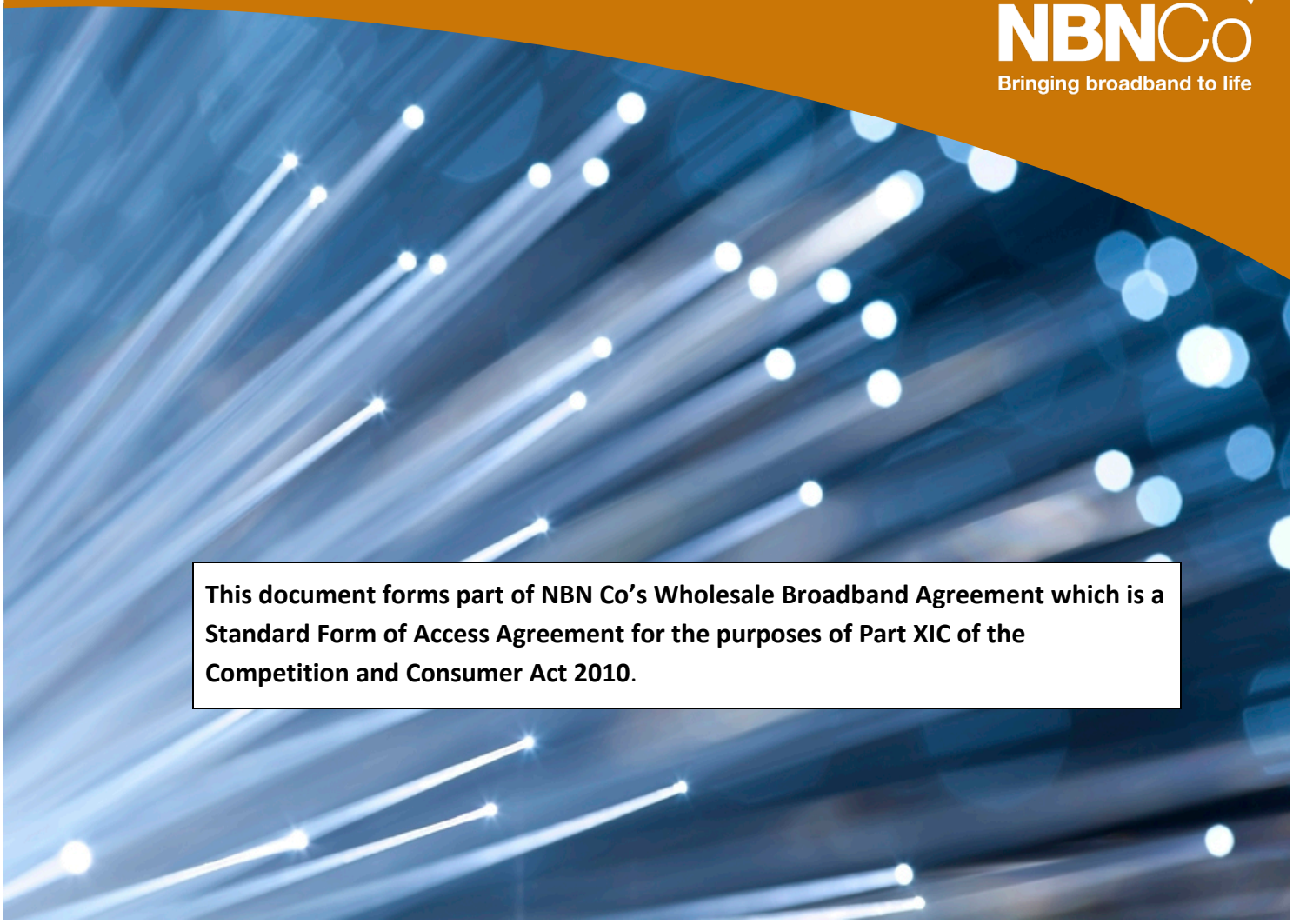
# NBN Co Fibre Access Service

UNI-V ELECTRICAL SPECIFICATION – ~~FOURTH~~ FIFTH RELEASE

**~~02 JULY~~28 AUGUST 2013**

NBNCo
Bringing broadband to life



**This document forms part 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 – ~~Fourth~~ Fifth Release**

~~02/07~~28/08/2013

Version: 45.0

## Copyright



## 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.

# Table of Contents

# Summary of Tables

# Summary of Figures

# 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 current 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.

## 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.

## 1.4. Overview

The NBN Co UNI-V has been designed with the intention that it will be compatible with a large proportion of customer premises equipment (**CPE**) and cabling commonly connected to the Australian PSTN. However, there may be 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 to improve interoperability.

