Underwriters Laboratories
455 East Trimble Road.
San Jose,
CA 95131, USA

TEST REPORT

ACCORDING TO: ANSI/TIA-968-B and CS-03

FOR:

Ribbon
SBC 1000 Session Border Controller
With
FXS and T1/E1 cards

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1 Client information

Client name:	Ribbon Communications Inc.
Address:	4 Technology Park Drive, Westford, MA 01886, USA.
E-mail:	aelshama@rbbn.com
Contact name:	Mr Adam Elshama

2 Equipment Under Test

Product name:	Session Border Controller
Model(s):	SBC 1000
Serial number:	P4033511390041
Software version	UX1000 version 2.0.0 Build 85
Receipt date	10/24/2011
Sample Tag Number	1227120
Modification status	As received
Parameters affecting compliance	The equipment may be configured for use as a T1 or E1 interface. Testing was performed with the equipment set for T1 operation.

3 Test project performance

Project ID:	11CA54240
Location:	Underwriters Laboratories, Inc. 455 East Trimble Road. San Jose, CA 95131, USA
Test started:	10/24/2011 3:19:00 PM
Test completed:	11/2/2011
Test specification(s):	**ANSI/TIA-968-B** Telecommunications Telephone Terminal Equipment Technical Requirements for Connection of Terminal Equipment to the Telephone Network Approved: August 11, 2009 **CS-03 Issue 9, Amendment 1 July 2005** Issue 9, Amendment 1, July 2005 Issue 9, Amendment 2, March 2006 Issue 9, Amendment 3, October 2006, April 2007 Issue 9, Amendment 4, May 2009 Issue 9, Amendment 4, December 2010 Approved: August 11, 2009
Test suite:	TIA-968-B Part 4 (Common Requirements) (5/28/2010, modified); TIA-968-B Part 5.2 Digital (8/11/2010, modified)

4 Test report summary

Testing was completed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested.

The test results relate only to the items tested.

A summary of the test status of the product under test with respect to each test requirement of the standard is provided in section 9.

Detailed test results are presented in section 10.

	Name and Title	**Date**	**Signature**
Tested by:	Dave Weaver	11/8/2011	

Revision History

Rev.	Date	Revisions	Revised By
-	11/8/2011	Original Issue	-
V1	9/15/2016	Added modified chassis and updated company name	Dave Weaver
V2	6/2/2018	Updated company name and product name. The report was previously issued under the Sonus brand name. The company name has now changed to Ribbon Communications Inc. Only cosmetic changes have occurred to reflect the rebranding.	Dave Weaver

EUT description

The Ribbon SBC 1000 made by Ribbon Communications Inc.is a 1U (1.75") high and 19" wide Unified Exchange equipped with common control motherboard, one 2-port or single port T1/E1 interface card for connection to public network 1544 kbit/s or 2048 kbit/s digital and ISDN primary rate access lines, one digital signaling processor (DSP) card, 2 Ethernet ports for 10/100/1000Mbps internet protocol devices and 2 USB ports for data devices. It also has the option to provide one additional DSP card, one single port T1/E1 WAN card for connection to 1544 kbit/s or 2048 kbit/s data network WAN line and one single board computer with two USB ports.

There are six configurable card slots at the back of the Ribbon SBC 1000 chassis to provide connection for the following interface cards.

Up to six 4-port FXS cards for on-premises analog telephone equipment. There are three types of FXS card. The cards come in pairs with one card providing the power to an attached daughter card. There is a variation of the card that provides the power which includes bypass relays that will connect attached terminal equipment directly to PSTN lines in case of power failure.

Up to six 4-port FXO cards for connection to PSTN analog trunk lines **(Not tested)**

Up to two 4-port ISDN BRI S/T interface cards **(Not tested)**

SBC 1000 system submitted for testing

The configuration of Ribbon SBC 1000 Session Border Controller / Unified Exchange for testing is equipped with the following components.

100-240Vac, 50/60Hz UL/cUL/CB certified PSU.

One single board computer with hard-drive and two USB ports.

Two digital signaling processor (DSP) cards.

One 2-port T1/E1 ISDN PRI interface card.

Six 4-port FXS interface card.

One motherboard with two 10/100/1000 Base-T Ethernet ports and two USB ports.

5 Technical judgments

5.1 T1 interface

The T1 interface is available as a single port module or a 2 port module. Both modules use the same PCB with the single port module being only partially populated. Only the two port module was tested. It was judged that test results gained from the 2 port module would be representative for the single port module.

5.2 Modified Chassis

As originally tested the chassis supported interface cards in the rear of the chassis only. A new version of the SBC 1000 adds an additional card connector to its motherboard and modifies the cosmetic design of its faceplate to add one additional 2-port T1/E1 card to the front-side of the chassis to increase the number of 2-port T1/E1 cards from one to two. The additional T1/E1 card is the same 2-port T1/E1 card previously tested in this report. There is no change to any electrical and mechanical design of the existing certified T1/E1 card. The changes in SBC 1000 motherboard and faceplate are judged to have no impact on the existing network connections. The additional T1/E1 interface card is judged to be compliant with the requirements with no additional testing required.

6 Test laboratory description

Recognized under the National Voluntary Laboratory Accreditation Program (NVLAP) for Telecommunications Evaluation. NVLAP Lab Code: 200252-0. This assessment has been performed in accordance with the requirements of ISO 17025.

Testing has been performed in accordance with issued UL test procedures.

This report may contain data that are not covered by the NVLAP accreditation (LAB code 200252-0). Please refer to Section 9 "Results Summary Table " for further details.

This report shall not be used to claim, constitute or imply product certification, approval, or endorsement by NVLAP or any agency of the US government.

All tests were performed under the following environmental conditions:

Temperature range	:	19 – 25 ^{o}C
Humidity range	:	5 – 75 %
Pressure range	:	86 – 106 kPa
Power supply range	:	Within 10% of rated voltage.

7 Test equipment used

Description	Model	S/N	Hardware Rev.	Software Rev.	Last Calibration
Telecom Conformance Analyzer	Hermon Laboratories TCA 8200	8764	A4.5	2.4.47, build 3242, 21-Feb-11 8:27:36.71	1/31/2011
Surge Generator*	E505	ME5B-325	-	-	*Used with calibrated instruments
Surge Generator*	E502B	ME5B-331	-	-	
Mains Coupling Network*	E4554	EMC4125	-	-	
Leakage Tester*	CDI HVC-200	2800	-	-	
Transient Waveform Monitor	TWM-5	2640	-	-	11/27/2010
Multimeter	Fluke 87	2511	-	-	5/3/2011
Oscilloscope	Le Croy 9370M	2830	-	-	2/11/2011

8 Requirement conditions table

Condition	Applies
TIA-968-B Part 4 (Common Requirements) (5/28/2010, modified)	
Is the TE hand-held or table-top equipment with a weight less then 5 kg?	No
Doess the TE facilitate Longitudinal surge paths?	Yes
Is the TE AC powered?	Yes
Does the TE have an intentional dc conducting path from its telephone connection to earth ground at operational voltages?	No
Does the TE have an intentional dc conducting path from its telephone connection to earth ground for protection purposes?	No
Does the TE provide through-transmission paths?	Yes
Does the TE have a loop-start interface (LS)?	No
Does the TE have a ground-start interface (GS)?	No
Does the TE have a Tie-trunk interface (Tie)?	No
Does the TE have an Off Premise station(s) (OPS)?	No
Does the TE have an On Premise station(s) (ONS)?	Yes
Does the TE have an 1.544 Mbps digital PBX-CO trunk ports?	Yes
Is the TE an approved data circuit terminal?	No
Does the TE have a Ringing sources?	No
Does the TE contains an analog-to-digital converter or generates a data bit stream?	No
Is the TE an approved test equipment or approved test circuitry?	No
Does the TE have an Private Line?	No
Is the TE an data terminal equipment intended to operate with a programming resistor?	No

9 Test results summary

TIA-968-B	CS-03	Test Description	Status	Verdict
4		**Common Requirements**		
4.1		**ENVIRONMENTAL SIMULATION**		
4.1.1	2.1.1 Pt I	Mechanical shock	NA	-
4.1.2	2.4.1 Pt I	Telephone line surge – Type A	A	Pass
4.1.3	2.4.2 Pt I	Telephone line surge – Type B	A	Pass
4.1.4	2.5.1 Pt I	Power line surge	A	Pass
4.2	**2.2**	**LEAKAGE CURRENT LIMITATIONS**		
4.2.1 /7	2.2.1 Pt I	Leakage Current	A	Pass
4.3		**HAZARDOUS VOLTAGE LIMITATIONS**		
4.3.1	2.3.1 Pt I	General requirement	A	Pass
4.3.2	2.3.7 Pt I	Physical separation of leads	A	Pass
4.3.4	2.3.10 Pt I	Intentional paths to ground (as required by clause 4.1)	NA	-
4.4		**BILLING PROTECTION**		
4.4.1	3.5.1 Pt I	Call duration requirements on data equipment	NA	-
4.4.2	3.5.2 Pt I	Voice and data equipment on-hook signal requirements	A	Pass
4.4.3	3.5.3 Pt I	Signaling interference requirements	NA	-
4.4.4	3.5.4 Pt I	Other billing protection requirements	NA	-
4.5		**ENCODED ANALOG CONTENT**		
4.5.1	3.6 Pt II	Encoded analog content limits	NA	-
4.6		**CONNECTORS &WIRING CONFIGURATIONS**		
4.6.2	Pt III	Wiring configurations	A	Pass
4.6.3	Pt III	Multi-line, private branch exchange (PBX), and key telephone systems	NA	-
4.7		**ALLOWABLE NET AMPLIFICATION BETWEEN PORTS**		
4.7.2	3.4.4.1(3)(a) Pt I	Allowable net amplification between network interface ports	NA	-
4.7.3	3.4.4.1(3)(a) Pt I	Allowable net amplification between ports for other approved TE and network interface ports	A	Pass
4.7.4	Table 3.4(b) Note (7) Pt I	Single frequency (SF) guard band	A	Pass
4.7.5	3.4.4.1(3)(b) Pt I	SF cut-off	NA	-
5		**INTERFACE REQUIREMENTS**		
5.1		**ANALOG VOICE BAND INTERFACE REQUIREMENTS**		
5.1.2	3.4.1/3	Limitations on signals not intended for network control signaling	NA	-
5.1.3	3.4.2	Limitations on signals intended for network control signaling	NA	-
5.1.4	3.4.8	Limitations at the interface from non-approved external signal sources	NA	-
5.1.5	3.4.4	Through transmission limitations	NA	-
5.1.6	3.4.6	Signal power in the 3995–4005 Hz frequency band	NA	-
5.1.7	3.3.2.1	Longitudinal voltage at frequencies below 4 kHz	NA	-

5.1.8	3.3.2.2-3	Voltage in the 4 kHz to 30 MHz frequency range	NA	-
5.1.10	3.6 Pt I	Analog voice band transverse balance limits	NA	-
5.1.11		**Loop start interfaces**		
5.1.11.2.1/2	3.7.1 Pt I	On-hook resistance	NA	-
5.1.11.2.3	3.7.2 Pt I	DC current during ringing	NA	-
5.1.11.2.4/5	3.7.3Pt I	Ringing frequency impedance	NA	-
5.1.11.2.7	1.8 Pt I	Ringer equivalence	NA	-
5.1.11.3	NER	Transitioning to the off-hook state	NA	-
5.1.11.3.1	3.11 Pt I	Manual programming of memory dialing numbers	NA	-
5.1.11.3.2	3.10 Pt I	Automatic stutter dial tone detection	NA	-
5.1.11.4	3.5.2.1 Pt I	Loop current requirements	NA	-
5.1.12	Pt I	Ground start interfaces	NA	-
5.1.13	3.5.5 Pt I	Loop reverse-battery – Incoming	NA	-
5.1.14	Pt I	Loop reverse-battery – Outgoing	NA	-
5.1.15	2.3.3 Pt I	E&M	NA	-
5.1.16	Pt I	Off premises station (OPS)	NA	-
5.1.17	2.3.6 Pt I	Private line (ringdown, voice band metallic, and in-band)	NA	-
5.2		**LADC AND DIGITAL INTERFACE REQUIREMENTS**		
5.2.1	2.3.5 Part I	Local area data channel (LADC)	NA	-
5.2.2	3.2 Pt VII	Subrate digital and PSDS Type I interfaces	NA	-
5.2.3	3.2.1-9 Pt VII	PSDS Type II and Type III interfaces	NA	-
5.2.4	3.2-6 Pt II	DS1 and ISDN PRI terminal equipment	A	Pass
5.3		**ISDN & DSL INTERFACE REQUIREMENTS**		
5.3.1	3.5.2 Pt VI	Basic rate ISDN (BRI) and IDSL	NA	-
5.3.2	3.2-5 Pt VIII	ADSL, ADSL2, ADSL2+, and reach extended ADSL2 (READSL2) modes	NA	-
5.3.3	3.2-5 Pt VIII	ADSL2 and ADSL2+ all digital mode	NA	-
5.3.4	3.2-5 Pt VIII	SHDSL, ESHDSL	NA	-
5.3.5	3.2-5 Pt VIII	HDSL2 and SMC4	NA	-
5.3.6	3.2-5 Pt VIII	HDSL4	NA	-
5.3.7	3.2-5 Pt VIII	SDSL	NA	-
5.3.8	3.2-5 Pt VIII	SMC6, VDSL and VDSL2	NA	-
5.3.9	3.2-5 Pt VIII	SMC 2, SMC 3, SMC 7, SMC 8, and other DSL	NA	-
47 CFR Part 68	CS-03			
68.317	Pt V	Hearing aid compatibility	NA	-
68.318	3.9 Pt I	Additional limitations	NA	-

10 Detailed Test Results

Test specification:	4.1 Environmental simulation		
Test purpose:			
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/2/2011 8:36:11 AM		
Remarks: Post surge			

Test results

Standard reference	Requirement	Verdict
4.1	Unpackaged approved terminal equipment and approved protective circuitry shall comply with all the criteria specified in this Standard, both prior to and after application of the mechanical and electrical stresses specified in this section.	Pass

Test specification:	4.1.2.1 Metallic voltage surge - type A		
Test purpose:	Two metallic voltage surges (one of each polarity) shall be applied between any pair of connections on which lightning surges may occur. Surges parameters shall comply with requirements 4.1.2.1.1 of the standard.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/2/2011 8:34:34 AM		
Remarks: Post surge			

Test results

Test leads		
	Normal	Inverse
Tip - Ring grounded	Pass	Pass
Ring – Tip grounded	Pass	Pass

Failure modes resulting from application of Type A telephone line surges:

Regardless of operating state, equipment and circuitry are allowed to be in violation of the transverse balance requirements of section 5 and, for terminal equipment connected to local area data channels, the longitudinal voltage requirements of subclause 5.2.1.4.3, if:

a) Such failure results from an intentional, designed failure mode that has the effect of connecting telephone or auxiliary connections with earth ground; and,

b) If such a failure mode state is reached, the equipment is designed so that it would become substantially and noticeably unusable by the user, or an indication is given (e.g., an alarm), in order that such equipment can be immediately disconnected or repaired.

