



Haliplex
Communication Systems

HPX-1600 USER GUIDE

**Chapter 2-19:
HPX-IM-1623
Dual FXO IM**

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1. INTRODUCTION

The Dual FXO Interface Module (IM) operates at 64kB/s and allows connection via an RJ-45. The dual port FXO is designed to connect to the analog PSTN line coming from the central office. It provides a 2-wire voice-grade interface serving as a loop termination for central office line current and ringing voltage. The Dual FXO IM emulates the operation of a telephone handset. Figure 1 shows the Dual FXO IM.



Figure 1: Dual FXO IM

2. IM CONFIGURATION

The IM configuration dialog has configuration tabs as discussed below.

2.1. INTERFACE PARAMETERS

The interface parameters managed are;

- Companding law; a type of signal processing in which the signal is compressed on input and expanded back to its original form on output. Used in
 - μ law; used in T1 networks.
 - A law; used in E1 networks.
- Signalling type; the transmission of signalling information within the voice channel.
 - CAS (Channel Associated Signalling); normally used in T1
 - R2 (A type of CAS); normally used in E1
- Unused bits;
 - E1: C,D = 0,1; for an E1, the remaining bits in CAS must differ therefore we set C to 0 and D to 1.
 - T1: C,D = A,B; the remaining bits in a T1, for simplicity, are set to the values of A and B.
- Ringing Setting
 - Country; selecting a country will set the following variables.
 - On-Hook Speed (OHS)
 - Ringer Impedance (RI)
 - Ringer Threshold (RT)
 - Current Limiting (CL)
 - TP/RING Voltage (TRV)
 - Min Loop Current (MLC)
 - AC Impedance (ACI)
 - Selecting custom setting will allow the user to set the following variables, when any other country is selected, the options should be greyed out and set according to Table1 on the following page.

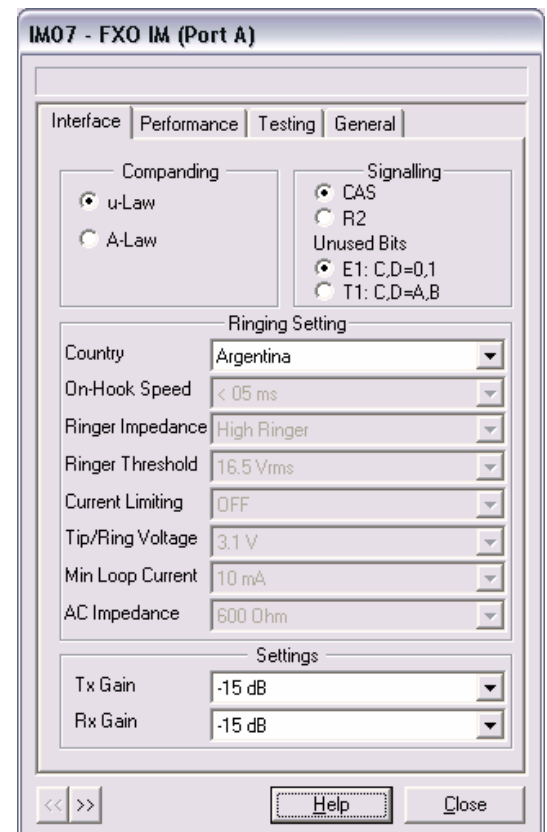


Figure 2: Dual FXO IM Configuration Dialog Interface Tab

Country	On Hook Speed	Ringer Impedence	Ringer Threshold	Current Limiting	TIP/RING Voltage	Minimum Loop Current	AC Impedence
Argentina (0)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
Australia (1)	26 ms +/- 10%	High Ringer	16.5 Vrms	Disabled	3.2 V	12 mA	220Ω + (820Ω 120nF)
Austria (2)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Bahrain (3)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Belgium (4)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Brazil (5)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
Bulgaria (6)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	220Ω + (820Ω 120nF)
Canada (7)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
Chile (8)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
China (9)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	200Ω + (680Ω 100nF)
Colombia (10)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
Croatia (11)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Cyprus (12)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Czech Republic (13)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Denmark (14)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Ecuador (15)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
Egypt (16)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
El Salvador (17)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
Finland (18)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
France (19)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Germany (20)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Greece (21)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Guam (22)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
Hong Kong (23)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
Hungary (24)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Iceland (25)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
India (26)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
Indonesia (27)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
Ireland (28)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Israel (29)	< 05 ms	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)