## 1.5. Definitions

The table in section 11 of this 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 NBN Co Ethernet Bitstream Service 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 this release of the UNI-V, only the first~~ and both UNI-V 2-wire interface ~~is~~ are 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:

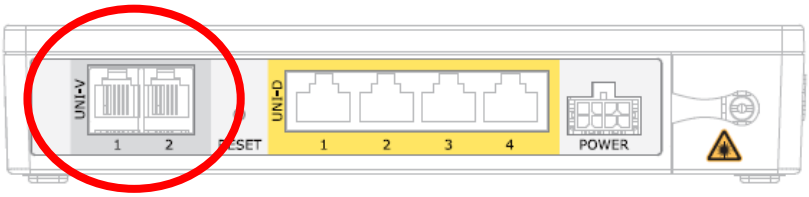



**Figure 1 - Indoor NTD port layout**

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

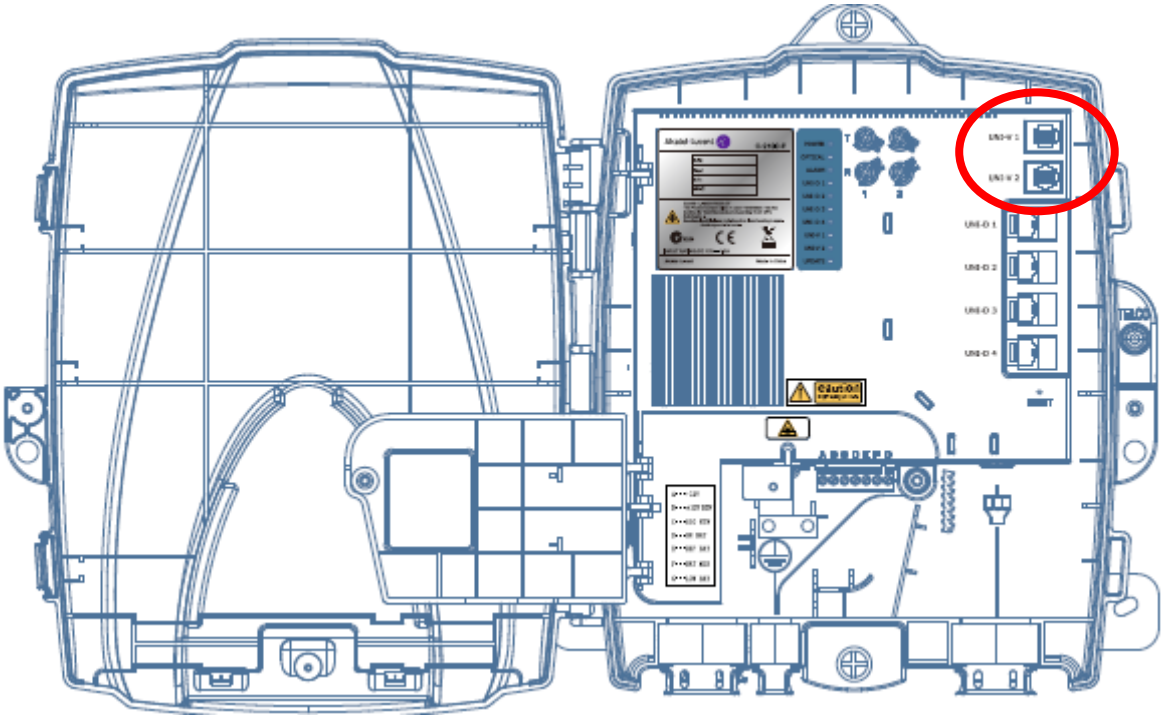


**Figure 2 - Outdoor NTD port layout**

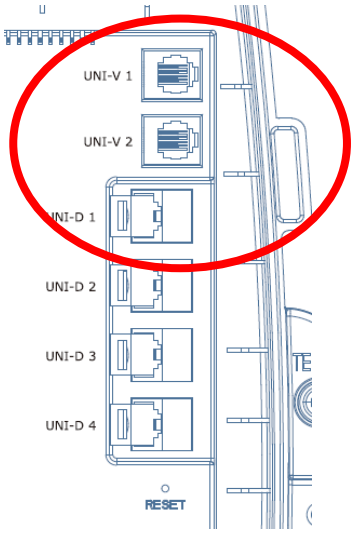



**Figure 3 - Outdoor NTD port layout, close up**

## 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 6.4 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.

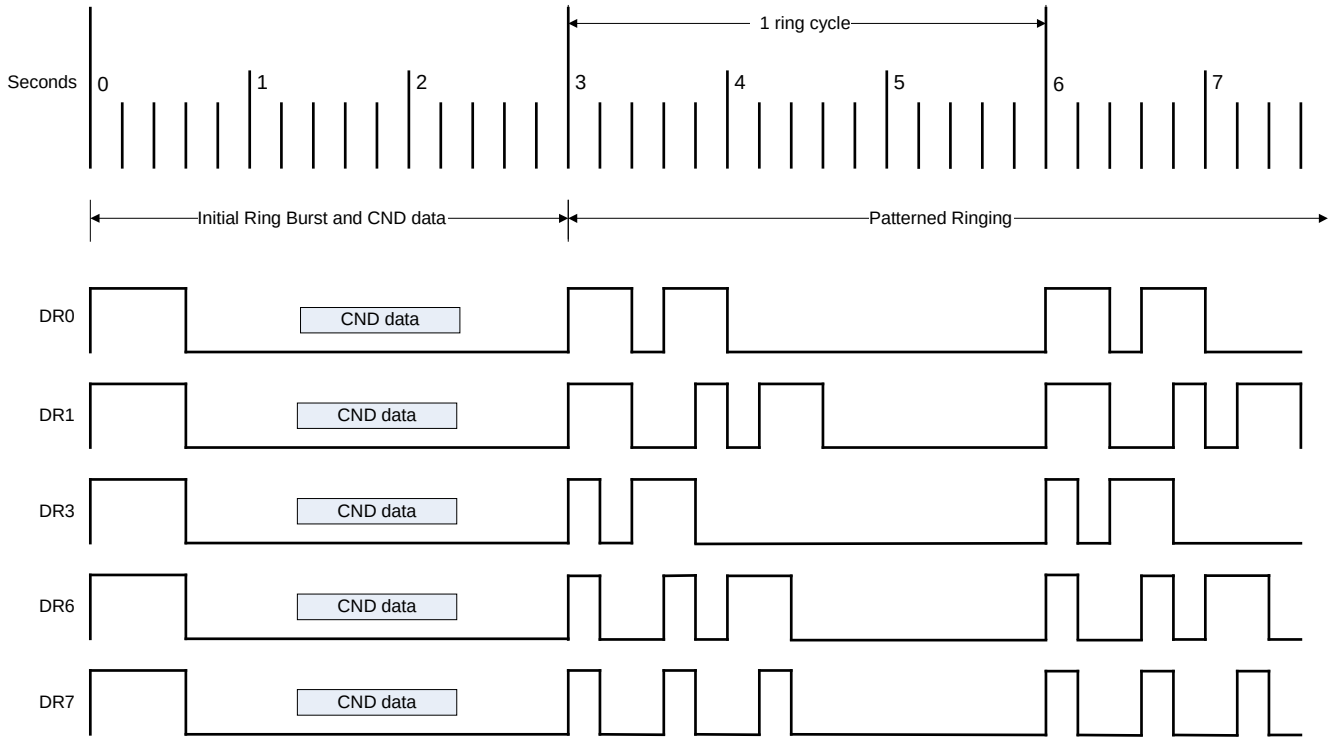



Figure 4 - Supported Ring Cadences

There is an initial burst of ringing for approximately 600ms. Following that, there is a period of up to 2300ms when a burst of FSK signalling can occur if CND is enabled. Subsequent to that, the requested ring cadence is initiated. Typically, the burst of FSK will be maintained for approximately 1000ms in duration.

## 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.

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 second (phase reversals each 450ms)<br>ANS is defined in ITU-T Rec V.25 |
| ANSam | 2100 Hz | amplitude-modulation<br>ANSam is defined in ITU-T Rec V.8 |
| /ANSam | 2100 Hz | phase reversal and amplitude-modulation<br>/ANSam is defined in ITU-T Rec V.8 |
| T.30 CNG | 1100Hz | ON for 0.5 seconds, OFF for 3 seconds<br>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 and NBN Co Ethernet Bitstream Service Product Technical Specification.