Failure modes resulting from application of Type B telephone line surges:

Approved terminal equipment and approved protective circuitry shall withstand the energy of Type B surge without causing permanent opening or shorting of the interface circuit and without sustaining damage that will affect compliance with the Standard.

Test specification:	4.1.2.2 Longitudinal voltage surge - type A		
Test purpose:	Two longitudinal voltage surges (one of each polarity) shall be applied to any pair of connections on which lightning surges may occur. Surges parameters shall comply with requirements 4.1.2.2.1 of the standard.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/2/2011 8:35:04 AM		
Remarks: Post surge			

Test results

Test leads		
	Normal	Inverse
Tip - Ring grounded	Pass	Pass
Ring – Tip grounded	Pass	Pass
Tip1 – Ring1 grounded	Pass	Pass
Ring1 – Tip1 grounded	Pass	Pass

Failure modes resulting from application of Type A telephone line surges:

Regardless of operating state, equipment and circuitry are allowed to be in violation of the transverse balance requirements of section 5 and, for terminal equipment connected to local area data channels, the longitudinal voltage requirements of subclause 5.2.1.4.3, if:

a) Such failure results from an intentional, designed failure mode that has the effect of connecting telephone or auxiliary connections with earth ground; and,

b) If such a failure mode state is reached, the equipment is designed so that it would become substantially and noticeably unusable by the user, or an indication is given (e.g., an alarm), in order that such equipment can be immediately disconnected or repaired.

Failure modes resulting from application of Type B telephone line surges:

Approved terminal equipment and approved protective circuitry shall withstand the energy of Type B surge without causing permanent opening or shorting of the interface circuit and without sustaining damage that will affect compliance with the Standard.

Test specification:	4.1.3.1 Metallic voltage surge - type B		
Test purpose:	Two metallic voltage surges (one of each polarity) shall be applied to equipment between any pair of connections on which lightning surges may occur. Surges parameters shall comply with requirements 4.1.3.1 of the standard.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/2/2011 8:35:26 AM		
Remarks: Post surge			

Test results

Test leads		
	Normal	Inverse
Tip - Ring grounded	Pass	Pass
Ring – Tip grounded	Pass	Pass
Tip1 – Ring1 grounded	Pass	Pass
Ring1 – Tip1 grounded	Pass	Pass

Failure modes resulting from application of Type A telephone line surges:

Regardless of operating state, equipment and circuitry are allowed to be in violation of the transverse balance requirements of section 5 and, for terminal equipment connected to local area data channels, the longitudinal voltage requirements of subclause 5.2.1.4.3, if:

a) Such failure results from an intentional, designed failure mode that has the effect of connecting telephone or auxiliary connections with earth ground; and,

b) If such a failure mode state is reached, the equipment is designed so that it would become substantially and noticeably unusable by the user, or an indication is given (e.g., an alarm), in order that such equipment can be immediately disconnected or repaired.

Failure modes resulting from application of Type B telephone line surges:

Approved terminal equipment and approved protective circuitry shall withstand the energy of Type B surge without causing permanent opening or shorting of the interface circuit and without sustaining damage that will affect compliance with the Standard.

Test specification:	4.1.3.2 Longitudinal voltage surge - type B		
Test purpose:	Two longitudinal voltage surges (one of each polarity) shall be applied to any pair of connections on which lightning surges may occur. Surges parameters shall comply with requirements 4.1.3.2 of the standard.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/2/2011 8:35:43 AM		
Remarks: Post surge			

Test results

Test leads		
	Normal	Inverse
Tip - Ring	Pass	Pass
Tip 1 - Ring 1	Pass	Pass

Failure modes resulting from application of Type A telephone line surges:

Regardless of operating state, equipment and circuitry are allowed to be in violation of the transverse balance requirements of section 5 and, for terminal equipment connected to local area data channels, the longitudinal voltage requirements of subclause 5.2.1.4.3, if:

a) Such failure results from an intentional, designed failure mode that has the effect of connecting telephone or auxiliary connections with earth ground; and,

b) If such a failure mode state is reached, the equipment is designed so that it would become substantially and noticeably unusable by the user, or an indication is given (e.g., an alarm), in order that such equipment can be immediately disconnected or repaired.

Failure modes resulting from application of Type B telephone line surges:

Approved terminal equipment and approved protective circuitry shall withstand the energy of Type B surge without causing permanent opening or shorting of the interface circuit and without sustaining damage that will affect compliance with the Standard.

Test specification:	4.1.4 Power line surge		
Test purpose:	Six power line surges (three of each polarity) shall be applied between the phase and neutral terminals of the AC power line while the equipment is being powered. Surges parameters shall comply with requirements 4.1.4.1 of the standard.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/2/2011 8:35:55 AM		
Remarks: Post surge			

Test results

Test leads		
	Normal polarity	Inverse polarity
Phase - Neutral	X	X
Phase - Neutral	X	X
Phase - Neutral	X	X

Failure modes resulting from application of power line surge.

Approved terminal equipment and approved protective circuitry shall comply with all the criteria in this Standard, both prior to and after the application of the power line surge notwithstanding that this surge may result in partial or total destruction of the equipment under test.

Test specification:	4.2 Leakage current limitation		
Test purpose:	Leakage current shall not exceed 10 mA peak at any time during the 90 second test interval described below when the 50-60 Hz AC test voltage in table 1 is applied between the test points in table 1.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/2/2011 9:00:47 AM		
Remarks: Post surge			

Test results

Test leads	Test voltage, VAC, rms	Leakage current	Verdict
(a) and (b)	**1500**	<0.1mA	Pass
(a) and (c)	**1000**	<0.1mA	Pass
(a) and (d)	1000	<0.1mA	Pass
(a) and (e)	1000	NA	-
(a) and (f)	1000	NA	-
(a) and (g)	1000	NA	-
(b) and (c)	**1500**	9.75mA	Pass
(b) and (d)	1500	3.11mA	Pass
(b) and (e)	1500	NA	-
(b) and (f)	1500	NA	-
(b) and (g)	1500	NA	-
(c) and (e)	1000	NA	-
(c) and (f)	1000	NA	-
(d) and (e)	1000	NA	-
(d) and (f)	1000	NA	-
(e) and (f)	1000	NA	-

Where:

(a) All telephone connections;

(b) All power connections;

(c) All possible combinations of exposed conductive surfaces on the exterior of such equipment or circuitry including grounding connection points, but excluding terminals for connection to other terminal equipment;

(d) All terminals for connection to approved protective circuitry or non-approved equipment;

(e) All auxiliary lead terminals;

(f) All E&M lead terminals, and

(g) All PR, PC, CY1 and CY2 leads.

Test specification:	4.3.1 General requirement		
Test purpose:	Under no condition of failure of approved terminal equipment or approved protective circuitry that can be conceived to occur in the handling, operation or repair of such equipment or circuitry, shall the open circuit voltage on telephone connections exceed 70 Vp after one second, except for voltages for network control signaling, alerting and supervision.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/2/2011 8:37:17 AM		
Remarks:			

There was no condition that could be conceived that would cause the EUT to not meet this requirement.

Test specification:	4.3.2 Physical separation of leads		
Test purpose:	To check the connection of non-approved equipment to approved terminal equipment or approved protective circuitry		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/2/2011 8:37:32 AM		
Remarks: Post surge			

Standard reference	Requirement	Verdict
4.3.2	**Connection of non-approved equipment to approved terminal equipment or approved protective circuitry:** Leads to, or any elements having a conducting path to telephone connections, auxiliary leads or E&M leads shall: a) Be reasonably physically separated and restrained from and be neither routed in the same cable as nor use the same connector as leads or metallic paths connecting power connections; b) Be reasonably physically separated and restrained from and be neither routed in the same cable as nor use adjacent pins on the same connector as metallic paths that lead to non-approved equipment, when the voltages on such metallic paths exceed the non-hazardous voltage source limits in 4.3.3.	 Pass Pass

Test specification:	4.6 Connectors & wiring configurations		
Test purpose:			
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/2/2011 8:38:19 AM		
Remarks: Post surge			

Test results

Standard reference	Requirement	Description	Verdict
4.6.1	**Introduction:** Connection of terminal equipment to the telephone network shall be made through a connector conforming to TIA-1096-A or by direct attachment to wiring installed by the provider(s) of wire line telecommunications including, but not limited to, splicing, bridging, twisting, and soldering. Hardware used to mount, protect, and enclose standard jacks is not described in this Standard or TIA-1096-A. The only requirement on connecting blocks, housings, dust covers, outdoor boxes, and the like that contain standard network jacks is that they shall accept standard plugs with cordage.	N/A	N/A
4.6.2	**Wiring configurations:** The connectors specified in TIA-1096-A shall be wired in accordance with any of the applicable wiring configurations provided in T1.TR.5-1999. The applicable connector and connector wiring configuration for approved TE shall be identified in consumer instructions and product approval documentation.	The T1 interface is provided with RJ-48 sockets	Pass
4.6.3	**Multi-line, private branch exchange (PBX), and key telephone systems:** Any of the jack configurations specified in section 4.6.2, used singly, in multiple combinations, or combined in common mechanical arrays, may be used as the interface between multi-line equipment such as PBX and key telephone systems, and the telephone network. The telephone company and installation supervisor may mutually agree to use electrical connections alternative to those specified in subclause 4.6.2.	NA	N/A

Test specification:	4.7.3 Allowable net amplification (ONS -> 1.544 Mbps)		
Test purpose:	To verify that the approved terminal equipment and approved protective circuitry with provision for transmission between ports to other terminal equipment that is separately approved for direct connection to wireline carrier networks and network interface ports have not adjustments that will allow net amplification to occur in the through-transmission path within the 200–3995 Hz voice band that exceed the values shown in table 3 in the direction of transmission toward the network.		
Test mode:	Evaluation	Verdict:	PASS
Date & Time:	10/27/2011 2:26:53 PM		
Remarks:			

Measurement uncertainty

Expanded uncertainty, k=2 (95% confidence):

Power level	±0.14 dB

General parameters

Parameter	Value
EUT state	ONS (600 ohm) -> T1
Tx & Rx Setup	ChA (DC-in, tone) -> 1.5M (Ts 0)
Start frequency	200 Hz
Stop frequency	3.995 kHz
Stimulus level	-11.00 dBV
Stimulus signal type	White Noise
Overall meas. time	30 s

Gain

Gain	Limit	Verdict
		Pass
-1.46 dB	0 dB	Pass

Test specification:	4.7.3 Allowable net amplification (ONS -> 1.544 Mbps)		
Test purpose:	To verify that the approved terminal equipment and approved protective circuitry with provision for transmission between ports to other terminal equipment that is separately approved for direct connection to wireline carrier networks and network interface ports have not adjustments that will allow net amplification to occur in the through-transmission path within the 200–3995 Hz voice band that exceed the values shown in table 3 in the direction of transmission toward the network.		
Test mode:	Evaluation	**Verdict:**	PASS
Date & Time:	11/2/2011 8:27:27 AM		
Remarks: Post surge			

Measurement uncertainty

Expanded uncertainty, k=2 (95% confidence):

Power level ±0.14 dB

General parameters

Parameter	Value
EUT state	ONS (600 ohm) -> T1
Tx & Rx Setup	ChA (DC-in, tone) -> 1.5M (Ts 0)
Start frequency	200 Hz
Stop frequency	3.995 kHz
Stimulus level	-11.00 dBV
Stimulus signal type	White Noise
Overall meas. time	30 s

Gain

Gain	Limit	Verdict
		Pass
-1.07 dB	0 dB	Pass

Test specification:	4.7.4 Single frequency (SF) guard band (ONS -> 1.544 Mbps)		
Test purpose:	To verify that the insertion loss in through-connection paths for any frequency in the 800 to 2450 Hz band not exceed the loss at any frequency in the 2450 to 2750 Hz band by more than 1 dB (maximum loss in the 800 to 2450 Hz band minus minimum loss in the 2450 to 2750 Hz band plus 1 dB).		
Test mode:	Evaluation	Verdict:	PASS
Date & Time:	10/27/2011 2:45:36 PM		
Remarks:			

Measurement uncertainty

Expanded uncertainty, k=2 (95% confidence):

Signal level ±0.14dB

General parameters

Parameter	Value
EUT state	ONS (600 ohm) -> T1
Tx & Rx Setup	ChA (DC-in, tone) -> 1.5M (Ts 0)
Stimulus level	-11.00 dBV
Tx and Rx levels	Tx voltage = -11dBV without Tx adjustment

Test ranges

Frequency		
Start	Stop	Step
800.00 Hz	2.40 kHz	1.26 x F
2.45 kHz	2.75 kHz	100.00 Hz

Ripple in band 1, Ripple in band 2, Max (band1-band2) insertion loss

Ripple band 1	Ripple band 2	Max (band1-band2) insertion loss	Limit	Verdict
				Pass
0.15 dB	0.96 dB	0.55 dB	1 dB	Pass

Insertion loss vs frequency

Frequency	Loss
800 Hz	0.38 dB
1008 Hz	0.41 dB
1270 Hz	0.29 dB
1600 Hz	0.28 dB
2016 Hz	0.4 dB
2400 Hz	0.25 dB
2450 Hz	0.38 dB
2550 Hz	0.64 dB
2650 Hz	-0.15 dB
2750 Hz	0.81 dB

Test specification:	4.7.4 Single frequency (SF) guard band (ONS -> 1.544 Mbps)		
Test purpose:	To verify that the insertion loss in through-connection paths for any frequency in the 800 to 2450 Hz band not exceed the loss at any frequency in the 2450 to 2750 Hz band by more than 1 dB (maximum loss in the 800 to 2450 Hz band minus minimum loss in the 2450 to 2750 Hz band plus 1 dB).		
Test mode:	Evaluation	Verdict:	PASS
Date & Time:	11/2/2011 8:23:10 AM		
Remarks: Post surge			

Measurement uncertainty

Expanded uncertainty, k=2 (95% confidence):

Signal level ±0.14dB

General parameters

Parameter	Value
EUT state	ONS (600 ohm) -> T1
Tx & Rx Setup	ChA (DC-in, tone) -> 1.5M (Ts 0)
Stimulus level	-11.00 dBV
Tx and Rx levels	Tx voltage = -11dBV without Tx adjustment