Italy (30)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Japan (31)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.2 V	16 mA	600Ω
Jordan (32)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.2 V	16 mA	600Ω
Kazakhstan (33)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	16 mA	600Ω
Kuwait (34)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
Latvia (35)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Lebanon (36)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Luxembourg (37)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Macao (38)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
Malaysia (39)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.2 V	12 mA	600Ω
Malta (40)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Mexico (41)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
Morocco (42)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Netherlands (43)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
New Zealand (44)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	370Ω + (620Ω 310nF)
Nigeria (45)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Norway (46)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Oman (47)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.2 V	12 mA	600Ω
Pakistan (48)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.2 V	12 mA	600Ω
Peru (49)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
Philippines (50)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.2 V	12 mA	600Ω
Poland (51)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Portugal (52)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Romania (53)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Russia (54)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
Saudi Arabia (55)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
Singapore (56)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
Slovakia (57)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Slovenia (58)	3 ms +/- 10%	Synthesized Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
South Africa (59)	< 05 ms	Synthesized Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	220Ω + (820Ω 120nF)
South Korea (60)	< 05 ms	Synthesized Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
Spain (61)	26 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Sweden (62)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)

Switzerland (63)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Syria (64)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.1 V	16 mA	600Ω
Taiwan (65)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
TBR21 (66)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	270Ω + (750Ω 150nF)
Thailand (67)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.2 V	12 mA	600Ω
UAE (68)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
United Kingdom (69)	3 ms +/- 10%	High Ringer	16.5 Vrms	Enabled	3.5 V	10 mA	320Ω + (1050Ω 230nF)
USA (70)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
Yemen (71)	< 05 ms	High Ringer	16.5 Vrms	Disabled	3.5 V	10 mA	600Ω
Custom Setting (72)	Select from: < 05 ms 3 ms +/- 10% 26 ms +/- 10%	Select from: High Ringer Synthesized Ringer	Select from: 16.5 Vrms 23.65 Vrms 49.5 Vrms	Select From: Disable Enable	Select from: 3.1 V 3.2 V 3.35 V 3.5 V	Select from: 10 mA 12 mA 14 mA 16 mA	Select from: 600Ω 900Ω 270Ω + (750Ω 150nF) 220Ω + (820Ω 120nF) 370Ω + (620Ω 310nF) 320Ω + (1050Ω 230nF) 370Ω + (820Ω 110nF) 275Ω + (780Ω 115nF) 120Ω + (820Ω 110nF) 350Ω + (1000Ω 210nF) 0Ω + (900Ω 30nF) 600Ω + 2.16μF 900Ω + 1μF 900Ω + 2.16μF 600Ω + 1μF Global impedance

Table 1: Country with associated PTT settings

- Settings
 - Transmit Gain Setting (dB); -15dB to +12dB (nominally 0)
 - Receive Gain Setting (dB); -15dB to +12dB (nominally 0)

2.2. PERFORMANCE PARAMETERS

This feature has yet to be implemented.

