Curtis-Straus

Test Report

Report No	EE0696-1
Client	Locknetics Security Engineering 575 Birch Street Forestville, CT 06010
Phone	(860) 314-5248
Fax	(860) 314-2452
FRN	0005178298
Model	PXH
FCC ID	P2GPXH
Equipment Type	Low Power Communication Device Transmitter
Equipment Code	DXX
Results	As detailed within this report
Prepared by	Evan Gould – Test Engineer
Authorized by	Michael Buchholz – EMC Manager
Issue Date	9/30/04
Conditions of issue	This Test Report is issued subject to the conditions stated in 'terms and conditions' section of this report.

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Summary

This report is an application for certification of a transmitter operating pursuant to 47 CFR 15.209. The product is the PXH modular hardwired credential. It transmits at 125kHz, and detects the presence of an access card. The unit is used in conjunction with a Network Control Module.

Test Methodology

Radiated emissions testing is performed according to the procedures specified in ANSI C63.4 (2003). To maximize emissions, the EUT was rotated around it's vertical axis and the receiving antenna's height and polarity was varied.

Frequency range investigated:	9kHz – 1GHz	
Measurement distance:	9kHz – 30MHz	1m
	30MHz – 1000MHz	3m

AC Line conducted emissions testing was performed with a 50Ω/50μH LISN.

EUT Configuration

EUT Configuration

Work Order: E0696
Company: Locknetics Security Engineering
Company Address: 575 Birch Street
Forestville, CT 06010
Contact: Adam ODay

	MN	SN	FCC ID
EUT:	PXH	-	P2GPXH
EUT Max Frequency:	9.8MHz		

Support Equipment:	MN	SN
Network Control Module	NCM	-

EUT Cables:	Qty	Shielded?	Length	Ferrites
AC power cable	1	no	1.5m	no
Credential comm cable	1	no	4.5m	no

Unpopulated EUT Ports:	Qty	Reason
none		

Software / Operating Mode Description:

The credential system was exercised by waving a pass card in front of the credential reader. The system would then open and close the lock relay.

Statement of Conformity

The PXH has been found to conform with the following parts of the 47 CFR as detailed below:

Part 2	Part 15	Comments
	15.15(b)	The product contains no user accessible controls that increase transmission power above allowable levels.
2.925	15.19	The label is shown in the label exhibit.
	15.21	Information to the user is shown in the instruction manual exhibit.
	15.27	No special accessories are required for compliance.
	15.203	The antenna is not accessible to the user and therefore cannot be easily removed.
	15.205 15.209	The fundamental is not in a Restricted band and the spurious and harmonic emissions in the Restricted bands comply with the general emission limits of 15.209.
	15.207	The unit meets the AC line conducted emissions requirements of 15.207.

Fundamental

LIMITS

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

[15.209(a)]

MEASUREMENT

Radiated Emissions Table *Curtis-Straus LLC*

Date: 30-Aug-04 **Company:** Locknetics Security Engineering **Work Order:** E0696
Engineer: Josh LeBlanc **EUT Desc:** PXH

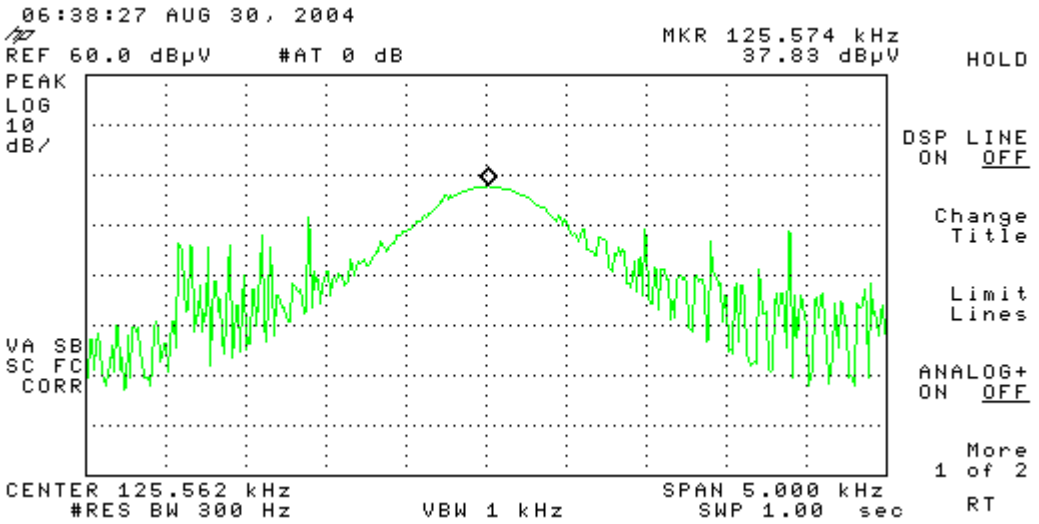
Frequency Range: 9kHz - 30MHz **Measurement Distance:** 1m
Detector: Peak **RBW:** 9kHz **VBW:** 30kHz

Antenna Polarization (0° / 90°)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Distance Factor (dB)	Adjusted Reading (dBµV/m)	47 CFR 15.209 Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
0°	0.125	37.8	24.9	53.0	0.0	99.1	-33.2	25.6	-58.8	Pass

Table Result: Pass by -58.9 dB ***Worst Freq:*** 0.125 MHz

Test Site: "F" **Pre-Amp:** Orange **Cable:** 65 ft RG8A/U **Analyzer:** Red **Antenna:** Sm Loop (low)

ANALYZER PLOT



Spurious Emissions

LIMITS

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

[15.209(a)]

MEASUREMENTS

Radiated Emissions Table — *Curtis-Straus LLC*

Date: 30-Aug-04 **Company:** Locknetics Security Engineering **Work Order:** E0696
Engineer: Josh LeBlanc **EUT Desc:** PXH