Test ranges

Frequency		
Start	Stop	Step
800.00 Hz	2.40 kHz	1.26 x F
2.45 kHz	2.75 kHz	100.00 Hz

Ripple in band 1, Ripple in band 2, Max (band1-band2) insertion loss

Ripple band 1	Ripple band 2	Max (band1-band2) insertion loss	Limit	Verdict
				Pass
0.13 dB	0.60 dB	0.36 dB	1 dB	Pass

Insertion loss vs frequency

Frequency	Loss
800 Hz	0.39 dB
1008 Hz	0.4 dB
1270 Hz	0.29 dB
1600 Hz	0.28 dB
2016 Hz	0.41 dB
2400 Hz	0.35 dB
2450 Hz	0.56 dB
2550 Hz	0.46 dB
2650 Hz	0.06 dB
2750 Hz	0.65 dB

Test specification:	5.2.4.1 Pulse repetition rate		
Test purpose:	The free running line rate of the transmit signal shall be 1.544 Mbps with a tolerance of ± 32 ppm, i.e., ± 50 bps.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/27/2011 8:00:08 AM		
Remarks:			

Measurement uncertainty

Expanded uncertainty, k=2 (95% confidence):

Measured bit rate ± 1 ppm

General parameters

Parameter	Value
Overall meas. time	60 s
Tx Clock source	Recovered Clk
Line coding	B8ZS
Frame format	ESF (193E)

Bit rate, Minimum bit rate offset, Maximum bit rate offset

Bit frequency	Minimum bit rate offset	Limit	Maximum bit rate offset	Limit	Verdict
					Pass
1543972 bit/s	-20.1 ppm	-32 ppm	-16.8 ppm	32 ppm	Pass

Test specification:	5.2.4.1 Pulse repetition rate		
Test purpose:	The free running line rate of the transmit signal shall be 1.544 Mbps with a tolerance of ± 32 ppm, i.e., ± 50 bps.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/2/2011 7:26:23 AM		
Remarks: Post surge			

Measurement uncertainty

Expanded uncertainty, k=2 (95% confidence):

Measured bit rate ± 1 ppm

General parameters

Parameter	Value
Overall meas. time	60 s
Tx Clock source	Recovered Clk
Line coding	B8ZS
Frame format	ESF (193E)

Bit rate, Minimum bit rate offset, Maximum bit rate offset

Bit frequency	Minimum bit rate offset	Limit	Maximum bit rate offset	Limit	Verdict
					Pass
1543969 bit/s	-23.3 ppm	-32 ppm	-18.1 ppm	32 ppm	Pass

Test specification:	5.2.4.2.1 Pulse shape A		
Test purpose:	The pulse shape of the digital signal applied to a 100 ohm resistor shall fall within the pulse template described in Figure 34.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/27/2011 7:57:29 AM		
Remarks:			

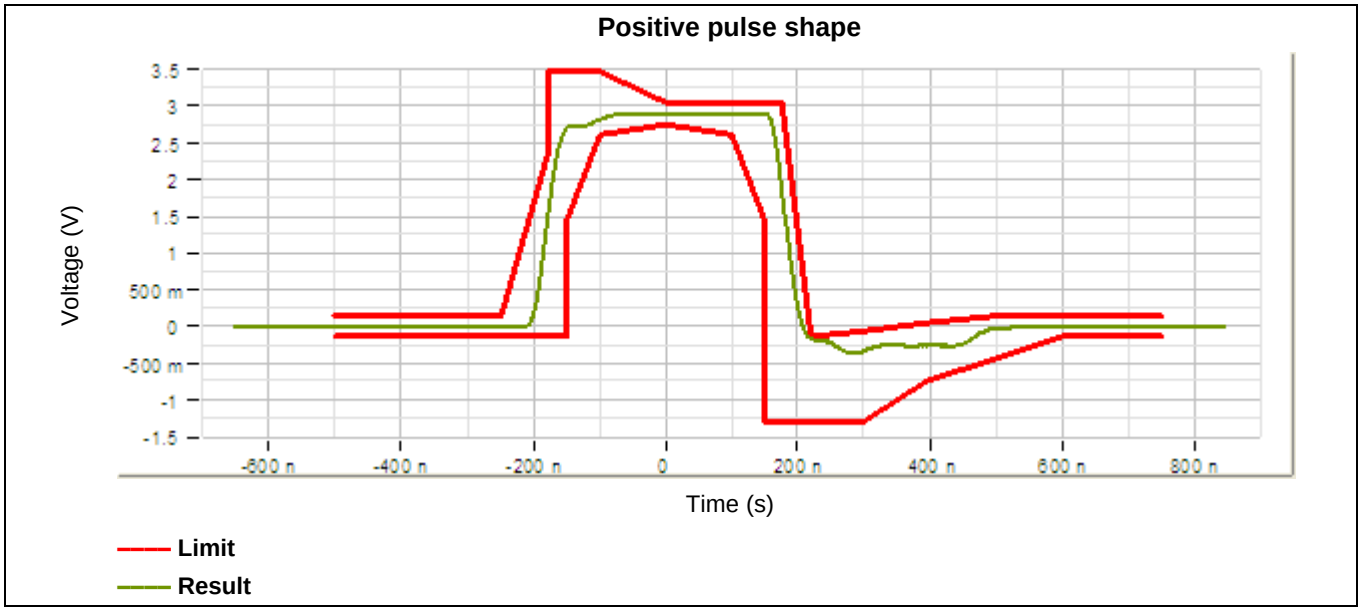
Measurement uncertainty

Expanded uncertainty, k=2 (95% confidence):

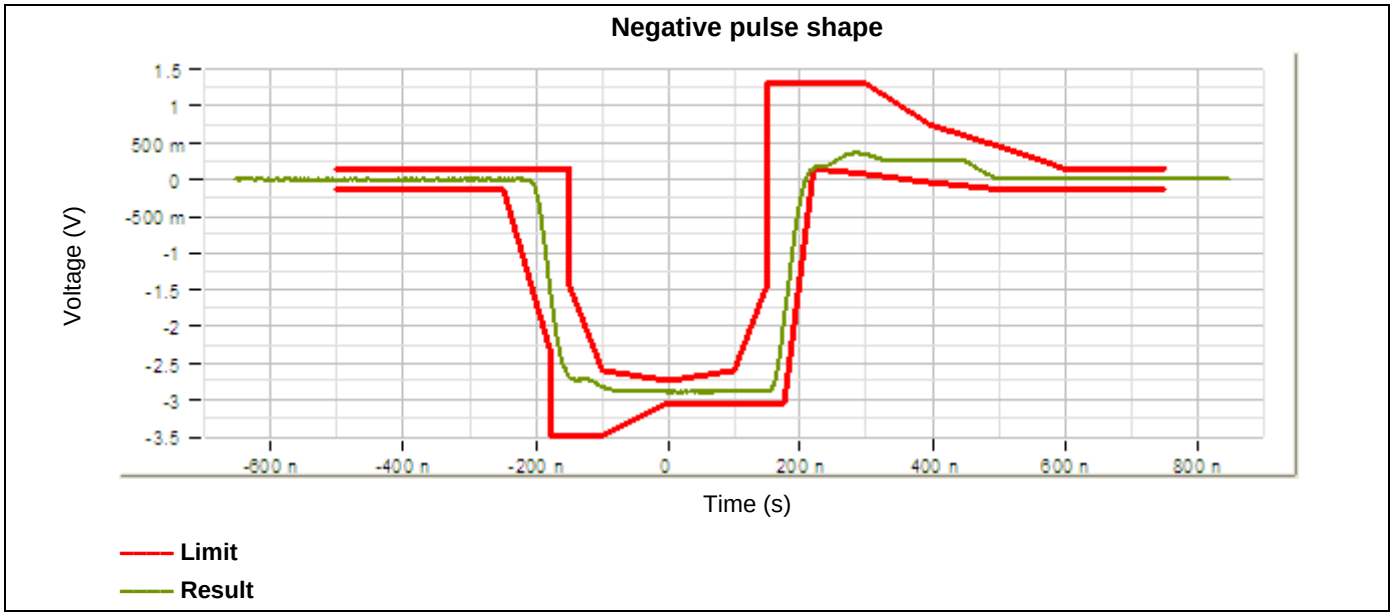
Pulse amplitude	±2.2%
Timing	±0.35%

General parameters

Parameter	Value
Overall meas. time	120 s
Amplitude auto-scaling	On (x 0.80 - x 1.20)
Frame format	Unframed
Pattern	1:2



Test specification:	5.2.4.2.1 Pulse shape A		
Test purpose:	The pulse shape of the digital signal applied to a 100 ohm resistor shall fall within the pulse template described in Figure 34.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/27/2011 7:57:29 AM		
Remarks:			



Positive pulse shape fail ratio, Negative pulse shape fail ratio

Ratio	Ratio	Limit	Verdict
			Pass
0 %	0 %	0 %	Pass

Min pos pulse voltage, Max pos pulse voltage, Min neg pulse voltage, Max neg pulse voltage

Min pos peak	Max pos peak	Limit min	Limit max	Min neg peak	Max neg peak	Limit min	Limit max	Verdict
								Pass
2.89 V	2.90 V	2.4 V	3.6 V	-2.90 V	-2.91 V	-3.6 V	-2.4 V	Pass

Test specification:	5.2.4.2.1 Pulse shape A		
Test purpose:	The pulse shape of the digital signal applied to a 100 ohm resistor shall fall within the pulse template described in Figure 34.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/2/2011 8:31:15 AM		
Remarks: Post surge			

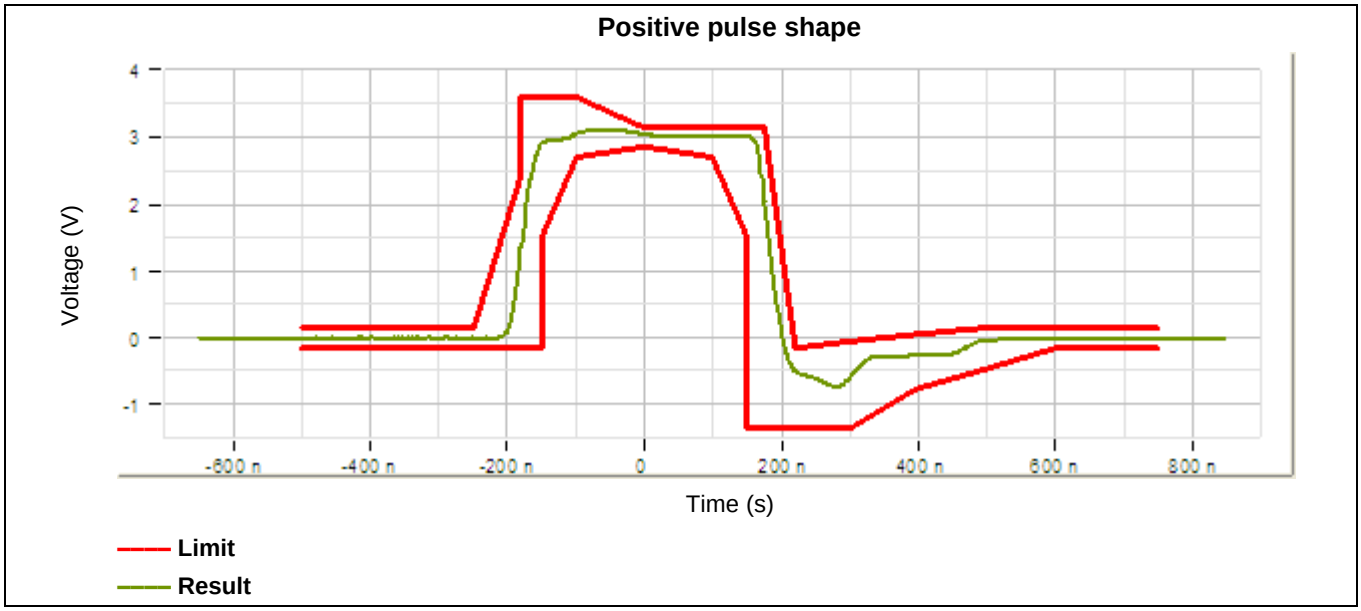
Measurement uncertainty

Expanded uncertainty, k=2 (95% confidence):

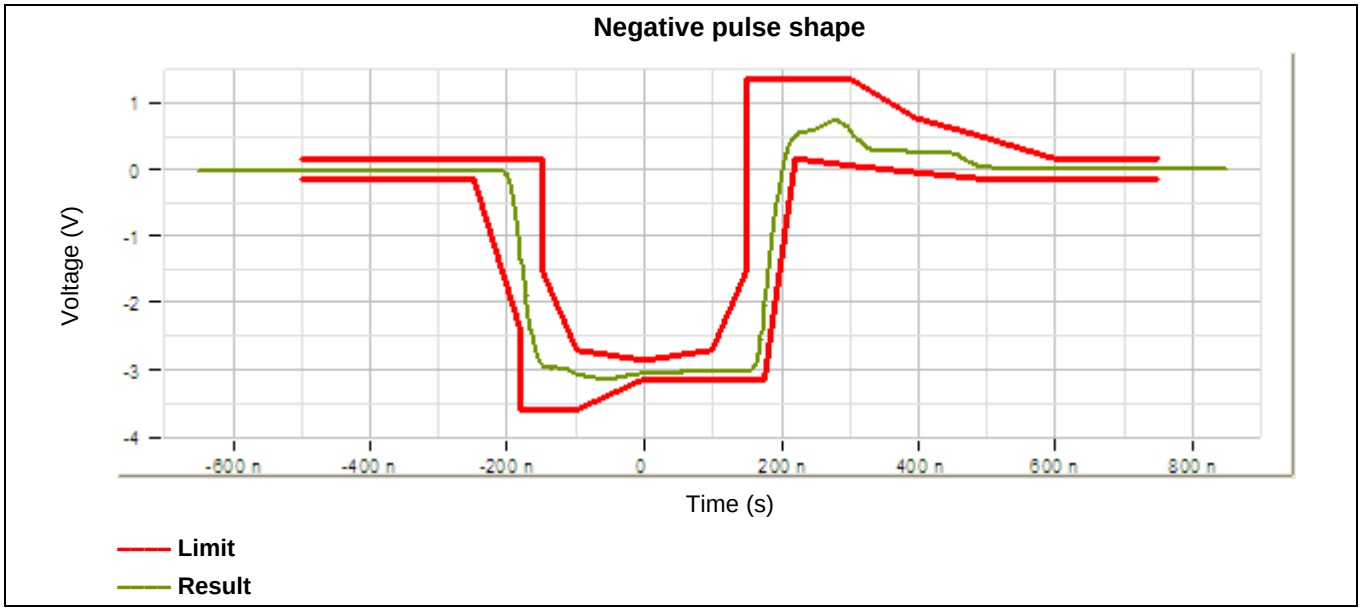
Pulse amplitude	±2.2%
Timing	±0.35%

General parameters

Parameter	Value
Overall meas. time	120 s
Amplitude auto-scaling	On (x 0.80 - x 1.20)
Frame format	Unframed
Pattern	1:2