~~. 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.~~

### ~~2.12.~~2.10. Battery run-time

The run-~~-~~time of the battery back-up power supply is as described in the NBN Co Ethernet Bitstream Service Product Technical Specification.

~~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.~~

## ~~2.47.~~2.11. RFC2833 transport of DTMF

The NTD can be configured using TR-069/TR-104 to transport DTMF signals as RTP Events across an IP network as described IETF RFC2833. The NTD will offer RFC2833 carriage in the INVITE for an originating call if the NTD is configured to do so and the capability is successfully negotiated during call establishment. Otherwise, the NTD will transparently pass the DTMF signals as "audio" in-band in the RTP media stream.

### ~~2.47.1.~~2.11.1. DTMF Interception

When operating in the RFC2833 mode, the NTD intercepts DTMF signals at ingress to the UNI-V and generates RTP DTMF events addressed to the recipient of the RTP media established during SIP.

The performance of the ingress DTMF detector is specified in section 6.2 of this document.

Once a DTMF digit is detected it (and any other audio present) is suppressed in the RTP "audio" media except for the small portion of the DTMF signal.

The RTP DTMF Events are generated with the Volume field set to zero.

The RTP DTMF End Events are repeated twice (for a total of three end events) for robustness.

### ~~2.47.2.~~2.11.2. DTMF Reconstruction

Incoming RTP DTMF events are reconstructed as a DTMF electrical signal at the UNI-V egress.