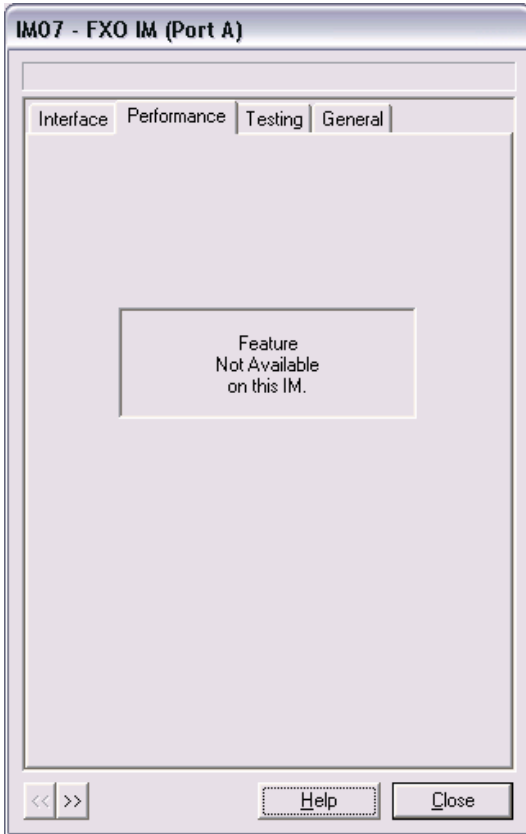


Figure 3: Dual FXO IM Configuration Dialog Performance Tab

2.3. TESTING PARAMETERS

The testing tab presents two testing options, Loopback and Launch Test.

2.3.1. LOOPBACK MODE

The user can select from Line, Equipment or Line and Equipment Loopback. For more information refer to Section 3.

2.3.2. LAUNCH TEST

The user is able to launch a 1kHz tone at 0dBm into the transmit and receive paths of the circuit, the channel and interface respectively. This is done by an oscillator switched into transmit and receive paths.

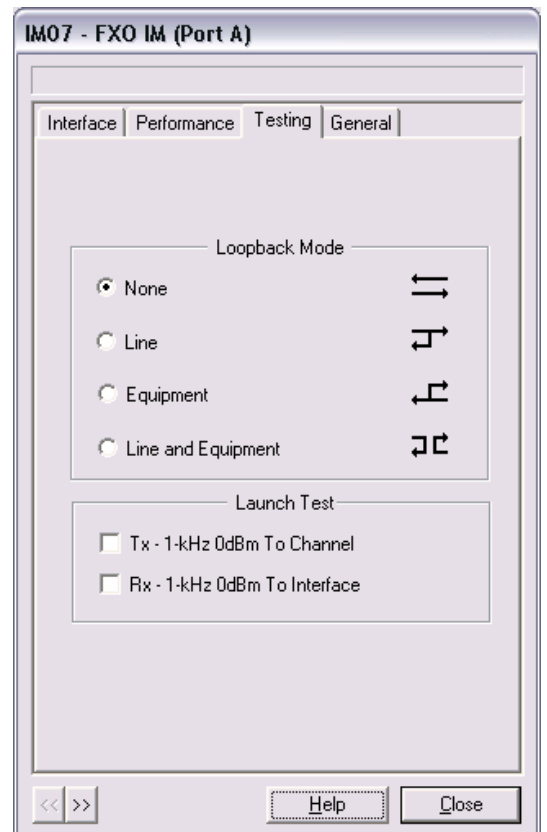


Figure 4: Dual FXO IM Configuration Dialog Testing Tab

3. IM TESTING

The following tests are currently available;

- No loopback (default)
- Line loopback (1)
 - Data is sent through the IM connectors to the backplane and loops back to the IM connector, whilst the data sent from the backplane through the IM is dropped.
- Equipment loopback (2)
 - Data is sent through the backplane to the IM connector and loops back to the backplane, whilst the data sent from the IM connector is dropped.
- IM Connector loopback (1 and 2)
 - Data that is sent through the IM connector loops back out to the IM connector. Data that is sent from the backplane through the IM is looped back out to the backplane.

The location of each of these loopbacks is shown below.