Test specification:	5.2.4.2.1 Pulse shape A		
Test purpose:	The pulse shape of the digital signal applied to a 100 ohm resistor shall fall within the pulse template described in Figure 34.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/2/2011 8:31:15 AM		
Remarks: Post surge			



Positive pulse shape fail ratio, Negative pulse shape fail ratio

Ratio	Ratio	Limit	Verdict
			Pass
0 %	0 %	0 %	Pass

Min pos pulse voltage, Max pos pulse voltage, Min neg pulse voltage, Max neg pulse voltage

Min pos peak	Max pos peak	Limit min	Limit max	Min neg peak	Max neg peak	Limit min	Limit max	Verdict
								Pass
3.12 V	3.13 V	2.4 V	3.6 V	-3.13 V	-3.14 V	-3.6 V	-2.4 V	Pass

Test specification:	5.2.4.2.2 Pulse shape B		
Test purpose:	The pulse shape of the digital signal applied to a 100 ohm resistor shall fall within the pulse template obtained by passing the bounding pulses described in Figure 34 through the transfer function described in paragraph 5.2.4.2.2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/27/2011 7:45:39 AM		
Remarks:			

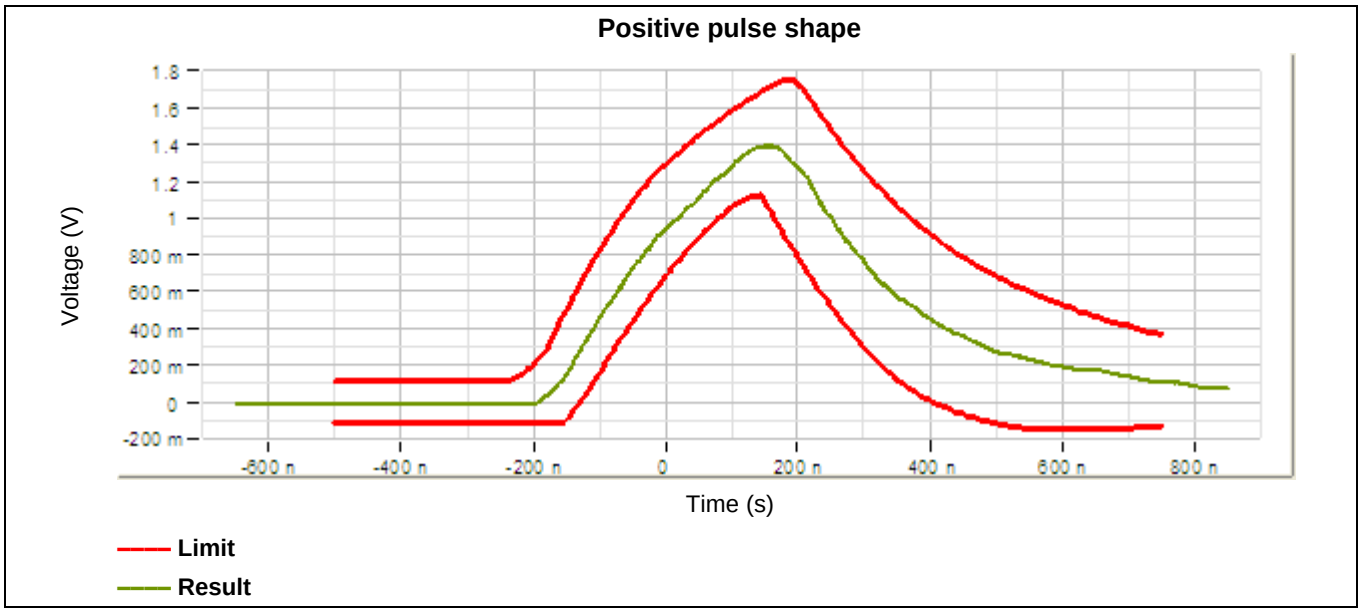
Measurement uncertainty

Expanded uncertainty, k=2 (95% confidence):

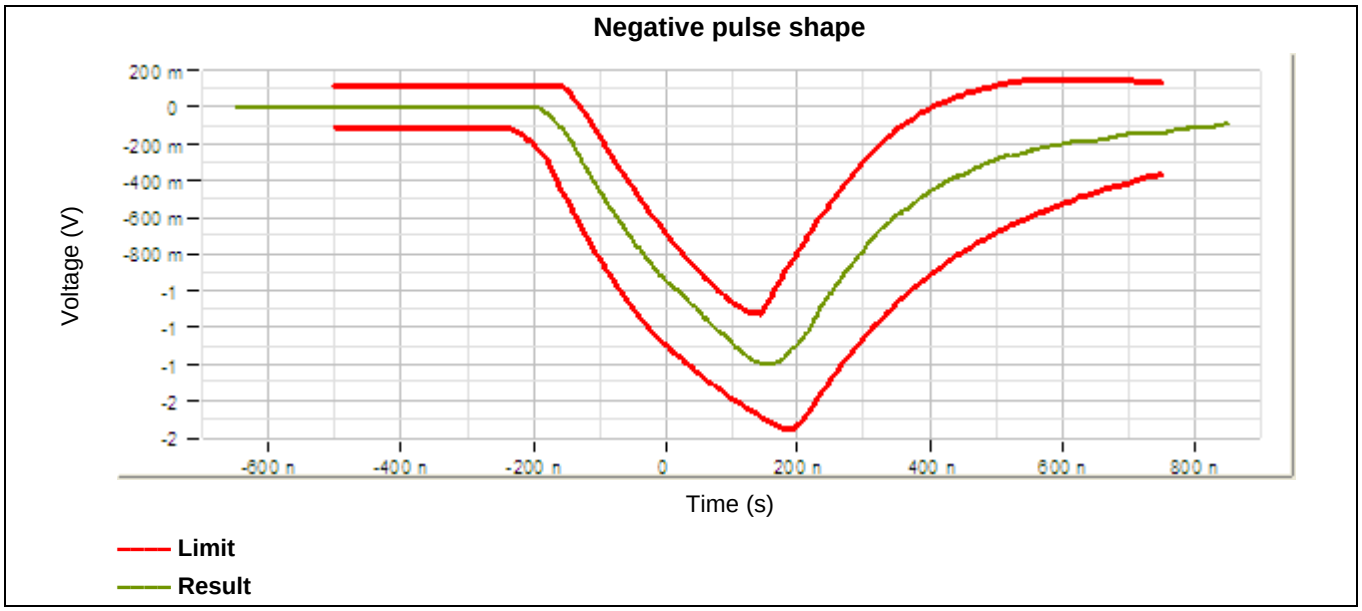
Pulse amplitude	±2.2%
Timing	±0.35%

General parameters

Parameter	Value
Overall meas. time	120 s
Amplitude auto-scaling	On (x 0.80 - x 1.20)
Frame format	Unframed
Pattern	1:7



Test specification:	5.2.4.2.2 Pulse shape B		
Test purpose:	The pulse shape of the digital signal applied to a 100 ohm resistor shall fall within the pulse template obtained by passing the bounding pulses described in Figure 34 through the transfer function described in paragraph 5.2.4.2.2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/27/2011 7:45:39 AM		
Remarks:			



Positive pulse shape fail ratio, Negative pulse shape fail ratio

Ratio	Ratio	Limit	Verdict
			Pass
0 %	0 %	0 %	Pass

Min pos pulse voltage, Max pos pulse voltage, Min neg pulse voltage, Max neg pulse voltage

Min pos peak	Max pos peak	Min neg peak	Max neg peak
1.391 V	1.397 V	-1.395 V	-1.402 V

Test specification:	5.2.4.2.2 Pulse shape B		
Test purpose:	The pulse shape of the digital signal applied to a 100 ohm resistor shall fall within the pulse template obtained by passing the bounding pulses described in Figure 34 through the transfer function described in paragraph 5.2.4.2.2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/2/2011 8:32:52 AM		
Remarks: Post surge			

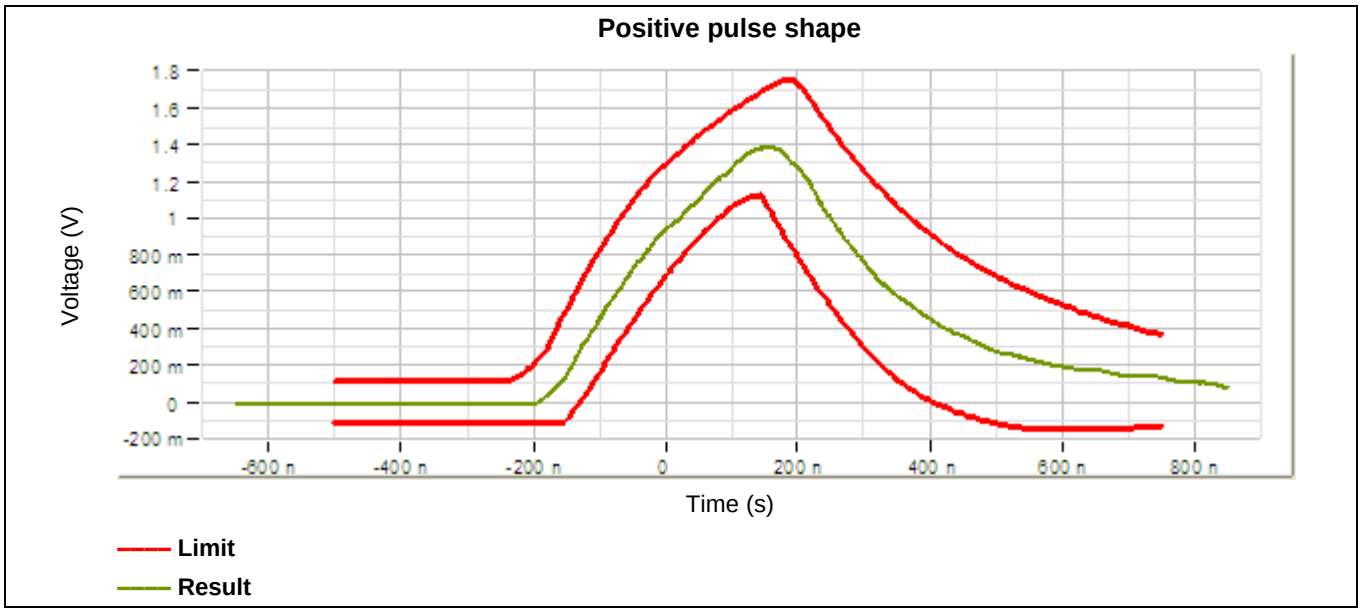
Measurement uncertainty

Expanded uncertainty, k=2 (95% confidence):

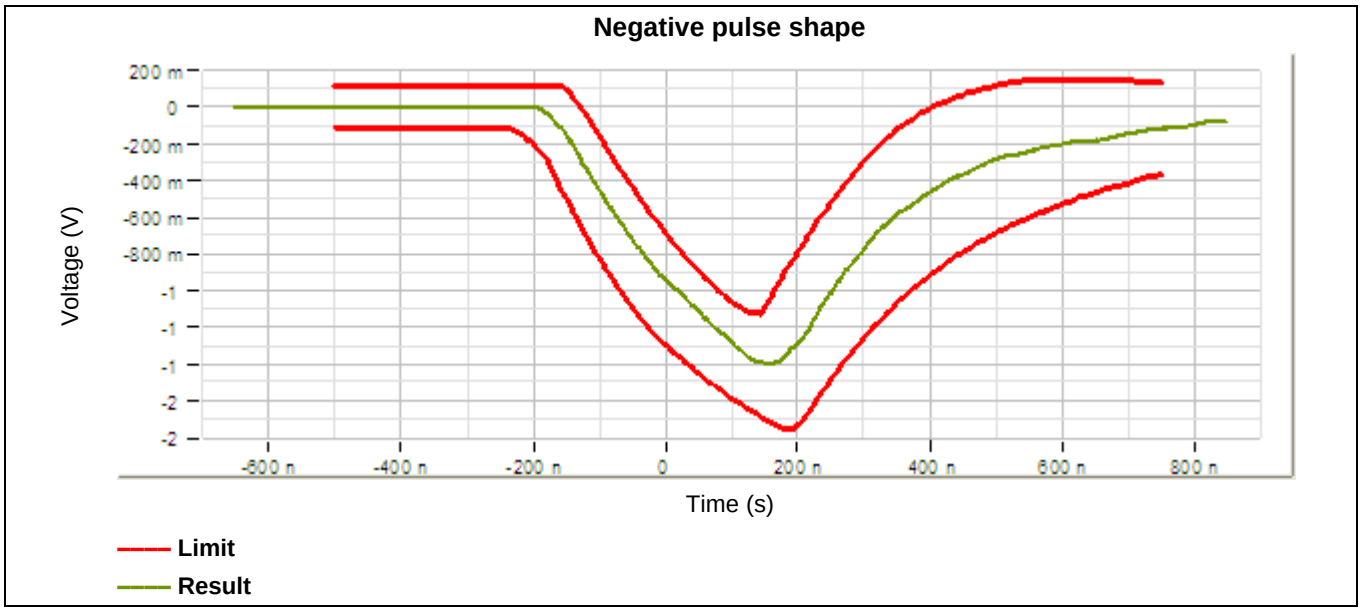
Pulse amplitude	±2.2%
Timing	±0.35%

General parameters

Parameter	Value
Overall meas. time	30 s
Amplitude auto-scaling	On (x 0.80 - x 1.20)
Frame format	Unframed
Pattern	1:7



Test specification:	5.2.4.2.2 Pulse shape B		
Test purpose:	The pulse shape of the digital signal applied to a 100 ohm resistor shall fall within the pulse template obtained by passing the bounding pulses described in Figure 34 through the transfer function described in paragraph 5.2.4.2.2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/2/2011 8:32:52 AM		
Remarks: Post surge			



Positive pulse shape fail ratio, Negative pulse shape fail ratio

Ratio	Ratio	Limit	Verdict
			Pass
0 %	0 %	0 %	Pass

Min pos pulse voltage, Max pos pulse voltage, Min neg pulse voltage, Max neg pulse voltage

Min pos peak	Max pos peak	Min neg peak	Max neg peak
1.385 V	1.39 V	-1.394 V	-1.399 V

Test specification:	5.2.4.2.3 Pulse shape C		
Test purpose:	The pulse shape of the digital signal applied to a 100 ohm resistor shall fall within the pulse template obtained by passing the bounding pulses described in Figure 34 through the transfer function described in paragraph 5.2.4.2.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/27/2011 7:32:31 AM		
Remarks:			