Frequency Range: 30-1000MHz **Measurement Distance:** 3 m
Detector: Peak **RBW:** 120kHz **VBW:** 300kHz

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	47 CFR 15.209 Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
H	56.68	41.9	24.8	7.7	0.9	25.7	40.0	-14.3	Pass
V	74.55	37.7	24.8	7.0	1.1	21.0	40.0	-19.0	Pass
H	89.235	40.0	24.7	9.3	1.2	25.8	43.5	-17.7	Pass
V	99.99	39.0	24.7	11.3	1.3	26.9	43.5	-16.6	Pass
V	100.54	42.0	24.7	11.3	1.3	29.9	43.5	-13.6	Pass
V	101.365	42.4	24.7	11.4	1.3	30.4	43.5	-13.1	Pass
V	102.035	42.5	24.7	11.5	1.3	30.6	43.5	-12.9	Pass
Vbb	109.35	42.5	24.7	12.0	1.4	31.2	43.5	-12.3	Pass
Vbb	114.15	39.0	24.7	12.4	1.4	28.1	43.5	-15.4	Pass
Hbb	124.0	33.1	24.7	12.9	1.4	22.7	43.5	-20.8	Pass
Hbb	167.15	48.3	24.6	10.6	1.7	36.0	43.5	-7.5	Pass
Hbb	205.1	52.2	24.5	10.9	1.9	40.5	43.5	-3.0	Pass
Vbb	228.0	45.8	24.4	12.0	2.1	35.5	46.0	-10.5	Pass
V	270.0	44.1	24.3	13.4	2.3	35.5	46.0	-10.5	Pass
Vbb	272.0	43.5	24.2	13.4	2.3	35.0	46.0	-11.0	Pass
Hbb	316.0	39.9	24.1	14.3	2.5	32.6	46.0	-13.4	Pass
Hbb	375.0	41.7	24.1	15.9	2.8	36.3	46.0	-9.7	Pass
Vbb	487.5	37.0	23.9	17.6	3.3	34.0	46.0	-12.0	Pass

Table Result: Pass by -3.0 dB ***Worst Freq:*** 205.1 MHz

Test Site: "F" **Pre-Amp:** Orange **Cable:** 65 ft RG8A/U **Analyzer:** Red **Antenna:** Green

No spurious emissions were detected in the range 9kHz – 30MHz.

AC Line Conducted Emission Measurements

LIMITS

Frequency of emission (MHz)	Quasi-peak limit (dBµV)	Average limit (dBµV)
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

[47 CFR 15.207(a)]

MEASUREMENTS

AC Mains Conducted Emissions — ***Curtis-Straus LLC***

Date: 30-Aug-04 **Company:** Locknetics Security Engineering **Work Order:** E0696
Engineer: Josh LeBlanc **EUT Desc:** PXH **Test Site:** EMI1
Notes: 120 Vac side of AC supply
LISN(s): Yellow-Black
Range: 0.15-30Mhz **Other Equipment:** **Spectrum Analyzer:** Green

	Q.P. Readings		Ave. Readings		Impedance Factor	47 CFR 15.207		47 CFR 15.207		Overall
Frequency (MHz)	QP1 (dBµV)	QP2 (dBµV)	AV1 (dBµV)	AV2 (dBµV)	(dB)	qp Limit (dBµV)	qp Margin dB	AVE Limit (dBµV)	AVE Margin dB	Result (Pass/Fail)
0.15	24.3	23.8			20.0	66.0	-21.7	56.0	-11.7	Pass
11.61	21.6	21.5			20.0	60.0	-18.4	50.0	-8.4	Pass
12.54	21.7	21.4			20.0	60.0	-18.3	50.0	-8.3	Pass
13.25	22.7	19.8			20.0	60.0	-17.3	50.0	-7.3	Pass
14.05	19.1	19.6			20.0	60.0	-20.4	50.0	-10.4	Pass
18.62	15.7	15.1			20.0	60.0	-24.3	50.0	-14.3	Pass

Table Result: Pass by -7.30 dB ***Worst Freq:*** 13.25 MHz

Voltage Variation

REQUIREMENT

"For intentional radiators, measurements of the variation of the...radiated signal level of the fundamental frequency component of the emission...shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage." [15.31(e)]

MEASUREMENTS

Voltage Variations — *Curtis-Straus LLC*

Date: 30-Aug-04 **Company:** Locknetics Security Engineering **Work Order:** E0696
Engineer: Josh LeBlanc **EUT Desc:** PXH

Measurement Distance: 1m **Resolution Bandwidth:** 300Hz
Detector Type: Peak **Video Bandwidth:** 1kHz

Notes: voltage range 12-24Vdc

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)								
10.2Vdc (85%)	125.5	32.8								
18Vdc	125.5	32.8								
27.6Vdc (115%)	125.5	32.8								

Test Site: "F" **Pre-Amp:** Orange **Cable:** 65 ft RG8A/U **Analyzer:** Red **Antenna:** Green

Test Equipment Used

REV. 25-AUG-2004

SPECTRUM ANALYZERS	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
RED	9kHz-1.8GHz	8591E	HP	3441A03559	00024	26-MAY-2005
WHITE	9kHz-22GHz	8593E	HP	3547U01252	00022	04-MAR-2005
BLUE	9kHz-1.8GHz	8591E	HP	3223A00227	00070	30-SEP-2004
YELLOW	9kHz-2.9GHz	8594E	HP	3523A01958	00100	11-AUG-2005
GREEN	9kHz-26.5GHz	8593E	HP	3829A03618	00143	02-AUG-2005
BLACK	9kHz-12.8GHz	8596E	HP	3710A00944	00337	18-AUG-2005
YELLOW-BLACK	20Hz-40.0MHz	3585A	HP	2504A05219	00030	02-DEC-2004
ORANGE	9kHz-26.5GHz	E4407B	HP	US39440975	00394	03-JUN-2005