The RFC2833 DTMF events contain information on the length of the event and the NTD uses this to reconstruct the output electrical DTMF signal. It should be noted that the NTD reconstructs DTMF signals with a minimum of 50ms duration. That is, incoming RTP Events that indicate a length of less than 50ms are always reconstructed as 50ms DTMF signals at the egress of the NTD UNI-V.

The level of the reconstructed DTMF is specified in section 6.3 of this document.

# 3. UNI-V 2-wire interface capability

## 3.1. Background

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

## 3.2. Regulatory Requirements

The UNI-V 2-wire interface complies with specifications in Table 8~~Table 9~~.

| Item | Regulatory item | Specification |
|---|---|---|
| **1** | **Safety** | AS/NZS 60950.1:2011<br>(Refer to section 3.3 of this document) |
| **2** | **EMC** | AS/NZS CISPR22:2009<br>Class B |
| **3** | **MEPS** | AS/NZS 4665:2006 |

**Table 8 - Regulatory Requirements**

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

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

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

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

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

a. the requirements of AS/CA S008:2010; and

b. installation in accordance with the requirements of AS/ACIF S009:2013; and

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

Access seeker must ensure that End Users, installers and other contractors only connect the UNI-V to cabling and equipment in accordance with these requirements.

## 3.4. Off-Hook resistance budget

The general case is based on the typical scenario for Off-Hook resistance budget set out in Table 9~~Table 10~~.

| Component | Resistance | Notes |
|---|---|---|
| Standard CPE | 500 Ω | |
| One standard series device | 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 Ω | Or 150m (300m loop) of 0.5mm diameter copper |
| Margin | 23 Ω | |
| Total | 700 Ω | Off-Hook DC loop resistance |

**Table 9 - 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 Ω/km and 0.5mm copper wire having 84.22 Ω/km.

## 3.5. Immunity to Overvoltage Conditions

The UNI-V 2-wire interface 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 10~~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, 200 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<br>0.2 on 4.4 off<br>(for 45 seconds) | -20dBm0 ± 1.5 | -29dBm ± 1.5 |
| Howler | 950 Hz to 2500Hz (Approx.) | Audible equivalent to: continuous, sweep/stepped frequency and/or graduated level | N/A | No tones less than -20dBm and no tones shall be greater than +10dBm |

**Table 10 - 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 10~~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).

# 5. UNI-V 2-wire interface Electrical Characteristics

## 5.1. Idle Condition

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

## 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.

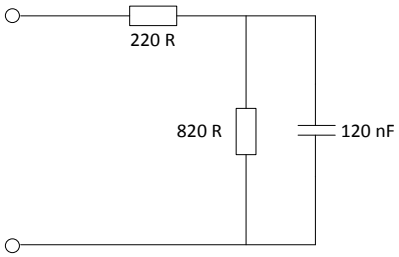



Figure 5 - TN12 impedance

## 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).

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

## 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.

## 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.

# 6. UNI-V 2-wire interface Signalling

## 6.1. DC Signalling

### 6.1.1. Line Seizure and Hold

(a) The UNI-V 2-wire interface should detect the application of a resistive termination up to 700 Ω within 300 ms.

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

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

### 6.1.2. Line Release (Clear Forward)

The UNI-V 2-wire interface should recognise 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.

### 6.1.3. Line Release (Clear Back)

At the completion of a call:

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

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

(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.

### 6.1.4. Re-Answer Signal

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

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

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

### 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:

a) it 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

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

## 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 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.

### 6.2.1. Immunity to DTMF False Detection in Send Direction

The 2-wire port, when operating in RFC2833 DTMF out-of-band mode, complies with the requirements described in ETSI ES 202 718 V1.1.1 (2011-10), section 6.2.20.

The referenced requirement stipulates that the 2-wire port generates no more than 5 DTMF False Trigger Events during the course of 30 minutes. A reference test file is provided as part of the referenced standard.

## 6.3. DTMF Signalling Generation

Locally-generated DTMF signals transmitted out to the analogue 2-wire port should be as follows:

a) Allocation of frequencies to digits shall be as per ITU-Rec. Q.23.

b) Frequency tolerances shall be ±1.5% from the nominal frequencies.

c) The level of individual tones shall be -10±2dBm for high-group frequencies, and -12±2dBm for low-group frequencies, with a difference of no greater than 4dB.

d) Tone duration shall be 50 ms or greater.

e) Interdigital pause is subject to the timing of the incoming RFC2833 messages.

f) The output rise- and fall-time, measured between 10% and 90% of the maximum amplitude of each digit envelope, shall be 5ms when terminated with 600Ω.

g) The total distortion products (measured as harmonics or intermodulation) shall be at least 20 dB below the level of the lower power fundamental frequency.