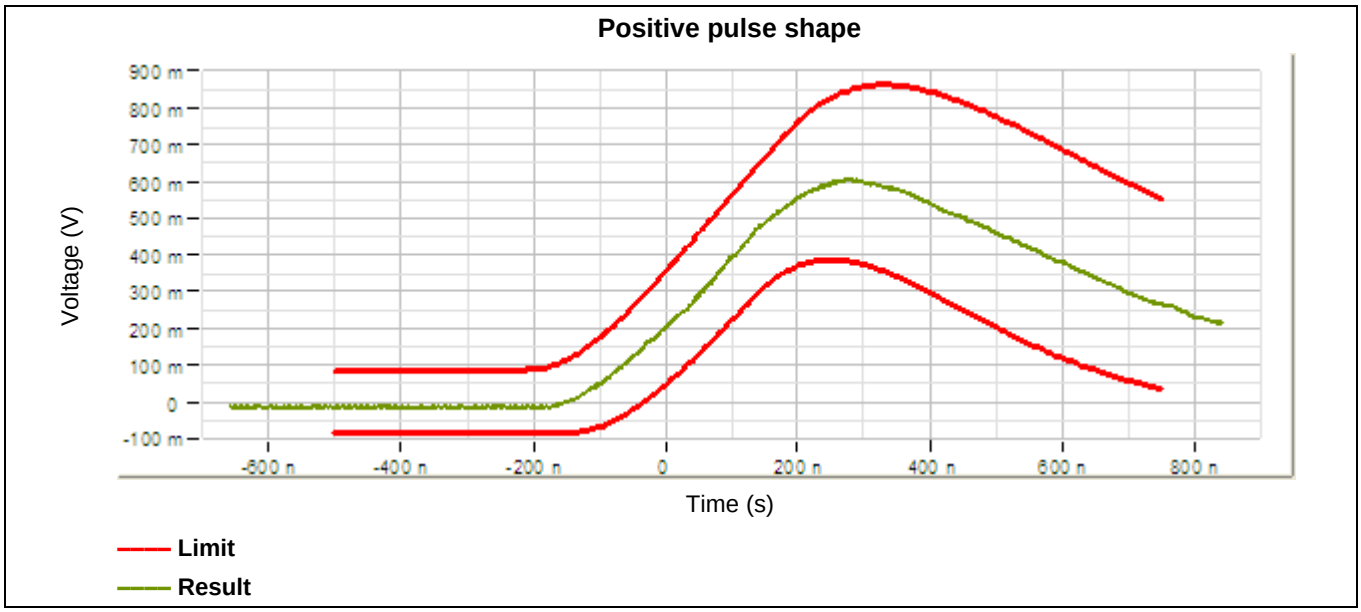
Measurement uncertainty

Expanded uncertainty, k=2 (95% confidence):

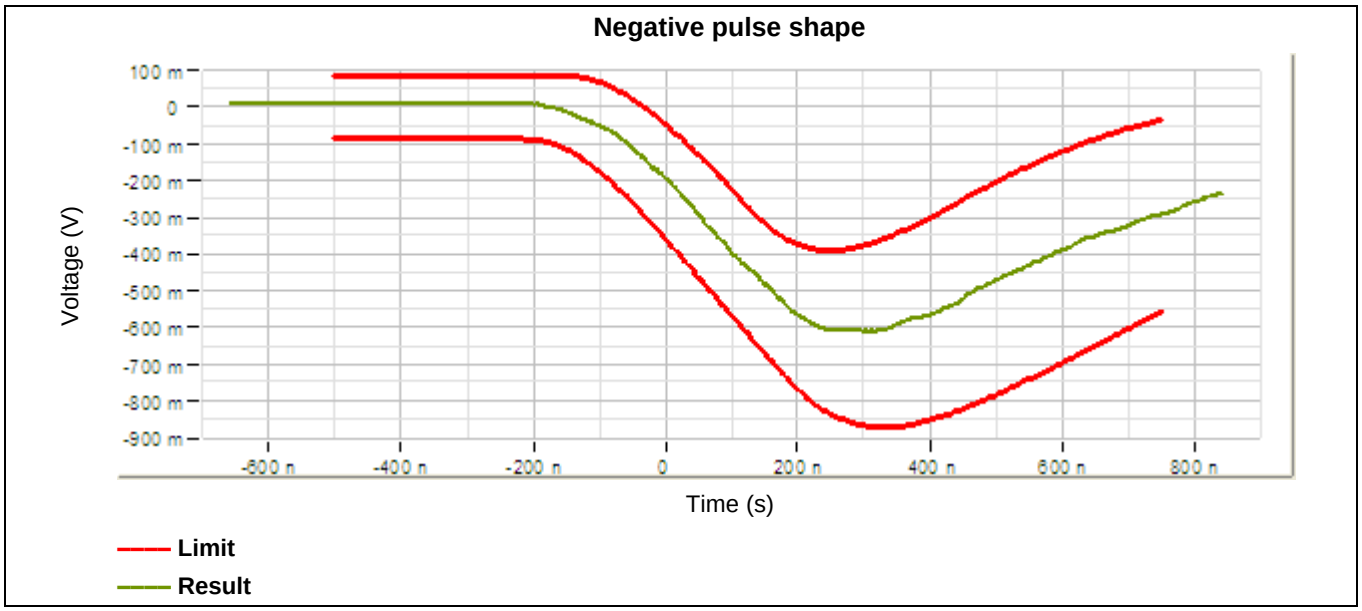
Pulse amplitude	±2.2%
Timing	±0.35%

General parameters

Parameter	Value
Overall meas. time	120 s
Amplitude auto-scaling	On (x 0.80 - x 1.20)
Frame format	Unframed
Pattern	1:7



Test specification:	5.2.4.2.3 Pulse shape C		
Test purpose:	The pulse shape of the digital signal applied to a 100 ohm resistor shall fall within the pulse template obtained by passing the bounding pulses described in Figure 34 through the transfer function described in paragraph 5.2.4.2.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/27/2011 7:32:31 AM		
Remarks:			



Positive pulse shape fail ratio, Negative pulse shape fail ratio

Ratio	Ratio	Limit	Verdict
			Pass
0 %	0 %	0 %	Pass

Min pos pulse voltage, Max pos pulse voltage, Min neg pulse voltage, Max neg pulse voltage

Min pos peak	Max pos peak	Min neg peak	Max neg peak
604.74 mV	611.22 mV	-612.96 mV	-618.57 mV

Test specification:	5.2.4.2.3 Pulse shape C		
Test purpose:	The pulse shape of the digital signal applied to a 100 ohm resistor shall fall within the pulse template obtained by passing the bounding pulses described in Figure 34 through the transfer function described in paragraph 5.2.4.2.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/2/2011 8:34:06 AM		
Remarks: Post surge			

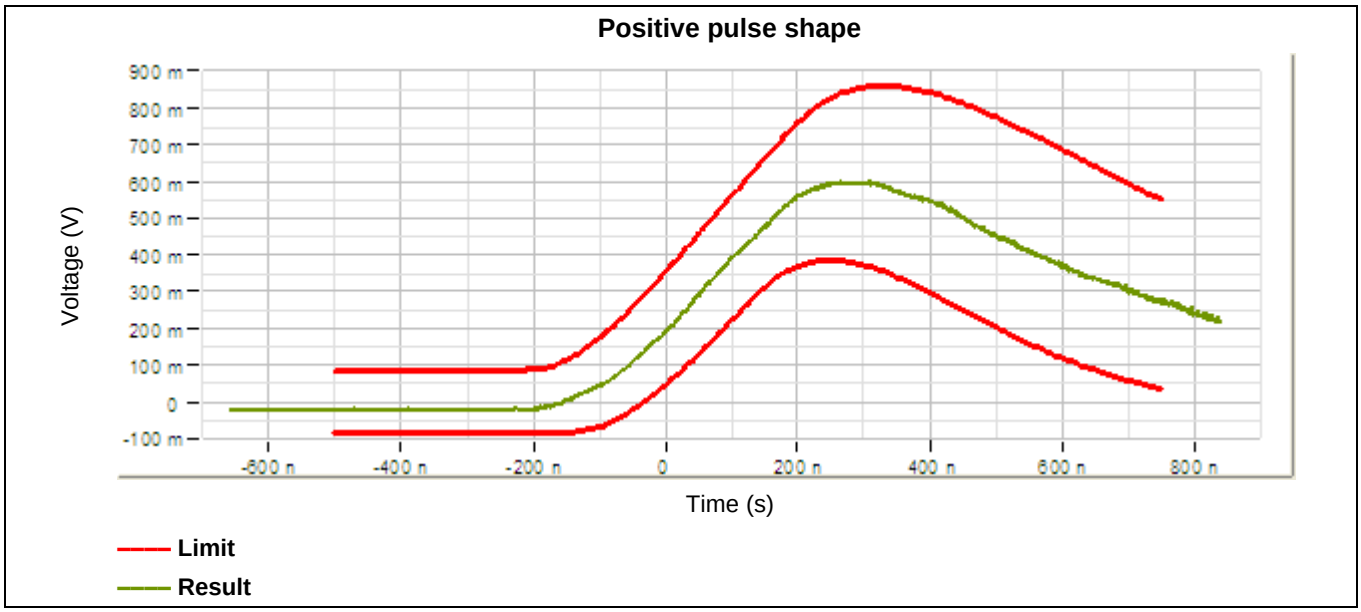
Measurement uncertainty

Expanded uncertainty, k=2 (95% confidence):

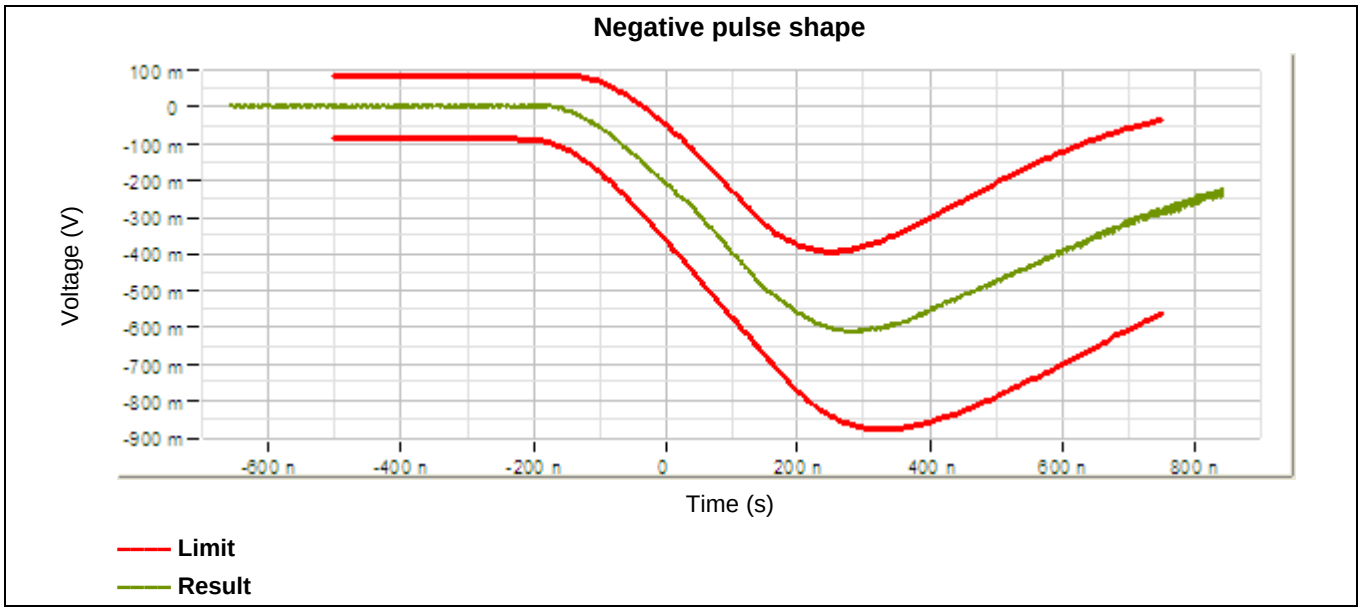
Pulse amplitude	±2.2%
Timing	±0.35%

General parameters

Parameter	Value
Overall meas. time	30 s
Amplitude auto-scaling	On (x 0.80 - x 1.20)
Frame format	Unframed
Pattern	1:7



Test specification:	5.2.4.2.3 Pulse shape C		
Test purpose:	The pulse shape of the digital signal applied to a 100 ohm resistor shall fall within the pulse template obtained by passing the bounding pulses described in Figure 34 through the transfer function described in paragraph 5.2.4.2.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/2/2011 8:34:06 AM		
Remarks: Post surge			



Positive pulse shape fail ratio, Negative pulse shape fail ratio

Ratio	Ratio	Limit	Verdict
			Pass
0 %	0 %	0 %	Pass

Min pos pulse voltage, Max pos pulse voltage, Min neg pulse voltage, Max neg pulse voltage

Min pos peak	Max pos peak	Min neg peak	Max neg peak
599.4 mV	610.77 mV	-612.09 mV	-636.57 mV

Test specification:	5.2.4.4 Output power		
Test purpose:	The output power in a 3-kHz band about 772 kHz when an all ones signal sequence is being produced as measured across a 100 ohm terminating resistance shall not exceed +19 dBm. The power in a 3 kHz band about 1.544 MHz shall be at least 25 dB below that in a 3-kHz band about 772 kHz.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/27/2011 7:58:17 AM		
Remarks:			

Measurement uncertainty

Expanded uncertainty, k=2 (95% confidence):

Power and voltage in the -25 to +20 dBm range ±0.2dB

General parameters

Parameter	Value
Line coding	B8ZS
Frame format	Unframed
BER Pattern	All Ones
Reference frequency	772 kHz
Bandwidth	3 kHz
Overall meas. time	30 s

Average output power

Power at 772kHz	Limit	Verdict
		Pass
15.95 dBm	19 dBm	Pass

Average second harmonic level

2nd Harmonic level	Limit	Verdict
		Pass
-46.75 dBm	25 dB below power at 772kHz	Pass

Test specification:	5.2.4.4 Output power		
Test purpose:	The output power in a 3-kHz band about 772 kHz when an all ones signal sequence is being produced as measured across a 100 ohm terminating resistance shall not exceed +19 dBm. The power in a 3 kHz band about 1.544 MHz shall be at least 25 dB below that in a 3-kHz band about 772 kHz.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/2/2011 8:46:48 AM		
Remarks: Post surge			

Measurement uncertainty

Expanded uncertainty, k=2 (95% confidence):

Power and voltage in the -25 to +20 dBm range ±0.2dB

General parameters

Parameter	Value
Line coding	B8ZS
Frame format	Unframed
BER Pattern	All Ones
Reference frequency	772 kHz
Bandwidth	3 kHz
Overall meas. time	30 s