LISNS/MEASUREMENT PROBES	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
RED	10KHZ-30MHZ	8012-50-R-24-BNC	SOLAR	956348	00753	02-APR-2005
BLUE	10KHZ-30MHZ	8012-50-R-24-BNC	SOLAR	956349	00752	02-APR-2005
YELLOW-BLACK	10KHZ-30MHZ	8012-50-R-24-BNC	SOLAR	984735	00248	02-APR-2005
ORANGE	10KHZ-30MHZ	8012-50-R-24-BNC	SOLAR	903707	00754	02-APR-2005
GOLD	10KHZ-30MHZ	8012-50-R-24-BNC	SOLAR	984734	00247	02-APR-2005
WHITE-BLACK	10KHZ-30MHZ	8610-50-TS-100-N	SOLAR	972019	00678	02-APR-2005
BLACK	10KHZ-30MHZ	8610-50-TS-100-N	SOLAR	972017	00675	02-APR-2005
RED-BLACK	10KHZ-30MHZ	8610-50-TS-100-N	SOLAR	972016	00677	02-APR-2005
BLUE-BLACK	10KHZ-30MHZ	8610-50-TS-100-N	SOLAR	972018	00676	02-APR-2005
BLUE MONITORING PROBE	0.01-150MHZ	91550-2	TEGAM	12350	00807	21-MAY-2005
YELLOW MONITORING PROBE	0.01-150MHZ	91550-2	ETS	50972	00493	24-NOV-2004
GREEN CURRENT TRANSFORMER	40HZ-20MHZ	150	PEARSON	10226	00793	03-APR-2005
CISPR LINE PROBE	150KHZ-30MHZ	N/A	C-S	01	00805	20-DEC-2004
CISPR TELCO VOLTAGE PROBE	150KHZ-30MHZ	CS A/C-10	C-S	CS01	00296	11-SEP-2004
CISPR 22 TELCO ISN	9KHZ-30MHZ	FCC-TLISN-T4	FISCHER	20115	00746	15-OCT-2004

OPEN AREA TEST SITE (OATS)	FCC CODE	IC CODE	VCCI CODE	CALIBRATION DUE
SITE F	93448	IC 2762-F	R-1688	25-MAR-2005
SITE T	93448	IC 2762-T	R-905	25-MAR-2005
SITE A	93448	IC 2762-A	R-903	25-MAR-2005
SITE M	93448	IC 2762-M	R-904	25-MAR-2005
BUBBLE (HP FACILITY)	N/A	N/A	R-1467	16-MAY-2005

LINE CONDUCTED TEST SITES	FCC CODE	IC CODE	VCCI CODE	CALIBRATION DUE
EMI 1	93448	N/A	C-1801	01-MAY-2006
EMI 2	93448	N/A	C-1802	01-MAY-2006
EMI 3	93448	N/A	C-1803	01-MAY-2006
BUBBLE (HP FACILITY)	N/A	N/A	C-1556	16-MAY-2005

PREAMPS / ATTENUATORS / FILTERS	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
RED	0.10-2000MHZ	ZFL-1000-LN	C-S	N/A	00798	31-MAR-2005
BLUE	0.01-2000MHZ	ZFL-1000-LN	C-S	N/A	00759	26-JUL-2005
BLUE-BLACK	0.01-2000MHZ	ZFL-1000-LN	C-S	N/A	00800	31-MAR-2005
GREEN	0.01-2000MHZ	ZFL-1000-LN	C-S	N/A	00802	27-FEB-2005
BLACK	0.01-2000MHZ	ZFL-1000-LN	C-S	N/A	00799	27-FEB-2005
ORANGE	0.01-2000MHZ	ZFL-1000-LN	C-S	N/A	00765	27-FEB-2005
WHITE	1-20GHZ	SMC-12A	C-S	426643	00760	21-JUL-2005
YELLOW-BLACK	1-20GHZ	SMC-12A	C-S	535055	00801	21-JUL-2005
ORANGE-BLACK	1-20GHZ	SMC-12A	C-S	637367	00761	21-JUL-2005
HF (YELLOW)	18-26.5GHZ	AFS4-18002650-60-8P-4	C-S	467559	00758	20-JUL-2005
HIGH PASS FILTER	1-18 GHZ	SPA-F-55204	K&L	36	00817	06-JAN-2006
LOW PASS FILTER	1-9 GHZ	11SL10-4100/X4400-O/O	K&L	4	00816	06-JAN-2006
HF 20DB ATTENUATOR	0.03-20 GHZ	PE 7019-20	PASTERNACK	01	00791	21-MAY-2005

ANTENNAS	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
GREEN BILOG	30MHZ-2GHZ	CBL6112B	CHASE	2742	00620	06-APR-2006
GREEN-BLACK BILOG	30MHZ-2GHZ	CBL6112B	CHASE	2412	00127	06-JAN-2006