## 6.4. 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 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 should be as specified in Table 11~~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 11 - Ring Cadence Definitions**

## 6.5. Answer Signal (Ring Trip)

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

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

# 7. UNI-V 2-wire interface Transmission specification

## 7.1. General

Unless otherwise stated in section 7 of this document:

a) The transmission characteristics of the UNI-V 2-wire interface 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 have a nominal level of -10dBm0 and a frequency of 1020Hz.

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

## 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.

## 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.The reference frequency is 1020Hz.

## 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.

## 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.

## 7.6. Idle Channel Noise performance

### 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 12 - Weighted Noise Limits**

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

### 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*

## 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 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.*

## 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*

## 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*

## 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 and access seeker networks, together with third party networks involved in each communication, each contribute a portion of the end-to-end delay.

## 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.*

## 7.12. Balance About Earth

### 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)*

### 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)*

## 7.13. End-to-End (Analogue-to-Analogue) performance

### 7.13.1. Composite Loss

The 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 consistent with the levels described in section 7.2 of this document.

### 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.

### 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.*

# 8. Caller ID and Visual Message 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 to CPE connected to the UNI-V 2-wire interface

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

The UNI-V 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.

## 8.1. General

This specification describes the minimum capabilities for the transmission of data for presentation of Calling Number, Calling Name and Visual Message Waiting Indication display from the UNI-V 2-wire interfaces on the UNI-V to the CPE. These capabilities are based on Telcordia Specifications with the adaptation required for operation within the Australian 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) and a stop bit (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 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.

The CPE must be ready to receive data at the time the UNI-V sends it.

### 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 CPE currently deployed in the Australian PSTN.

**Ring Cadences**

In order to allow up to 3.5 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 signalling is then applied.

**Message Format**

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

For the Australian PSTN, only the MDMF is 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 network topology.

## 8.2. Physical Layer Description

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

### 8.2.1. Modem Details

The data signalling interface will conform to the minimum capability in Table 13~~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<br>(measured at the UNI-V 2-wire interface) | 1200Hz: -10dBm0 ± 2dB.<br>2200Hz: -10dBm0 ± 2dB.<br>Termination: 10 kΩ resistive.<br>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.<br>Twist: Low frequency should not be greater level than high frequency. |
| Off-Hook Transmission Level<br>(measured at the UNI-V 2-wire interface) | 1200Hz: -10dBm0 ± 2dB.<br>2200Hz: -10dBm0 ± 2dB.<br>Termination: 600 Ω.<br>Level: Line level is measured in dBm, terminated with 600 Ω and will reflect the UNI-V output dBr value.<br>Twist: 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 13 - Data Transmission Parameters**

Note: The time that lapses between the transmission of individual data bytes within 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.

### 8.2.2. Subscriber Alerting Signal (SAS)

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

### 8.2.3. Customer Equipment Alerting Signal (CAS)

A CAS is a signal which is intended to be detected by the CPE.

The dual tone CAS will conform to the specifications in Table 14~~Table 15~~.

| Item | Specifications |
|---|---|
| Dual tone frequencies | 2130 ± 11 Hz<br>and<br>2750 ± 14 Hz |
| Transmission level<br>(at the UNI-V 2-wire interface into 600Ω) | 2130Hz: -10 dBm0 ±2 dB<br>and<br>2750Hz: -10dBm0 ±2 dB |
| Total harmonic distortion | The total power of harmonics and other extraneous frequency components in the CAS will be at least:<br>-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. |

Table 14 - CAS Parameters

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

### 8.2.4. ACK Signal Acceptance (CAS response)

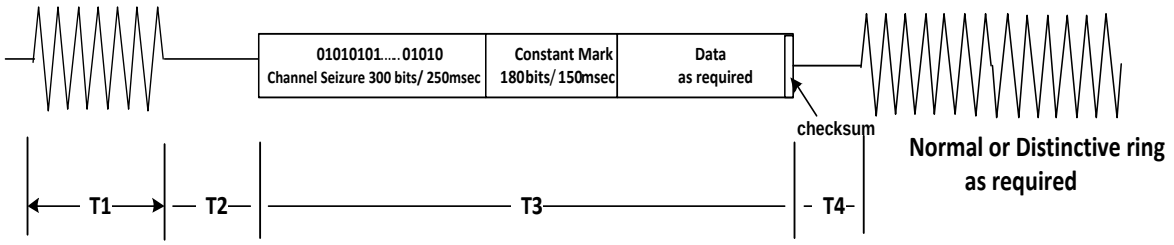
The Acknowledgment Signal (**ACK**) is a DTMF 'D' signal generated by the CPE.

NOTE: ACK signal duration: 60ms ±5ms

## 8.3. Message Timing specification

### 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 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 15 - On-Hook Data Transmission following Ring Timing

### 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.

The UNI-V will not present a pre or post data transmission signal (Line Polarity Reversal or an Open Switching Interval). References to pre or post data transmission signals have been included in this document for contextual information and background. 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 used by a Customer Product which relies on the UNI-V functionality described in this document.