Average output power

Power	Limit	Verdict
		Pass
15.93 dBm	19 dBm	Pass

Average second harmonic level

2nd Harmonic level	Limit	Verdict
		Pass
65.33 dBc	25 dBc	Pass

Test specification:	5.2.4.7 DS1 and ISDN PRI terminal equipment transverse balance		
Test purpose:	The transverse balance of TE in the frequency range of 12 - 1544 kHz shall be at least 35 dB.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/27/2011 8:08:36 AM		
Remarks:			

Measurement uncertainty

Expanded uncertainty, k=2 (95% confidence):

Balance (0 to 40 dB)	±0.21dB
Balance (40 to 60 dB)	±0.42dB

General parameters

Parameter	Value
Stimulus level	-10.00 dBV

Transverse balance

Frequency	Balance	Limit	Verdict
Condition 1: EUT state: Receive port			**Pass**
12.00 kHz	67.02dB	35 dB	Pass
15.96 kHz	69.42dB	35 dB	Pass
21.23 kHz	67.52dB	35 dB	Pass
28.23 kHz	65.92dB	35 dB	Pass
37.55 kHz	59.97dB	35 dB	Pass
49.94 kHz	54.63dB	35 dB	Pass
66.42 kHz	84.88dB	35 dB	Pass
88.34 kHz	83.84dB	35 dB	Pass
117.49 kHz	79.84dB	35 dB	Pass
156.26 kHz	75.55dB	35 dB	Pass
207.83 kHz	75.24dB	35 dB	Pass
276.41 kHz	71.47dB	35 dB	Pass
367.62 kHz	68.96dB	35 dB	Pass
488.94 kHz	66.04dB	35 dB	Pass
650.29 kHz	61.37dB	35 dB	Pass
864.88 kHz	59.62dB	35 dB	Pass
1.15 MHz	59.74dB	35 dB	Pass
1.53 MHz	56.81dB	35 dB	Pass
1.54 MHz	56.76dB	35 dB	Pass
Condition 2: EUT state: Transmit port			**Pass**
12.00 kHz	63.44dB	35 dB	Pass
15.96 kHz	65.68dB	35 dB	Pass
21.23 kHz	65.05dB	35 dB	Pass
28.23 kHz	62.69dB	35 dB	Pass

Test specification:	5.2.4.7 DS1 and ISDN PRI terminal equipment transverse balance		
Test purpose:	The transverse balance of TE in the frequency range of 12 - 1544 kHz shall be at least 35 dB.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/27/2011 8:08:36 AM		
Remarks:			

Frequency	Balance	Limit	Verdict
37.55 kHz	52.92dB	35 dB	Pass
49.94 kHz	52.89dB	35 dB	Pass
66.42 kHz	80.26dB	35 dB	Pass
88.34 kHz	76.61dB	35 dB	Pass
117.49 kHz	74.96dB	35 dB	Pass
156.26 kHz	71.68dB	35 dB	Pass
207.83 kHz	69.51dB	35 dB	Pass
276.41 kHz	69.89dB	35 dB	Pass
367.62 kHz	67.33dB	35 dB	Pass
488.94 kHz	63.09dB	35 dB	Pass
650.29 kHz	69.54dB	35 dB	Pass
864.88 kHz	54.57dB	35 dB	Pass
1.15 MHz	59.82dB	35 dB	Pass
1.53 MHz	55.02dB	35 dB	Pass
1.54 MHz	56.87dB	35 dB	Pass

Test specification:	5.2.4.7 DS1 and ISDN PRI terminal equipment transverse balance		
Test purpose:	The transverse balance of TE in the frequency range of 12 - 1544 kHz shall be at least 35 dB.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/2/2011 7:07:17 AM		
Remarks: Post Surge			

Measurement uncertainty

Expanded uncertainty, k=2 (95% confidence):

Balance (0 to 40 dB)	±0.21dB
Balance (40 to 60 dB)	±0.42dB

General parameters

Parameter	Value
Stimulus level	-10.00 dBV

Transverse balance

Frequency	Balance	Limit	Verdict
Condition 1: EUT state: Receive port			**Pass**
12.00 kHz	54.77dB	35 dB	Pass
15.96 kHz	52.18dB	35 dB	Pass
21.23 kHz	53.54dB	35 dB	Pass
28.23 kHz	51.35dB	35 dB	Pass
37.55 kHz	50.83dB	35 dB	Pass
49.94 kHz	45.74dB	35 dB	Pass
66.42 kHz	81.95dB	35 dB	Pass
88.34 kHz	79.80dB	35 dB	Pass
117.49 kHz	77.71dB	35 dB	Pass
156.26 kHz	73.93dB	35 dB	Pass
207.83 kHz	72.60dB	35 dB	Pass
276.41 kHz	70.04dB	35 dB	Pass
367.62 kHz	65.20dB	35 dB	Pass
488.94 kHz	60.34dB	35 dB	Pass
650.29 kHz	48.17dB	35 dB	Pass
864.88 kHz	43.67dB	35 dB	Pass
1.15 MHz	42.02dB	35 dB	Pass
1.53 MHz	45.55dB	35 dB	Pass
1.54 MHz	44.09dB	35 dB	Pass
Condition 2: EUT state: Transmit port			**Pass**
12.00 kHz	55.46dB	35 dB	Pass
15.96 kHz	54.91dB	35 dB	Pass
21.23 kHz	57.75dB	35 dB	Pass
28.23 kHz	55.80dB	35 dB	Pass
37.55 kHz	51.47dB	35 dB	Pass

Test specification:	5.2.4.7 DS1 and ISDN PRI terminal equipment transverse balance		
Test purpose:	The transverse balance of TE in the frequency range of 12 - 1544 kHz shall be at least 35 dB.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/2/2011 7:07:17 AM		
Remarks: Post Surge			

Frequency	Balance	Limit	Verdict
49.94 kHz	40.35dB	35 dB	Pass
66.42 kHz	83.03dB	35 dB	Pass
88.34 kHz	80.66dB	35 dB	Pass
117.49 kHz	79.65dB	35 dB	Pass
156.26 kHz	75.93dB	35 dB	Pass
207.83 kHz	74.91dB	35 dB	Pass
276.41 kHz	72.99dB	35 dB	Pass
367.62 kHz	68.85dB	35 dB	Pass
488.94 kHz	66.56dB	35 dB	Pass
650.29 kHz	56.77dB	35 dB	Pass
864.88 kHz	46.96dB	35 dB	Pass
1.15 MHz	43.01dB	35 dB	Pass
1.53 MHz	52.00dB	35 dB	Pass
1.54 MHz	49.53dB	35 dB	Pass

Test specification:	5.2.4.8 Off-hook signal requirements for TE connecting to 1.544 Mbps digital services		
Test purpose:	Upon entering the normal off-hook state, in response to alerting, for subrate channels, approved terminal equipment shall continue to transmit the signaling bit sequence representing the off-hook state for 5 seconds, unless the equipment is returned to the on-hook state during the above 5-second interval.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/27/2011 8:01:18 AM		
Remarks:			

Measurement uncertainty

Expanded uncertainty, k=2 (95% confidence):

Power level	±0.23 dB
Timing	±4ms

General parameters

Parameter	Value
Overall meas. time	500 ms
Tx Clock source	Internal Clk
Line coding	B8ZS
Frame format	ESF (193E)
Digital Termination	100 ohm
Tx Timeslot	1
Rx Timeslot	1

Tx Stimulus, Rx Events

#	Tx Stimulus	Rx Events	Verdict
			Pass
1	User/Remote command lasting 0.00 sec		-
2	User/Remote command lasting 0.00 sec		-
3	Analog Off-hook (Ch A) lasting 0.00 sec		-
4	User/Remote command lasting 0.00 sec	Expected: Digital Off-hook (ABCD bits = 1111) 0.00 - 2.00 sec from stimulus start Received: Digital Off-hook (ABCD bits = 1111) occuring 0.00 sec from stimulus start	Pass
5	lasting 5.00 sec	Expected: Digital Off-hook (ABCD bits = 1111) 0.00 - 0.00 sec from stimulus start Received: Digital Off-hook (ABCD bits = 1111) occuring 0.00 sec from stimulus start	Pass

Test specification:	5.2.4.8 Off-hook signal requirements for TE connecting to 1.544 Mbps digital services		
Test purpose:	Upon entering the normal off-hook state, in response to alerting, for subrate channels, approved terminal equipment shall continue to transmit the signaling bit sequence representing the off-hook state for 5 seconds, unless the equipment is returned to the on-hook state during the above 5-second interval.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/2/2011 8:47:13 AM		
Remarks: Post surge			

Measurement uncertainty

Expanded uncertainty, k=2 (95% confidence):

Power level	±0.23 dB
Timing	±4ms

General parameters

Parameter	Value
Overall meas. time	500 ms
Tx Clock source	Internal Clk
Line coding	B8ZS
Frame format	ESF (193E)
Digital Termination	100 ohm
Tx Timeslot	1
Rx Timeslot	1

Tx Stimulus, Rx Events

#	Tx Stimulus	Rx Events	Verdict
			Pass
1	User/Remote command lasting 0.00 sec		-
2	User/Remote command lasting 0.00 sec		-
3	Analog Off-hook (Ch A) lasting 0.00 sec		-
4	User/Remote command lasting 0.00 sec	Expected: Digital Off-hook (ABCD bits = 1111) 0.00 - 2.00 sec from stimulus start Received: Digital Off-hook (ABCD bits = 1111) occuring 0.00 sec from stimulus start	Pass
5	lasting 5.00 sec	Expected: Digital Off-hook (ABCD bits = 1111) 0.00 - 0.00 sec from stimulus start Received: Digital Off-hook (ABCD bits = 1111) occuring 0.00 sec from stimulus start	Pass

Test specification:	5.2.4.9 Billing protection requirements for direct inward dialing		
Test purpose:	To verify that the off-hook signal to the network interface commences within 0.5 seconds of the called station answering the call. The requirement is necessary to initiate the billing.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/27/2011 3:24:27 PM		
Remarks:			

Measurement uncertainty

Expanded uncertainty, k=2 (95% confidence):

Power level	±0.23 dB
Timing	±4ms

General parameters

Parameter	Value
Tx Clock source	Internal Clk
Line coding	B8ZS
Frame format	ESF (193E)
Tx Timeslot	1
Rx Timeslot	1

Tx Stimulus, Rx Events

#	Tx Stimulus	Rx Events	Verdict
			Pass
1	User/Remote command lasting 0.00 sec		-
2	Digital Off-hook (ABCD bits = 1111) lasting 0.00 sec		-
3	Analog Off-hook (Ch A) lasting 5.00 sec	Expected: Digital On-hook (ABCD bits = 0000) 0.00 - 0.50 sec from stimulus start Received: Digital On-hook (ABCD bits = 0000) occuring 0.00 sec from stimulus start	Pass

Test specification:	5.2.4.9 Billing protection requirements for direct inward dialing		
Test purpose:	To verify that the off-hook signal to the network interface commences within 0.5 seconds of the called station answering the call. The requirement is necessary to initiate the billing.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/2/2011 7:29:48 AM		
Remarks: Post surge			

Measurement uncertainty

Expanded uncertainty, k=2 (95% confidence):

Power level	±0.23 dB
Timing	±4ms

General parameters

Parameter	Value
Tx Clock source	Internal Clk
Line coding	B8ZS
Frame format	ESF (193E)
Tx Timeslot	1
Rx Timeslot	1

Tx Stimulus, Rx Events

#	Tx Stimulus	Rx Events	Verdict
			Pass
1	User/Remote command lasting 0.00 sec		-
2	Digital Off-hook (ABCD bits = 1111) lasting 0.00 sec		-
3	Analog Off-hook (Ch A) lasting 5.00 sec	Expected: Digital On-hook (ABCD bits = 0000) 0.00 - 0.50 sec from stimulus start Received: Digital On-hook (ABCD bits = 0000) occuring 0.00 sec from stimulus start	Pass

Test specification:	5.2.4.10 Allowable net amplification between ports		
Test purpose:	To check the allowable net amplification between ports.		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/27/2011 3:18:11 PM		
Remarks:			

Requirement

5.2.4.10 Allowable net amplification between ports: Approved terminal equipment and approved protective circuitry with provision for transmission between network interface ports or between ports to other terminal equipment that is separately approved and network interface ports shall meet the requirements of clause 4.7.

Test results

See 4.7 test results.

11 Photographs of test Samples

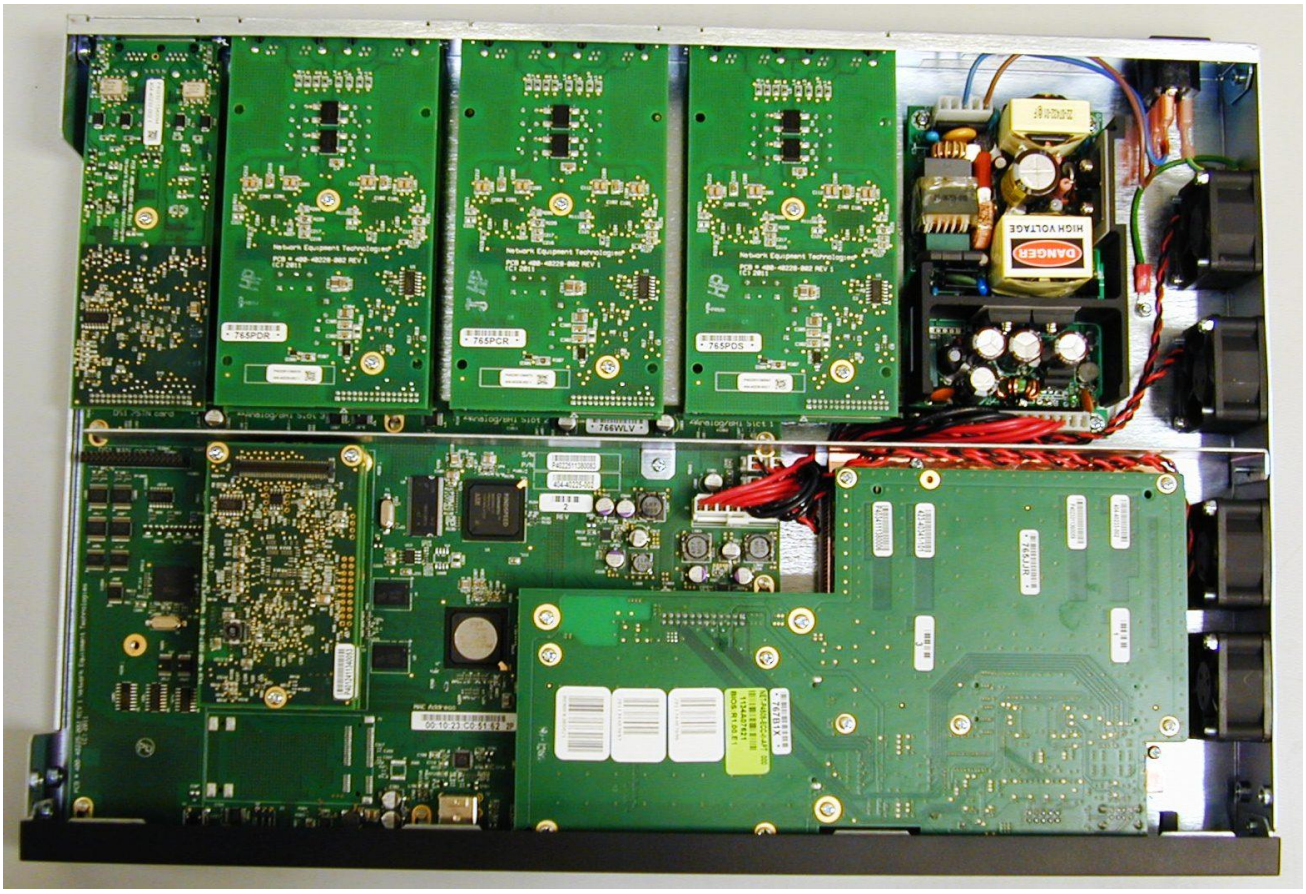
Photograph of the test samples during assessment. The photographs depict the samples as originally supplied.