GREEN-RED BILOG	30MHz-2GHz	CBL6112B	CHASE	2435	00990	06-APR-2006
BLUE-WHITE BILOG	30MHz-2GHz	3142B	EMCO	1527	TELOGY RENTAL	03-AUG-2006
RED BILOG	30MHz-1GHz	3143	EMCO	1270	00042	17-MAR-2005
BLUE BILOG	30MHz-1GHz	3143	EMCO	1271	00803	17-MAR-2005
GRAY BILOG	26MHz-2GHz	3141	EMCO	9703-1038	00066	19-MAY-2005(EMI) / 21-JUN-2005(RFI)
YELLOW-BLACK BILOG	20-2000MHz	CBL6140A	CHASE	1112	00126	19-MAY-2005(EMI) / 25-JUN-2005(RFI)
YELLOW HORN	1-18GHz	3115	EMCO	9608-4898	00037	22-MAY-2005
BLACK HORN	1-18GHz	3115	EMCO	9703-5148	00056	12-JUN-2005
ORANGE HORN	1-18GHz	3115	EMCO	0004-6123	00390	04-JUN-2005
HF (WHITE) HORN	18-26.5GHz	801-WLM	WAVELINE	00758	00758	15-JUL-2005
SMALL LOOP (RENTAL)	10kHz-30MHz	PLA-130/A	ARA	1009	TELOGY	11-FEB-2006
SMALL LOOP	9kHz-30MHz	PLA-130/A	ARA	1024	00755	23-FEB-2006
LARGE LOOP	20Hz-5MHz	6511	EMCO	9704-1154	00067	12-NOV-2005
ACTIVE MONOPOLE	30Hz-30MHz	3301B	EMCO	3824	00068	05-MAY-2005
INDUCTION COIL	50-60Hz	1000-4-8	C-S	N/A	00778	16-SEP-2004
ADJUSTABLE DIPOLE	30-1000MHz	3121C	EMCO	1370	00757	26-JUN-2005
ADJUSTABLE DIPOLE	30-1000MHz	3121C	EMCO	1371	00756	26-JUN-2005
RE101 LOOP SENSOR	30Hz-100kHz	RE101-13.3CM	C-S	N/A	00818	07-JAN-2005
RS101 RADIATING LOOP	30Hz-100kHz	RS101-12CM	C-S	N/A	00819	07-JAN-2005
RS101 LOOP SENSOR	30Hz-100kHz	RS101-4CM	C-S	N/A	00820	07-JAN-2005

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

Terms And Conditions

Paragraph 1. SERVICES. LABORATORY will:

1.1 Use the degree of care and skill ordinarily exercised by and consistent with the standards of the profession.
1.2 Perform all technical services in substantial accordance with the generally accepted laboratory principles and practices.
1.3 Retain all pertinent records relating to the services performed for a period of three (3) years following submission of the report describing such services, during which period the records will be made available to CLIENT upon reasonable request.

Paragraph 2. CLIENT'S RESPONSIBILITIES. CLIENT or his authorized representative will:

2.1 Provide LABORATORY with all plans, schematics, specifications, addenda, change orders, drawings and other information for the proper performance of technical services.
2.2 Designate a person to act as CLIENT's representative with respect to LABORATORY's services to be performed on behalf of the CLIENT; such person or firm to have complete authority to transmit instructions, receive information and data, interpret and define CLIENT's policies and decisions with respect to the LABORATORY's work on behalf of the CLIENT and to order, at CLIENT's expense, such technical services as may be required.
2.3 Designate a person who is authorized to receive copies of LABORATORY's reports.
2.4 Undertake the following:
(a) Secure and deliver to LABORATORY, without cost to LABORATORY, preliminary representative samples of the equipment proposed to require technical services, together with any relevant data.
(b) Furnish such labor and equipment needed by LABORATORY to handle samples at the LABORATORY and to facilitate the specified technical services.

Paragraph 3. GENERAL CONDITIONS:

3.1 LABORATORY, by the performance of services covered hereunder, does not in any way assume any of those duties or responsibilities customarily vested in the CLIENT, its employees, or any other party, agency or authority.
3.2 LABORATORY shall not be responsible for acts of omissions of any other party or parties involved in the design, manufacture or maintenance of the equipment or the failure of any employee, contractor or subcontractor to undertake any aspect of equipment's design, manufacture or maintenance.
3.3 LABORATORY is not authorized to revoke, alter, release, enlarge or release any requirement of the equipment's design, manufacture or maintenance unless specifically authorized by CLIENT or his authorized representative.
3.4 THE ONLY WARRANTY MADE BY LABORATORY IN CONNECTION WITH ITS SERVICE PERFORMED HEREUNDER IS THAT IT WILL USE THAT DEGREE OF CARE AND SKILL AS SET FORTH IN PARAGRAPH 1 ABOVE. NO OTHER WARRANTY, EXPRESS OR IMPLIED, IS MADE OR INTENDED FOR SERVICES PROVIDED HEREUNDER.
3.5 Where the LABORATORY indicates that additional testing is advisable to obtain more valid or useful data, and where such testing has not been authorized, CLIENT agrees to view such test reports as inconclusive and preliminary.
3.6 The LABORATORY will supply technical service and prepare a report based solely on the sample submitted to the LABORATORY by the CLIENT. The CLIENT understands that application of the data to other devices is highly speculative and should be applied with extreme caution.
3.7 The LABORATORY agrees to exercise ordinary care in receiving, preserving and shipping (F.O.B. Littleton, MA) any sample to be tested, but assumes no responsibility for damages, either direct or consequential, which arise from loss, damage or destruction of the samples due to the act of examination, modification or testing, or technical services or circumstances beyond LABORATORY's control.
3.8 The LABORATORY will hold samples for thirty (30) days after tests are completed, or until the CLIENT's outstanding debts to the LABORATORY are satisfied, whichever is later.
3.9 The CLIENT recognizes that generally accepted error variances apply and agrees to consider such error variances in its use of test data.
3.10 It is agreed between LABORATORY and CLIENT that no distribution of any tests, reports or analysis other than that described below shall be made to any third party without the prior written consent of both parties unless such distribution is mandated by operation of law. It is agreed that tests, reports, or analysis results may be disclosed to third party auditors of the laboratory at the laboratory facility in the course of accreditation maintenance audits. No reference to reports or technical services of the LABORATORY shall be made in any advertising or promotional literature without the express written permission of the LABORATORY.
3.11 The CLIENT acknowledges that all employees of LABORATORY operate under employment contracts with the LABORATORY and CLIENT agrees not to solicit employment of such employees or to solicit information related to other clients from said employees.
3.12 In recognition of the relative risks and benefits of the project to both CLIENT and LABORATORY, the risks have been allocated such that the CLIENT agrees, to the fullest extent permitted by law, to limit the liability of the LABORATORY to the CLIENT for any and all claims, losses, costs, damages of any nature whatsoever or claims expenses from any cause or causes, including attorneys' fees and costs and expert witness fees and costs, so that the total aggregate liability of the LABORATORY to the CLIENT shall not exceed $100,000, or the LABORATORY'S total fee for services rendered on this project, whichever is greater. It is intended that this limitation apply to any and all liability or cause of action however alleged or arising, unless otherwise prohibited by law.