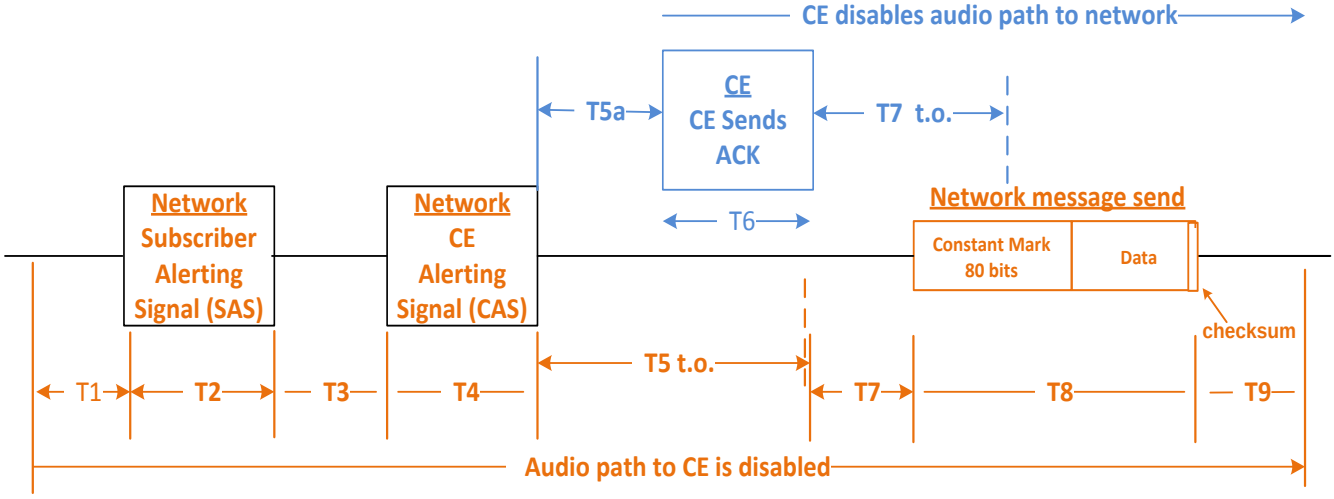
### 8.3.3. Data Transmission during Off-Hook State

For data transmission to occur while the CPE is in an Off-Hook state, the audio path must be disabled within the CPE to allow the UNI-V to communicate with the modem contained in the CPE. This is achieved by using the 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 CPE.
c) The UNI-V applies a CAS to the local CPE.
d) The 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 CPE receives the data sequence and enables the audio path at completion.

Note: For a single line service with multiple CPE connected in parallel, the UNI-V will only support one of the multiple parallel CPEs is engaged in the call. Thus 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<br>ACK delay from CE receiving the CAS tone. |
| T5 t.o. | 165ms max | Time out of UNI-V waiting for CE to ACK.<br>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<br>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<br><br>200 – 500 ms | Note: This is a CE specification requirement<br>Time out of CE waiting for Message Data.<br>CE can stop waiting for data and can enable the CE audio path.<br>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 16 - Off-Hook Data Transmission Timing

## 8.4. Message Structure Description

### 8.4.1. Multiple Data Message Format

Messages will be transmitted in the MDMF. MDMF allows several Parameter Messages for different features to be transmitted to the called party CPE within the same Message.

Each Message consists of a Message Header and a Message Body. The Message Header is a two-byte field consisting of a Message Type and a Message Length. Each of the Message Type and Message Length 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 the Message Body |
| Parameter Type | Parameter Type identification |
| Parameter Length | Total bytes in the Parameter Body |
| Parameter Body | Data (words) as required (variable length) |
| Parameter Type | Parameter Type identification |
| Parameter Length | Total bytes in the Parameter Body |
| Parameter Body | Data (words) as required (variable length) |
| Continued….<br>(Parameter Messages as required) | |
| Checksum | Error control – Checksum |

Table 17 - Multiple Data Message Format

Each Parameter Message consists of a Parameter Header 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 is one byte in length. The Parameter Type identifies the feature (e.g. the Calling Number Display feature). The Parameter Length indicates the number of bytes in the Parameter Body. The Parameter Body comprises data values and can be of variable length.

### 8.4.2. Error Control

The UNI-V will generate a Checksum which is transmitted as the last byte of the Message. A Checksum is appended to a Message to enable the called party's CPE to detect any error in the received Message.

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

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

### 8.4.3. Message Types

The Message Types in Table 18~~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 Indication | 82 |

Table 18 - Message Type Identifiers

### 8.4.4. Parameter Types

The following Parameter Types are those which the 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 and 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 19 - Parameter Type Identifiers

**Parameter Type:** Date and Time

The purpose of the Date and Time 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 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 | Parameter Length - Number of bytes in Parameter Body |
| 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 |

| 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 |

Table 20 - Parameter Type: Date and Time

**Parameter Type:** Calling Number

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

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 21~~Table 22~~.