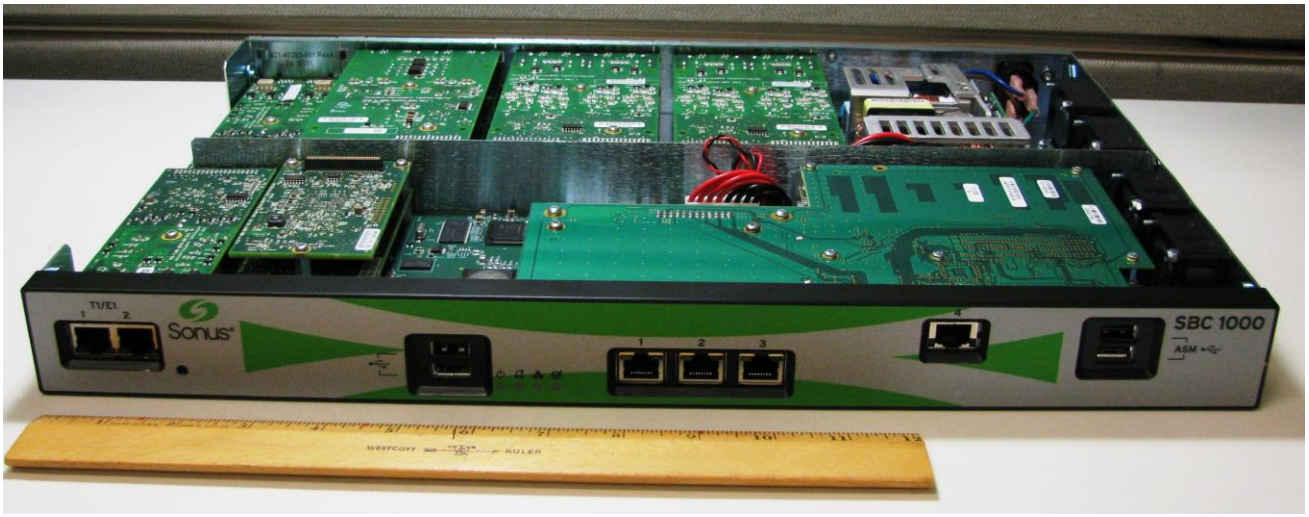
12.1 General view – Sonus branding



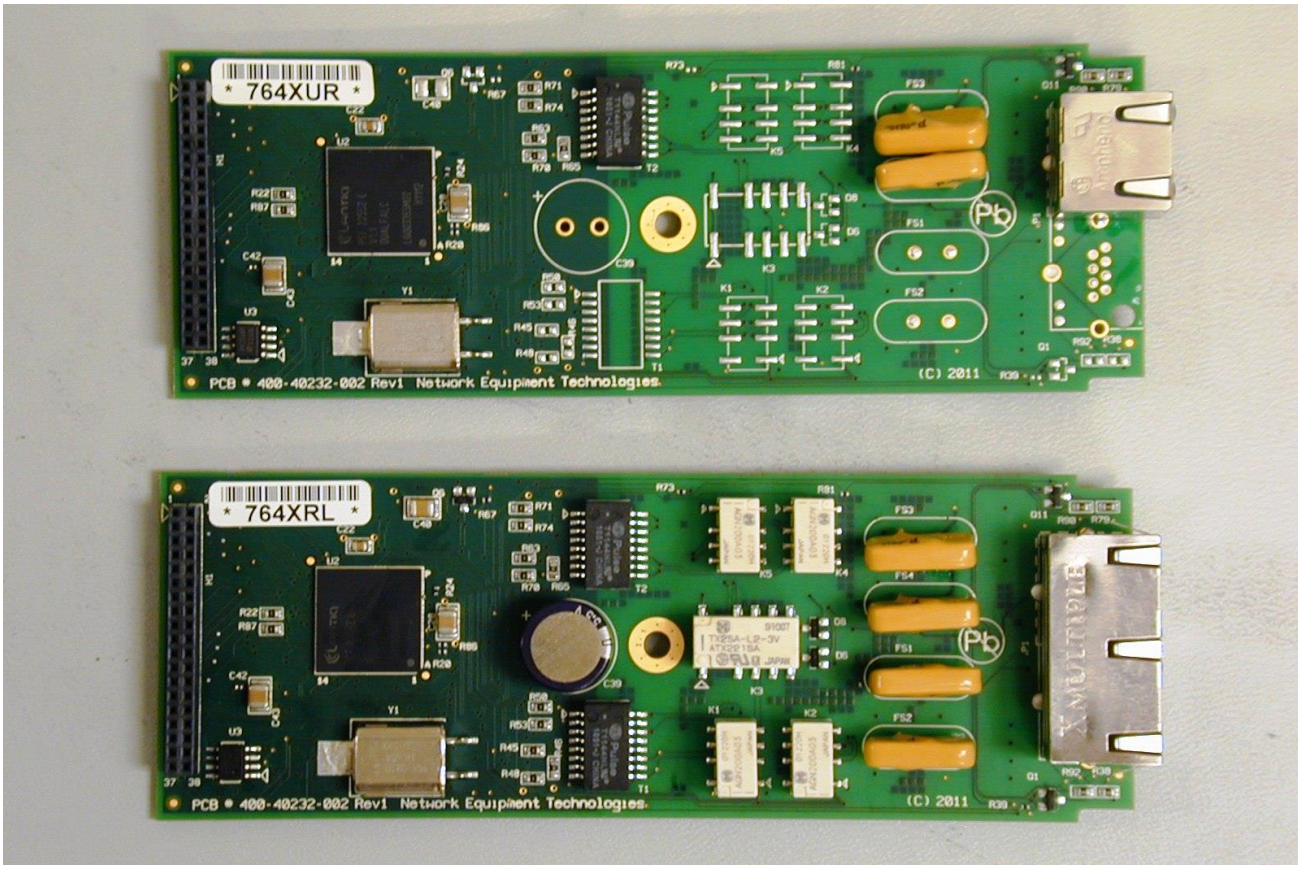
12.2 General view – Ribbon Branding



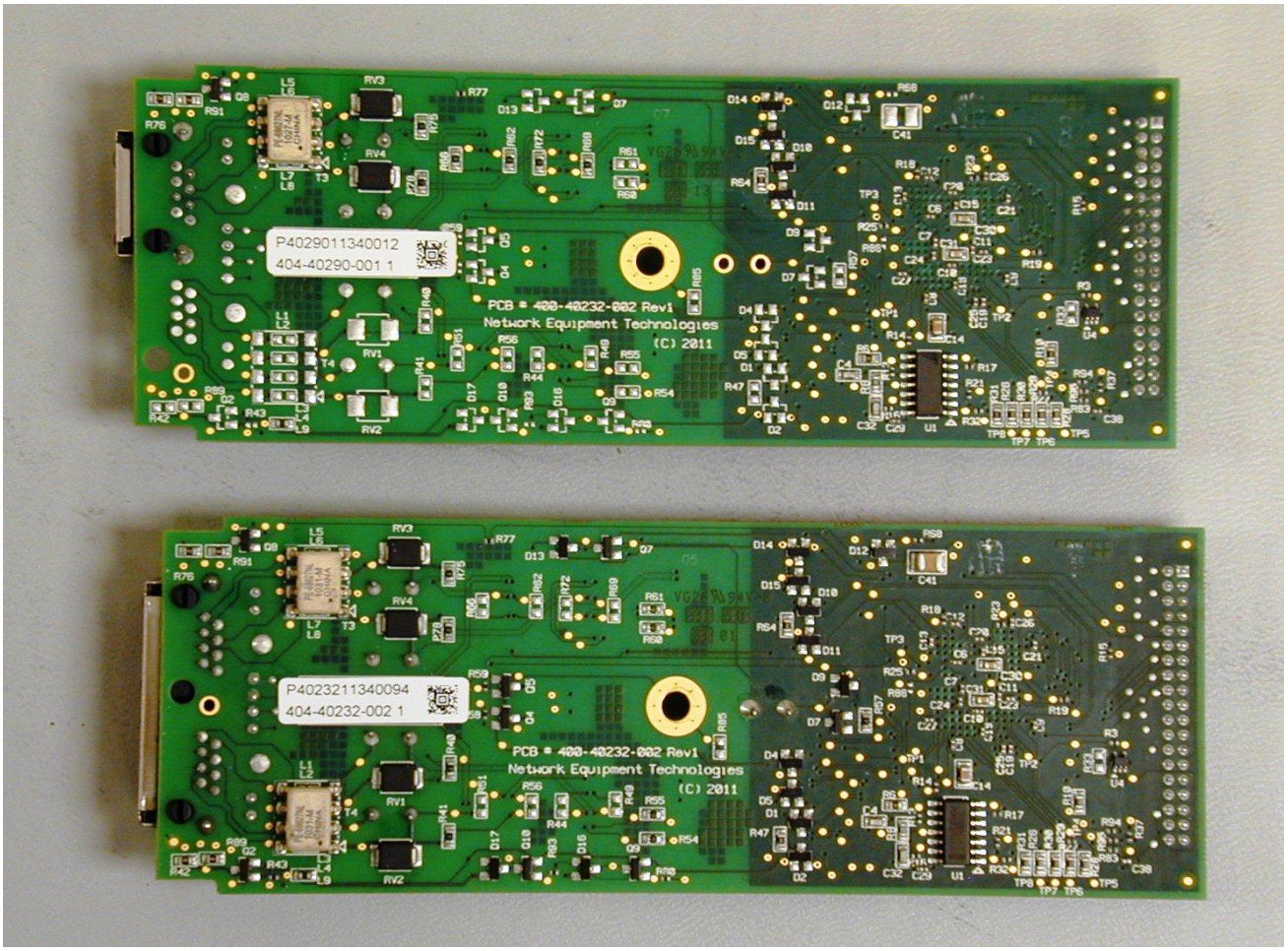
12.3 Internal View



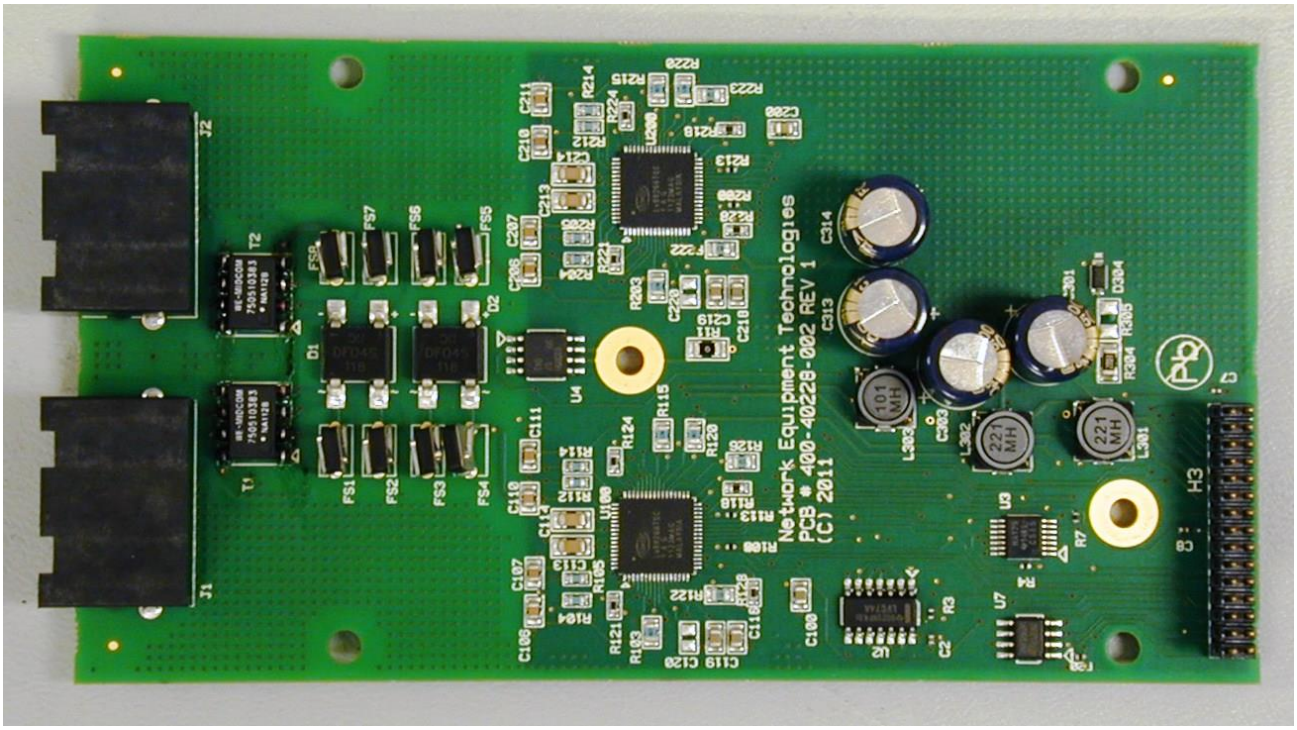
12.4 Internal view showing the addtional T1/E1 card in the modified chassis (see section 6.2)