Paragraph 4. INSURANCE:

4.1 LABORATORY shall secure and maintain throughout the full period of the services provided to the CLIENT adequate insurance to protect it from claims under applicable Workmen's Compensation Acts and also shall maintain one million dollars of general liability coverage to cover claims for bodily injury, death or property damage as may arise from the performance of its services.
4.2 The CLIENT hereby warrants that it has sufficient insurance to protect its employees adequately under applicable Workmen's Compensation Acts and for bodily injury, death, or property damage.
4.3 No insurance of whatever kind or type, which may be carried by either party is to be considered as in any way limiting any other party's responsibility for damages resulting from their operations or for furnishing work and materials.

Paragraph 5. PAYMENT:

5.1 CLIENT shall pay to LABORATORY such fees for services as previously agreed, orally or in writing, within 30 days of presentment of a bill for such services performed. In the event CLIENT ordered, orally or in writing, services but such services were not assigned a rate for billing, such services shall be billed at the LABORATORY's reasonable and customary rate.
5.2 CLIENT shall be responsible for all shipping, customs and other expenses related to services provided by LABORATORY to the CLIENT, and shall fully insure any test sample or other equipment provided to LABORATORY by the CLIENT.
5.3 Amounts overdue from CLIENT to LABORATORY shall be charged interest at a rate of 1½% per month.

Paragraph 6. ISO/IEC GUIDE 17025 ADDITIONS:

6.1 CLIENT agrees that this test report will not be reproduced except in full, without written approval from the LABORATORY.
6.2 CLIENT agrees that this test report shall not be used to claim product endorsement by A2LA or ANSI or any agency of the U.S. Government.
6.3 CLIENT agrees that test results presented herein relate only to the sample tested by the LABORATORY.

A2LA Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025-1999

CURTIS-STRAUS[1]
527 Great Road
Littleton, MA 01460
Barry Quinlan Phone: 978-486-8880

ELECTRICAL

until: July 31, 2005 Certificate Number: 1627-01

gnition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory
n the following Electromagnetic Compatibility (EMC), Telecommunications, and Product Safety tests:

omagnetic Compatibility (EMC)
ed emissions testing (electric and magnetic fields); Conducted emissions testing (voltage and current); Electros
rge testing; Electrical Fast Transient testing; Radiated Immunity testing; Conducted Immunity testing; Lightni
nity testing; Voltage Dips, Interrupts and Voltage Variations testing; Magnetic Immunity testing; RF Power
rements; Frequency Stability measurements; Longitudinal Induction measurements; Harmonic emissions testin
licker testing; Low frequency disturbance voltage testing; Disturbance Power measurements

Standards	Title
ons	
. 22 1997 with amendments 1 and 2	Limits and methods of measurement of radio disturbance characteristics of information technology equipment.
3438 1994	Limits and methods of measurement of radio interference characteristics of information technology equipment.
022:1994 and 1998	Limits and methods of measurement of radio disturbance characteristics of information technology equipment.
CISPR 22:1997	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement
a ICES-003 1997	Digital apparatus
ZS 3548 1995	Australian/New Zealand Standard Limits and methods of measurement of radio disturbance characteristics of inform technology equipment
. 11 1990, 1997, 1999	Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and med (ISM) radio-frequency equipment.

[1] This accreditation covers testing performed at the laboratory listed above and the satellite facility
d at 168 Ayer Rd, Littleton, MA 01460

011 1991, 1998	Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.
CISPR 11:1997	Industrial, scientific and medical (ISM) radio-frequency equipme Electromagnetic disturbance characteristics Limits and methods measurement
a ICES-001 1998	Industrial, scientific and medical radio frequency generators
3803	Industrial, Scientific and Medical Instrument
ZS 2064: 1997	Limits and methods of measurement of electromagnetic disturba characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.
108.8 – M1983	Electromagnetic Emission from Data Processing Equipment and Electronic Office Machines
13:1996, 1998, 2001	Limits and methods of measurement of radio interference characteristics of sound and television broadcast receivers and associated equipment.
013: 1990, 2001	Sound and television broadcast receivers and associated equipme
	Electromagnetic compatibility. Part 1: Specification for limits an methods of measurement of radio disturbance characteristics of broadcast receivers and associated equipment.
013 Amend 12 1994	Limits and methods of measurement of radio disturbance characteristics of broadcast receivers and associated equipment. Amendment 12
CISPR 13: 1996	Limits and methods of measurement of radio interference characteristics of sound and television broadcast receivers and associated equipment.
3439	Broadcast receiver and associated equipment Limits and methods
ZS 1053: 1999	measurement of radio interference characteristics of sound and television broadcast receivers and associated equipment.
14 1993	Limits and methods of measurement of radio disturbance
t discontinuous disturbances)	characteristics of electrical motor- operated and thermal applianc household and similar purposes, electric tools and electric appara
014 1993, 1997	Limits and methods of measurement of radio disturbance (*except*
tinuous disturbances)	characteristics of electrical motor- operated and thermal applianc household and similar purposes, electric tools and similar electric apparatus.
ZS 1044: 1995	Limits and methods of measurement of radio disturbance (*except*
tinuous disturbances)	characteristics of electrical motor- operated and thermal applianc household and similar purposes, electric tools and similar electric apparatus.
ity	
3783-1	Household Electrical Appliances
CISPR 14-1 1993	Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus Part 1: Emission Product family standard
CISPR 14-2 1997 + A1:2001	Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus Part 2: Immunity Product family standard