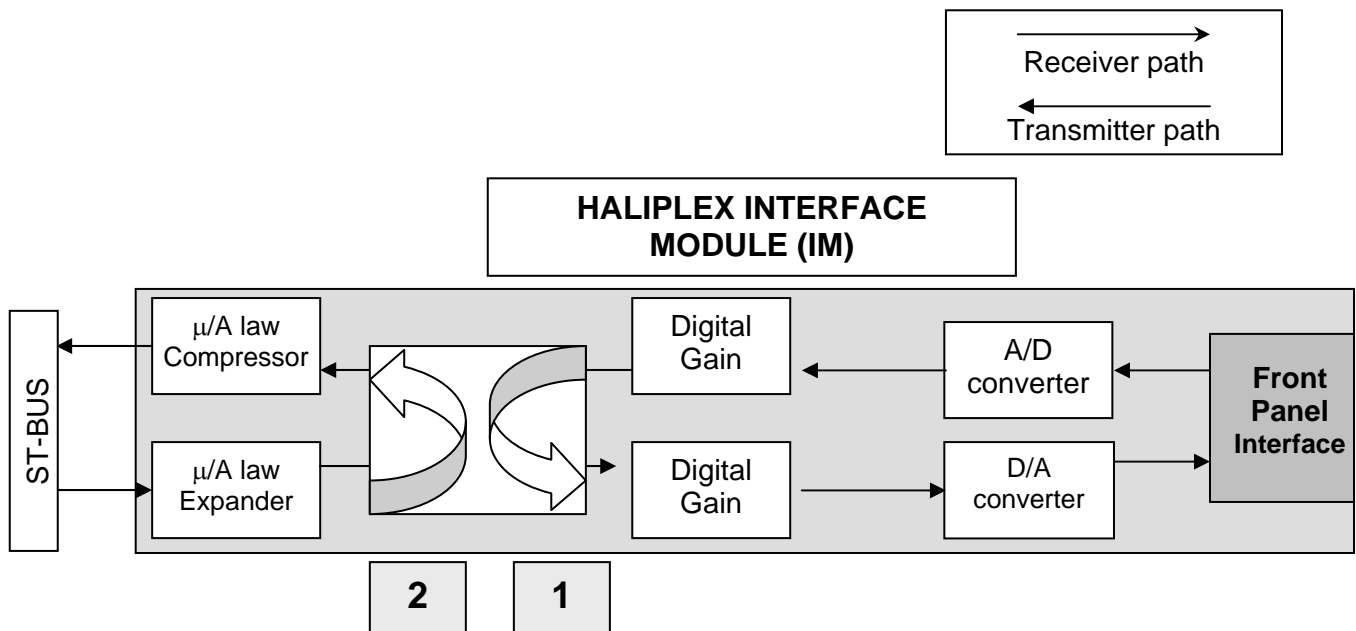


Figure 5: Dual FXO IM loopback options

4. IM ALARMS

The Dual FXO has four alarms; hardware fault, line drop-out and AIS detection, and an off-hook current exceeding alarm.

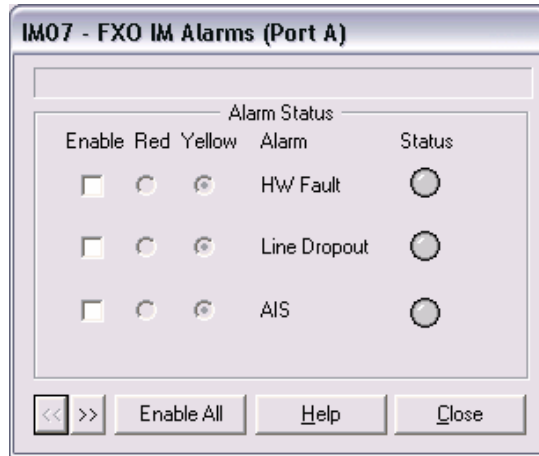


Figure 6: Dual FXO IM Alarm Monitor Setup Window

The hardware fault is triggered when a fault occurs with channel of the Dual FXO IM. Line dropout is the loss of signal of the voice connection. In the event of the connection to the remote end of the digital voice stream being disconnected or failing, the Dual FXO IM can detect the line state of all 1's.

IM INDICATORS

Each Dual FXO IM has two alarm indications LED's on the front panel.

The LED interpretations are summarised below in Table 2.