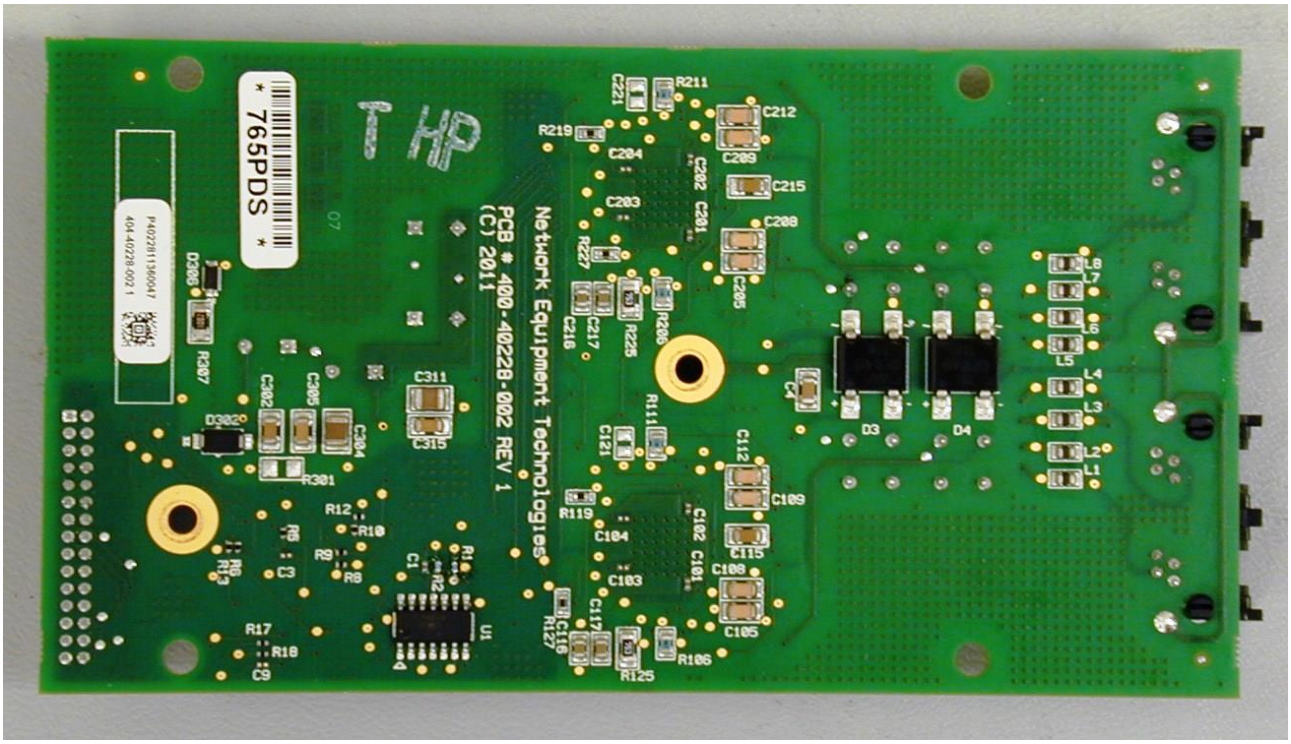
12.5 Top of 1port and 2 port T1 interface



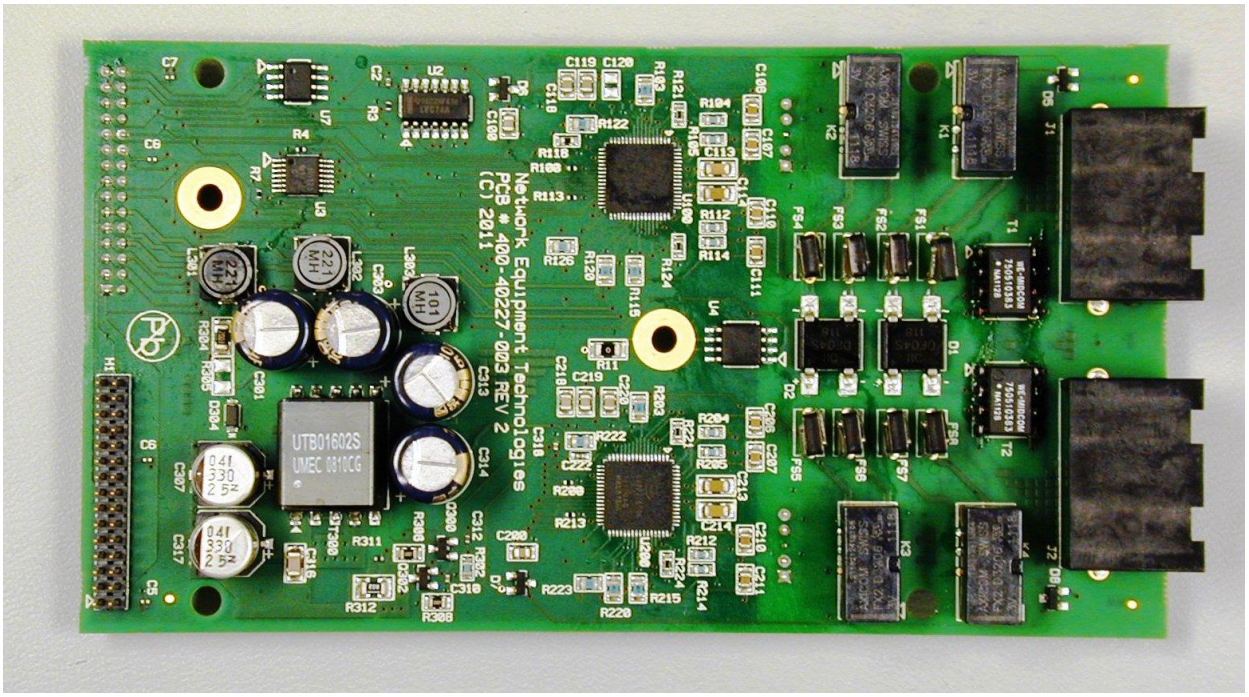
12.6 Bottom of 1 port and 2 port T1 interface



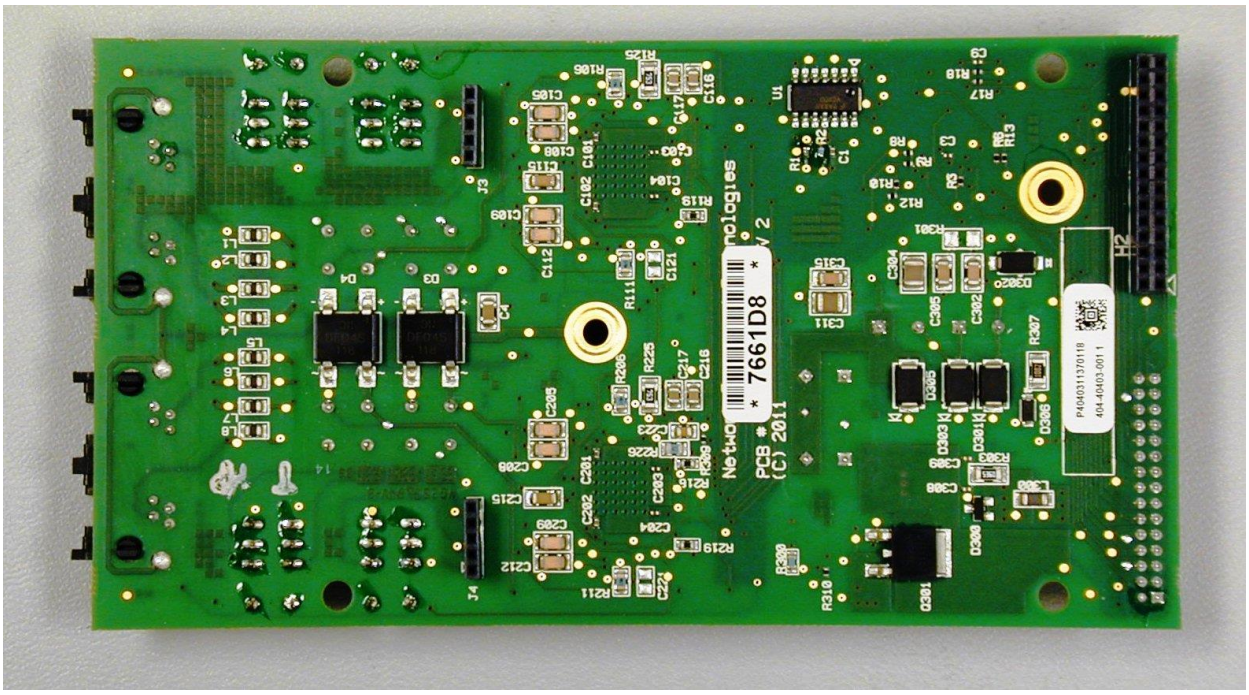
12.7 Top of FXS interface (This card is used in conjunction with the either of the cards in 12.7 and 12.8)



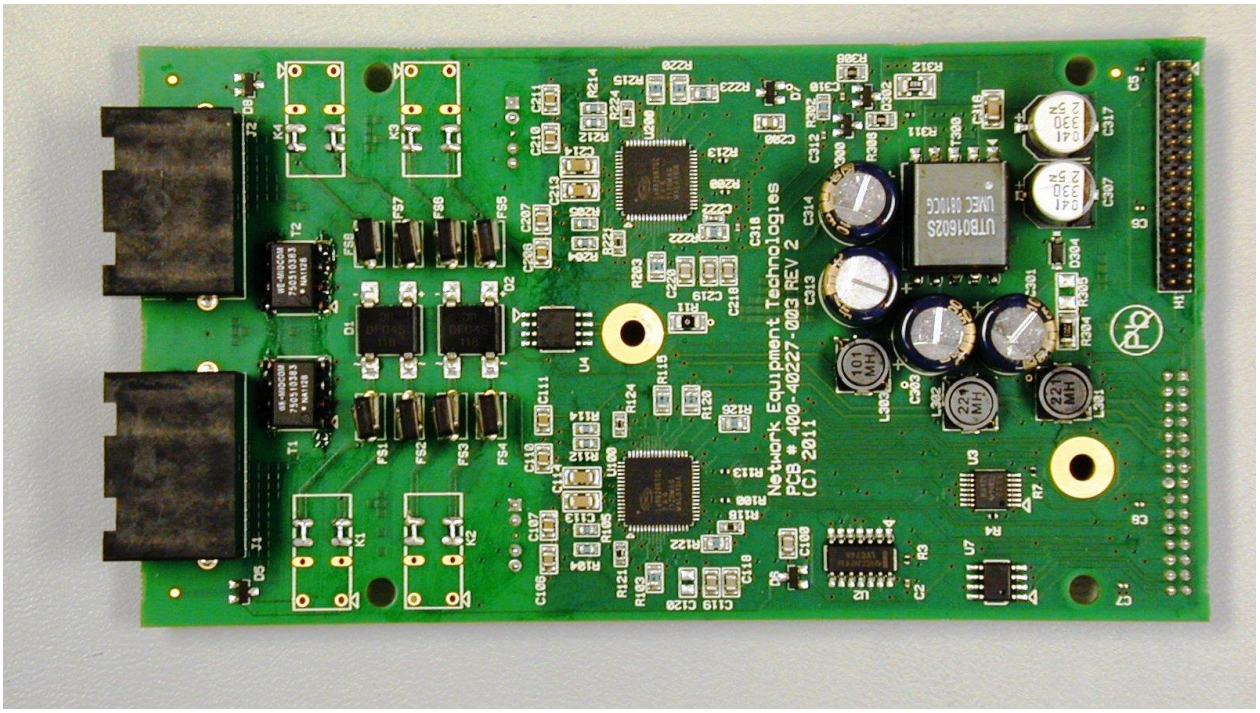
12.8 Bottom of FXS interface (This card is used in conjunction with the either of the cards in 12.7 and 12.8)



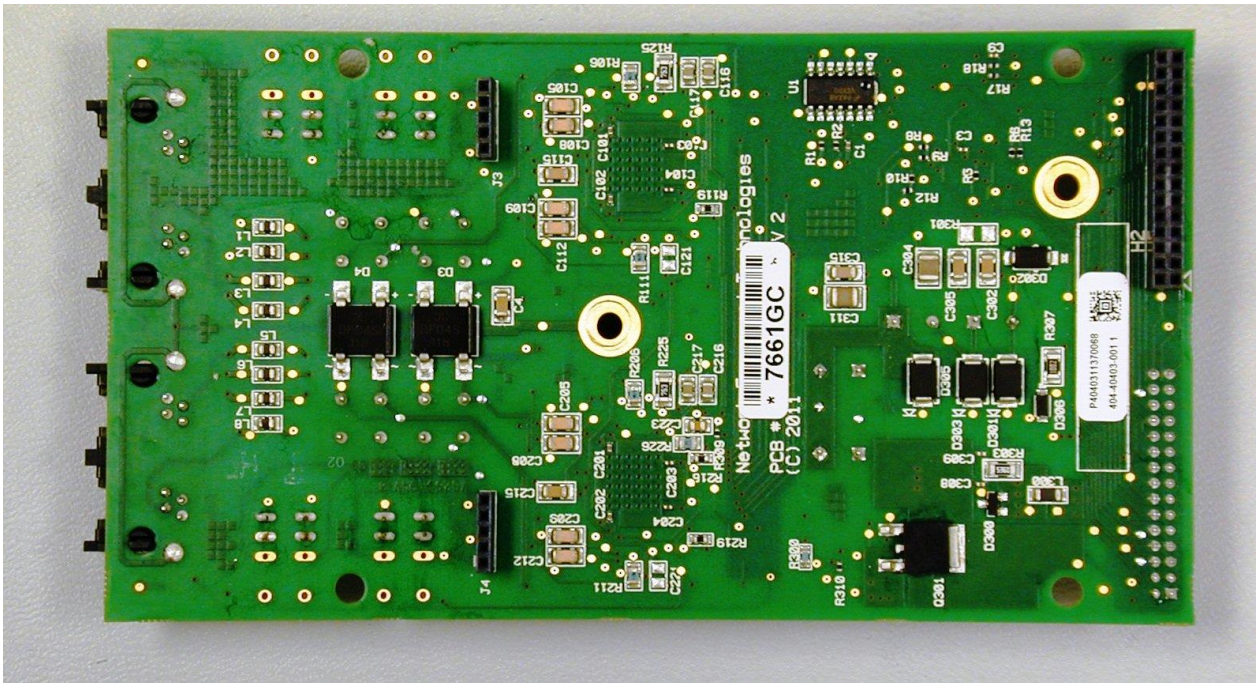
12.9 Top of FXS card (this card provides power to the card in 12.5/6 and features the bypass relays)



12.10 Bottom of FXS card (this card provides power to the card in 12.5/6 and features the bypass relays)



12.11 Top of FXS card (this card provides power to the card in 12.5/6)



12.12 Bottom of FXS card (this card provides power to the card in 12.5/6)