14-2 1996, 1997 + A1:2001	Immunity requirements for household appliances, tools an similar apparatus.
20: 1995, 2002 with amendment 3	Limits and methods of measurement of immunity characte
iated group only)	of sound and television broadcast receivers and associated equipment.
020: 1995, 2002	Electromagnetic immunity of broadcast receivers and
iated group only)	Associated equipment.
. 24	Information technology equipment – Immunity characteris Limits and methods of measurement
CISPR 24 1997	Information technology equipment – Immunity characteris Limits and methods of measurement
ZS 3200.1.2: 1995	Approval and test specification – Medical electrical Equipr – General requirements for safety – Collateral Standard: Electromagnetic compatibility – Requirements and tests.
ean Union Basic EMC Standards	
000-4-2: 1995, 1999, 2001	Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 2: Electrostatic discharge immunity test – Basic EMC Publication
000-4-3:1997, 1998, 2002	Electromagnetic compatibility (EMC). Part 4: Testing and
ZS 61000.4.3 1999	measurement techniques. Section 3: Radiated, radio-freque electromagnetic field immunity test
000-4-4 1995	Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 4: Electrical fast transient/burst immunity test – Basic EMC publication
000-4-5 1995	(EMC) Part 4: Testing and measurement techniques. Sectio
ZS 61000.4.5 1999	Surge immunity test.
000-4-6 1996	Electromagnetic compatibility (EMC). Part 4: Testing
ZS 61000.4.6 1999	and measurement techniques. Section 6: Immunity to cond disturbances, induce by radio-frequency fields.
000-4-8 1994	Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 8: Power frequency magn field immunity test.
000-4-11 1994	(EMC) Part 4: Testing and measurement techniques. Sectio Voltage dips, short interruptions and voltage Variations immunity tests.
61000-2-2 1993	Electromagnetic compatibility (EMC). Part 2: Environmen Section 2: Compatibility levels for low-frequency conducte disturbances and signaling in public low-voltage power sup systems (IEC 1000-2-2:1990)
oduct Family Standards	
081-1 1992	Electromagnetic capability – Generic emission standard. Pa Residential, commercial and light industry. (I.S.)
081-2 1993	Electromagnetic compatibility – Generic emission standard 2: Industrial environment
082-1 1992, 1998	Electromagnetic compatibility – Generic emission standard 1: Residential, commercial and light industry
082-2 1995	Electromagnetic compatibility – Generic immunity Standard. Part 2: Industrial environment

000-6-1: 1997, 2001	Electromagnetic Compatibility (EMC)- Part 6: Generic standards Section 1: Immunity for residential, commercial and light-industr environments
000-6-2: 1998, 2001	Electromagnetic Compatibility (EMC)- Part 6: Generic standards Section 2: Immunity for industrial environments
091-2 1996	Specification for Uninterruptible Power Systems (UPS). Part 2: E requirements
024 1998	Information technology equipment – Immunity Characteristics – and methods of measurement.
103-1 1997	Electromagnetic Compatibility – Product family standard for aud video, audio-visual and entertainment lighting control apparatus professional use. Part 1: Emission
103-2 1997	Electromagnetic Compatibility – Product family standard for aud
ding Annex A3)	video, audio-visual and entertainment lighting control profession Part 2: Immunity
326 1998	Electrical equipment for measurement, control and laboratory us EMC requirements
547 1996	Equipment for general lighting purposes – EMC immunity requirements
130-4 1996	Alarm Systems. Part 4: Electromagnetic compatibility. Product f standard: Immunity requirements for components of fire, intrude social alarm systems.
104 1995	Electromagnetic compatibility immunity – requirements for hous appliances, tools and similar apparatus. Product family standard.
083-2 1995	Cabled distribution systems for television and sound signals. Pa Electromagnetic compatibility for equipment.
601-1-2: 1993, 2002	Medical electrical equipment Part 1: general requirements for saf Section 2: Collateral standard: Electromagnetic compatibility – requirements and tests
800-3 1995	Adjustable speed electrical power drive systems. Part 3: EMC pr standard including specific test methods.
555 Part 2 1987	Disturbances in supply systems caused by household appliances similar electrical equipment. Part 2: Harmonics
555 Part 3 1987	Disturbances in supply systems caused by household appliances similar electrical equipment. Part 3: Voltage fluctuations.
000-3-2: 1995, 2000	Electromagnetic compatibility (EMC). Part 3: Limits Section 2:
AS/NZS 61000.3.2 1998	for harmonic current emissions
000-3-3 1995	Electromagnetic compatibility (EMC). Part 3: Limits Section 2:
ZS 61000.3.3 1999	Limitation of voltage fluctuations and flicker in low-voltage supp systems.
00 386-1 1994	Equipment Engineering (EE); Public telecommunication network equipment electro-magnetic compatibility (EMC) requirements F Product family overview, compliance criteria and test levels