The number transmitted should be 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 Body<br>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 21 - Parameter Type: Calling Number

**Parameter Type:** Reason for Absence of Calling Number

The purpose of the Reason for Absence of the Calling Number 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 is contained in the Message, the Reason for Absence of Calling Number must not be contained in the Message and vice versa.

| 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 22 - Parameter Type: Reason for Absence of Calling Number

**Parameter Type:** Calling Name

The purpose of the Calling Name Parameter Type is to convey to the called party the name of the calling party. 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 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 will transmit all 8-bit ASCII codes as provided by the access seeker.
CLI-capable 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 spaces).

| Byte number | Value (Hexadecimal) | Meaning |
|---|---|---|
| 1 | 07 | Parameter Type – Calling Name |
| 2 | nn | Parameter Length – Number of bytes in 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 23 - Parameter Type: Calling Name

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

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

The delivery of the Calling Name and the Reason for Absence of Calling Name are mutually exclusive. That is, if the Calling Name is contained in the Message, the Reason for Absence of Calling Name is not contained in the 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 Body |
| 3 | see table | Parameter value |

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

Table 24 - Parameter Type: Reason for Absence of Calling Name

**Parameter Type:** Visual Message Waiting Indicator

The purpose of the Visual Message Waiting Indicator Parameter Type is to switch on or off the CPE Visual Message Waiting Indicator (i.e. to indicate the presence of a waiting 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 CPE. This is done to ensure synchronization 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 Body |
| 3 | see table | Parameter value |

| Hex | Meaning |
|---|---|
| FF | Indicator ON |
| 00 | Indicator OFF |

Table 25 - Parameter Type: Visual Message Waiting Indicator

**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 | 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 26 - 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 | 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 27 - 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 | 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 28 - 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 29 - CND Example 4

# 9. Fax and Modem capability

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

The performance of these services is very much dependent on the performance of the end-to-end telephony service which includes both NBN Co and 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.

## 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 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.

### 9.1.1. Echo Suppressor Disabling

The UNI-V 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 30 - Answer Tone Characteristics

### 9.1.2. Echo Canceller Disabling

The UNI-V 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 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 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 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 31 - 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 32 - 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.

# 10. REFERENCES

| | | |
|---|---|---|
| **Australian Standards** | | |
| | Australian Standards<br>AS 1000:1979 | The International System of Units (SI) and its application |
| | AS/CA S002:2010 | Analogue interworking and non-interference requirements for Customer Equipment for connection to the Public Switched Telephone Network |
| | AS/NZS 60950.1:2011 | Information technology equipment - Safety - General requirements |
| | AS/NZS CISPR22:2009 | Information technology equipment - Radio disturbance characteristics |
| | AS/NZS 4665.1 and AS/NZS 4665.2 | Performance of external power supplies |
| | AS/CA S003.1:2010<br>AS/CA S003.2:2010<br>AS/CA S003.3:2010 | Requirements for Customer Access Equipment for connection to a Telecommunications Network |
| | AS/CA S009:2013 | Installation requirements for Customer Cabling |
| | TS030:1997 | Requirements for Customer Equipment with an Analogue Data Interface Connected to the Public Switched Telephone Networks |
| **ITU-T** | | |
| | ITU-T Rec. Q.23 (11/88) | Technical features of push-button telephone sets |
| | ITU-T Rec. G.114 | One way transmission time |
| | ITU-T Rec. G.164 | Echo Suppressors |
| | ITU-T Rec. G.168 | Digital Network Echo Cancellers |
| | ITU-T Rec. G.712 (1101) | Transmission performance characteristics of pulse code modulation channels |
| | ITU-T REC. K.21 | Resistibility of telecommunications equipment installed in customer premises to overvoltages and overcurrents. |
| | ITU-T Rec. P.862 and P.862.1 | Perceptual evaluation of speech quality |
| **Telcordia** (IP owner of Bellcore Standards) | | |
| | GR-30-CORE | Voice band Data Transmission Interface |
| | GR-31-CORE<br>(formally TR-NWT-000031) | CLASS$^{SM}$ Feature: Calling Number Delivery |
| | GR-575-CORE<br>(formally TR-NWT-000575) | CLASS$^{SM}$ Feature: Calling Identity Delivery on Call Waiting |
| | GR-1188-CORE | CLASS$^{SM}$ Feature: Calling Name Delivery Generic Requirements |
| | GR-1401-CORE | Visual Message Waiting Indicator Generic Requirements |

| | | |
|---|---|---|
| **Broadband Forum** | | |
| | TR-069 Amendment 1 | CPE WAN Management Protocol v1.1 |
| | TR-104 | DSLHome™ Provisioning Parameters for VoIP CPE |
| **ETSI** | | |
| | ES 202 718 V1.1.1 (2011-10) | Speech and multimedia Transmission Quality (STQ); Transmission Requirements for IP-based Narrowband and Wideband Home Gateways and Other Media Gateways from a QoS Perspective as Perceived by the User |
| | ES 201 168 V1.2.1 (2000-10) | Speech processing, Transmission and Quality aspects (STQ); Transmission characteristics of digital Private Branch eXchanges (PBXs) for interconnection to private networks, to the public switched network or to IP gateways |
| **IETF** | | |
| | RFC2833 | RTP Payload for DTMF Digits, Telephony Tones and Telephony Signals |