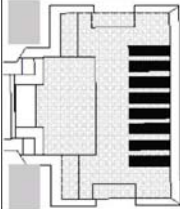
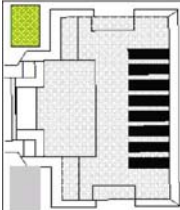
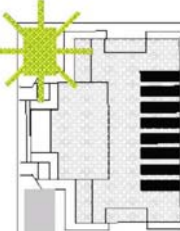
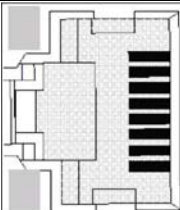
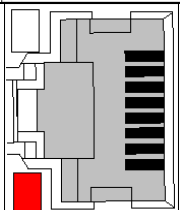
RJ45 LED Display		Interpretation
	Top LED off	If channel idle (On Hook)
	Top LED constantly on: green	When channel seized (Off Hook)
	Top LED flashing: slow flash rate	Receiving ringing
	Bottom LED off	No alarms
	Bottom LED constantly on - Red	Alarm exists

Table 2: Dual FXO IM LED Interpretations

5. INTERFACE SPECIFICATIONS

IM Connector	Dual RJ-45 Connector
Interface	2 wire loopstart
Trunk Speed	64kbs
Power Consumptions	< 3W
Alarm Monitoring	- Hardware fault - Line Dropout detected - AIS detected
Indicator LED's	- Incoming ringing signal from the PSTN/PAX line - Line looped condition (in use/busy) - Alarm condition exists on channel
Standards	ITU-T G.711, G.712, Q.421, AS-ACIF S003-2001
Ringing Frequency	Detected 13Hz to 68Hz
Maximum Ringer Load	0.2REN
On-Hook Leakage Current	Max 5 μ A at Tip Ring Voltage: 48V
DC Termination	- No current limiting: DAA voltage 6.5V at 20mA, follows 50 Ω slope - Current limiting: DC Termination as per TBR21
ABCD Signalling	- CAS - R2 (Q.421)
Level Adjustment	-15dB to +12dB (Nominally 0) Refer to interface for all level adjustments
Maximum Level	
- Rx	3dBm
- Tx	3dBm
Impedence (AC resistance)	- 600 Ω - 900 Ω - 270 Ω + (750 Ω 150nF) (TBR21) and 275 Ω + (780 Ω 150nF) - 220 Ω + (820 Ω 120nF) (Australia/New Zealand #1) and 220 Ω + (820 Ω 115nF) - 220 Ω + (820 Ω 115nF) (Slovakia/South Africa/Germany/Bulgaria) - 370 Ω + (620 Ω 310nF) (New Zealand #2) - 320 Ω + (1050 Ω 230nF) (England) - 370 Ω + (820 Ω 110nF) - 275 Ω + (780 Ω 115nF) - 120 Ω + (820 Ω 110nF) - 350 Ω + (1000 Ω 210nF) - 0 Ω + (900 Ω 30nF) - 600 Ω + 2.16 μ F - 900 Ω + 1 μ F - 900 Ω + 2.16 μ F - 600 Ω + 1 μ F - Global impedance
Companding	μ -law, A-law
Test Tones	1kHz, 0dBm Tx & Rx

Loopback	Digital and Analogue
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Table 3: Interface Specifications

6. INTERNATIONAL COMPLIANCES

- CE
- A Tick
- C Tick
- FCC part 15 class B and part 68
- UL



FCC COMPLIANCE STATEMENT

This device complies with Part 15 and 68 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures

- *Reorient or relocate the receiving antenna*
- *Increase the separation between the equipment and the receiver*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected*
- *Consult the dealer or an experienced radio/TV technician for help*

Warning: *Any changes or modifications not expressly approved by Haliplex Pty Ltd could void the user's authority to operate this equipment.*

6.1. ELECTROMAGNETIC COMPATIBILITY (EMC)

- CISPR 22 class B
- EN55022
- EN55024
- FCC part 15 class B
- FCC part 68
- AS/NZS3548
- EN300386-1

6.2. SAFETY

- IEC60950, UL60950, and AS/NZS60950:2000 for General safety

6.3. IMMUNITY

- EN61000-4-2
- EN61000-4-3
- EN61000-4-4
- EN61000-4-5
- EN61000-4-11

6.4. PERFORMANCE

- AC/ACIF S003:2001