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N 300 386-2 1997, 1998,	Electromagnetic compatibility and radio spectrum matters (ERM);
N 300 386 2000 v1.2.1, 2001 v1.3.1	Telecommunication network equipment; Electromagnetic compatibility (EMC) requirements; Part 2: Product family standard.
00 132-1 1996	Equipment Engineering (EE); Power supply interface at th input to telecommunications equipment; Part 1: Operated l alternating current (ac) derived from direct current (dc) so
00 132-2 1996	Equipment Engineering (EE); Power supply interface at th input to telecommunications equipment; Part 2: Operated l direct current (dc)
83 1997	Equipment Engineering (EE): Transient voltages at Interfa on telecommunications direct current (DC) power distribu
dio standards	
EN 300 385 v1.2.1: 1998, 1999	Electromagnetic compatibility and Radio spectrum matters (ERM); Electromagnetic Compatibility (EMC) standard fo fixed radio links and ancillary equipment (ETS)
0 330 v1.2.1: 1998, 1999	Electromagnetic compatibility and Radio spectrum matters (ERM); Short range devices (SRD); Technical characterist and test methods for radio equipment in the range 9 kHz to MHz and inductive loop systems in the frequency range 9 to 30 MHz
00 328 1996	Radio Equipment and Systems (RES); Wideband transmis systems; Technical characteristics and test conditions for transmission equipment operating in the 2,4 GHz ISM ba using spread spectrum modulation techniques
N 300 440 v1.2.1 1999	Electromagnetic compatibility and Radio spectrum matters (ERM); Short range devices; Technical characteristics and methods for radio equipment to be used in the 1 Ghz to 40 frequency range
1 893:2002	Broadband Radio Access Networks (BRAN); 5 GHz (draf high performance RLAN; Harmonized EN covering Essen requirements of article 3.2 of the R&TTE Directive
00 836-1:1998	Broadband Radio Access Networks (BRAN); High Perfor Radio Local Area Network (HIPERLAN) Type 1; Confor testing specification; Part 1: Radio Type approval and Radi
	Frequency (RF) conformance test specification
489-17:2002	Electromagnetic compatibility and Radio spectrum Matter (ERM); Electromagnetic Compatibility (EMC) standard fo radio equipment and services; Part 17: Specific conditions 2,4 GHz wideband transmission systems and 5 GHz high performance RLAN equipment

0 328-2:2001	Electromagnetic compatibility and Radio spectrum Matters (ERM Wideband Transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using spread spectrum modulation techniques; Part 2: Harmonized EN covering essentia requirements under article 3.2 of the R&TTE Directive
1 489-1:2002	Electromagnetic compatibility and Radio spectrum Matters (ERM Electromagnetic Compatibility (EMC) standard for radio equipm and services; Part 1: Common technical requirements
669-2-1:2002	Switches for household and similar fixed electrical installations -- 2-1: Particular requirements – Electronic switches
a Radio Standards	
an GL-36 1995	Industry Canada – technical requirements for low power Devices 2400 – 2483.5 MHz band.
an RSS-119 1999, 2000 Issue 6	Industry Canada – Land mobile and fixed radio Transmitters and receivers, 27.41 to 960.0 MHz
an RSS-134 1996 & 2000, Issue 1	Industry Canada – 900 MHz narrowband personal communicatio services
an RSS-210 2000 Issue 3,	Industry Canada – Low power license-exempt radio 2001 Issue 5 communication devices
1998	Specification for Restricted Radiation Radio Apparatus (New Zea
tandards	
R FCC low power transmitters ng on frequencies below 1 GHz, ency alert systems, unintentional rs and ISM devices.	Scope A1
R FCC low power transmitters ng on frequencies above 1 GHz, e exception of spread spectrum s.	Scope A2
R FCC Unlicensed Personal unications System (PCS) devices	Scope A3
R FCC Unlicensed National nation Infrastructure devices and wer transmitters using spread um techniques.	Scope A4
R FCC Personal mobile Services in the following FCC arts 22, 24, 25, 27.	Scope B1
R FCC General Mobile Radio Services in the following FCC arts 22, 74, 90, 95, 97.	Scope B2
R FCC Maritime and Aviation RadioServices in 47 CFR Parts 87	Scope B3
R FCC Microwave Radio Services in 47 CFR Parts 21, 74 and 101.	Scope B4

ST MP-5 1986	FCC (Federal Communications Commission) methods Of measurement of radio noise emissions from industrial, scie and medical equipment.
89-CORE: 1997, 1999 issue 2/ ssue 3	Bellcore electromagnetic compatibility and electrical safet Generic criteria for network telecommunications equipme
EMC Standards	
C63.4: 1992, 1999, 2001	American National Standard for methods of measurement radio-noise emissions for low-voltage electrical and electr equipment in the range of 9 kHz to 40GHz.
C63.5 1988	American National Standard for electromagnetic compatib radiated emissions measurements in electromagnetic interference (EMI) control – calibration of antennas.
EMC Standards	
C62.41: 1980, 1991	IEEE recommended practice on surge voltages in low-volt AC power circuits
h EMC Standards	
M 3336.3 1995	Electromagnetic compatibility and electrical safety (EMC for wired terminal equipment. Harmonization document information over the OFCOM requirements.
African EMC standards other than CISPR equivalents	
1718-1: 1996	South African Bureau of Standards: Specification for Gam equipment. Part 1: Casino equipment.
ese VCCI Standards	
V-3/99.05 1999	Technical Requirements
V-4/99.05 1999	Instruction for Test Conditions for Requirement under Tes

mmunications

mmunications Registration; General test methods; Lightning surge; Drop testing; Balance testing; Signal powe lic and longitudinal); Frequency measurements; Pulse templates; Leakage testing; Impedance testing; Hearing atibility testing (*excluding volume control*); Protocol analysis and Jitter testing.

m Standards	Title
7 CFR Part 68 Telephone	Connection of terminal equipment to the telephone Termi Equipment network. Analog and Digital Equipment. TCB C1.
Issue 8 1996 through amendment 5	Specification for terminal equipment, terminal systems, Network protection devices, connection arrangements and hearing aids compatibility.
IA TSB31-B 1998	Bulletin Part 68 Rationale and Measurement Guidelines (F 1998)