# 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 |
| 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 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 |
|---|---|
| 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 Name | A Parameter Type used to convey the calling party name. |
| Calling Number | A Parameter Type used to convey the calling party number. |
| Carrier | A carrier as defined in the Telecommunications Act 1991, and includes both fixed and mobile carriers. |
| Checksum | A calculation and its corresponding value, used for the purpose of error detection, consisting of the two's complement of the modulo 256 sum of all the bytes in a Message (i.e. from the first byte of the Message Header to the last byte of the last Parameter 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 (CPE) | 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. |
| 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 single bit set to the logic value '1'. |
| Mark Signal | A string of mark bits sent immediately before the message starts to alert the CPE. |
| Message | A Message Header and a Message Body (together). |
| Message Body | Data consisting of one or more Parameter Messages. |
| Message Header | A two-byte field consisting of a Message Type and a Message Length. |
| Message Length | A one-byte field with a value which identifies the number of bytes in a Message Body. |
| Message Type | A one-byte field with an assigned value used to identify how the remainder of the Message is to be interpreted by the CPE. |
| Off-Hook | The state of the equipment when the CPE has an electrical configuration that enables the current in the basic network loop to be at its maximum steady-state value. |

| Term | Definition |
|---|---|
| On-Hook | The state of the equipment when the CPE has an electrical configuration that disables the current in the basic network loop |
| Open Switching Interval | A Disconnection supervision signal. |
| Parameter Body | Data consisting of Parameter bytes. |
| Parameter Header | A two-byte field consisting of a Parameter Type and a Parameter Length. |
| Parameter Length | A one-byte field with a value which identifies the number of bytes in the Parameter Body. |
| Parameter Message | A Parameter Header and a Parameter Body (together). |
| Parameter Type | A one-byte field with an assigned value used to identify how the remainder of the Parameter Body is to be interpreted by the CPE. |
| Reason for Absence of Calling Name | A Parameter Type used to indicate the reason for the absence of the calling party name. |
| Reason for Absence of Calling Number | A Parameter Type used to indicate the reason for the absence of the calling party number. |
| 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 | A physical phenomenon one or more of whose characteristics may vary to represent information. |
| Space | 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 tone that is intended to alert the called party, but not necessarily to be detected by the CPE. |
| Timed Loop Break | A method for invoking a hookflash for a predetermined period (e.g. Recall/Flash button). |
| Visual Message Waiting Indication | A visual method of indicating the presence of a waiting voicemail message. |
| Visual Message Waiting Indicator | A Parameter Type used to indicate the presence of a waiting voicemail message 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. |

# 12. Known issues

The features and functionality described in this document are subject to the following known issues.

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

### 1) Overmodulation of Dial tone, service tone levels non-compliant

***Overview***

Dial tone is presented to End Users and CPE to denote the readiness of the telephony service to accept dialling.

***Issue***

A slight overmodulation and hence minor imperfection to the Dial tone, Ringing (ringback) tone and 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 Dial tone they receive on other networks within the Australian PSTN.

Additionally, it has been observed that “Number-unobtainable" tones were non-compliant and generally louder than required and that that other service tones may be non-compliant by a margin of 0.2dB.

***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 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 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 40ms and 140ms.

***Issue***

The UNI-V can detect recall functionality between approximately 60ms and 150ms (for both indoor and outdoor NTD). Some CPE may not be able to invoke recall functionality because of this reduced timing window.

***Assessment***

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 in a future release of the UNI-V.

**3) Calling Number Display Timing**

***Overview***

Calling Number Display is used by End Users and CPE to identify the calling party's number.

***Issue***

The timing of the signals between the UNI-V and the 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 called party not hearing the first call waiting pips. The 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 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 CPE.

***Issue***

Calling number time and date is not delivered to 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 325ms 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 325ms 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***

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) G.168 Answer Tones Sensitivity

***Overview***

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 to cause mis-operation (eg. output levels around -10dBm [i.e. -13dBm0] would be more typical).

***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.

**7) Marginally non-compliant Ring Signals.**

***Overview***

The AC Ring Voltage (Vrms) and DC voltage during ring have been seen to be marginally non compliant from time to time.

***Issue***

The AC voltage has been found to occasionally not meet the required level of 55Vrms. The AC ring voltage was marginally non-compliant by 0.5Vrms whereas the DC voltage was non-compliant by 0.8V.

***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.