IA-IS-968	Telecommunications Telephone Terminal Equipment Technical Requirements for Connection of Terminal Equipment to the Tele Network
IA-IS-883	Telecommunications Telephone Terminal Equipment Supplemen Technical Requirements for Connection of Stutter Dial Tone Det Devices and ADSL Modems to the Telephone Network
68-A	Telecommunications Telephone Terminal Equipment Technical Requirements for Connection of Terminal Equipment to the Tele Network
Q.6-2001	Technical Requirements for SHDSL, HDSL2, HDSL4 Digital Subscriber Line Terminal Equipment to Prevent Harm to the Tele Network Industry
a VDSL January 2003	Terminal Attachment Program Requirements and Test Methods f Very-High-Bit-Rate Digital Subscriber Line (VDSL) Terminal Equipment
CIF S002-2001	Analogue interworking and non-interference requirements for Customer Equipment for connection to the Public Switched Tele Network
CIF S016-2001	Requirements for Customer Equipment for connection to hierarch digital interfaces
CIF S031-2001	Requirements for ISDN Basic Access Interface
CIF S038-2001	Requirements for ISDN Primary Rate Access Interface
CIF S043-2001	Requirements for Customer Equipment for Connection to a Metal Local Loop Interface of a Telecommunications Network — Part 1: General Part 2: Broadband Part 3: DC, Low Frequency AC and Voiceband
G.703	Physical/electrical characteristics of hierarchical Digital interface
2028	Network connection specification for connection of CPE to the P Hong Kong using digital leased circuits at data rate of 1544 kbit/s
2029	Network connection specification for connection of CPE to the P Hong Kong using digital leased circuits at data rate of 2048 kbit/s
: 1995	Attachment requirements for terminal equipment to be connected circuit switched data networks and leased circuits using a CCITT Recommendation X.21 interface, or at an interface physically, functionally and electrically compatible with CCITT Recommend X.21 but operating at any data signaling rate up to, and including, 1 984 kbit/s
: 1997	Attachment requirements for Data Terminal Equipment (DTE) to connect to Packet Switched Public Data Networks (PSPDNs) for CCITT Recommendation X.25 interfaces at data signaling rates u 920 kbit/s utilizing interfaces derived from CCITT Recommendat X.21 and X.21 bit

: 1995 + Amdt : 1997	Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN basic access
: 1995 + Amdt : 1997	Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN primary rate access
12 : 1993 + Amdt : 1996	Business Telecommunications (BT); Open Network Provis (ONP) technical requirements; 2 048 kbit/s digital unstructu leased line (D2048U) Attachment requirements for termina equipment
13 : 1996	Business TeleCommunications (BTC); 2 048 kbit/s digital structured leased lines (D2048S); Attachment requirements terminal equipment interface
1 : 1998	Terminal Equipment (TE); Attachment requirements for pa European approval for connection to the analogue Public Switched Telephone Networks (PSTNs) of TE (excluding supporting the voice telephony service) in which network addressing, if provided, is by means of Dual Tone Multi Frequency (DTMF) signaling
4 : 1997	Business TeleCommunications (BTC); 34 Mbit/s digital Unstructured and structured leased lines (D34U and D34S) Attachment requirements for terminal equipment interface
lia	
2 : 1997	Analogue Interworking and Non interference Requirements Customer Equipment Connected to the Public Switched Telephone Network
5 : 1997	General Requirements for Customer Equipment Connected Hierarchical Digital Interfaces
1 : 1997	Requirements for ISDN Basic Access Interface
8 : 1997	Requirements for ISDN Primary Rate Access Interface
CIF S043.2:2001	Requirements for Customer Equipment for connection to a metallic loop interface of a Telecommunications Network 2 Broadband

ct Safety

al test methods; Input tests; Electric strength tests; Impulse tests; Permanency of marking tests; Accessibility tes
y Hazard measurements; Capacitor discharge tests; Humidity conditioning; Earthing tests; Limited power sourc
rements; Stability tests; Steel ball tests; Lithium Battery Reverse Current measurements; Leakage current tests;
former abnormal tests; Telecom leakage tests; Over voltage/power cross tests (*excluding x-ray tests*).

t Safety Standards	Title
ic Product Safety Standards	
50 1991	Safety of information technology equipment including Incl Amendments 1, 2, 3, and 4 electrical business equipment.
50 1998	Safety of information technology equipment, including lectrical business equipment.
22.2 No.950-95	Safety of Information Technology Equipment (UL 1950)
950 2000	Safety of information technology equipment

950 2000	Safety of information technology equipment
950 1997, 1998, 2000	Safety of information technology equipment, including
950-1 2001	Electrical business equipment.
950-1 2003	
22.2 No. 60950-00	
22.2 No. 60950-1 03	
ZS 3260 1993	Approval and test specification – Safety of information technolo equipment including electrical business Equipment.
ZS 3260 Supp 1 1996	Approval and test specification – Safety of information technolo equipment including electrical business equipment – Alphabetic reference index to IEC 950 (Supplement to AS/NZS 3260:1993)
FS 001 1997	Australian Communications Authority – Safety requirements for customer equipment.
59 1995	Telephone Equipment
010-1 1990	Safety requirements for electrical equipment for measurement, c
1010-1 1993	and laboratory use, Part 1: General requirements.
010-1 1993, 2001	Safety requirements for electrical equipment for measurement, c
1010-1 2001	and laboratory use, Part 1: General requirements.
010B-1 2003	
01-1 1993	Electrical equipment for laboratory use Part 1: General requirem
CSA 1010-1 1999 (*Including AM 2*)	
11-1 1996	Electrical measuring and test equipment. Part 1: General require
21-1 1995	
601-1 1995	Medical electrical equipment. Part 1: General requirements for s
601-1 1995 (*Including AM 2*)	Medical electrical equipment
01-1 1997	Medical electrical equipment. Part 1: General Requirements for
065 1998, 2000	Audio, video and similar electronic apparatus – Safety requirem
UL 6500: 1998	Audio/video and musical instrument apparatus for
CSA 60065-00	Household, commercial and similar general use
ZS 3250 1995	Australian/New Zealand Standard – Approval and test
ZS 60065 2000	Specification – Mains operated electronic and related Equipmen household and similar general use
ian C22.2 No. 1-94 (1-98)	Audio, video and similar electronic equipment. Consumer and l commercial products
065 1994	Safety requirements for main operated electronic and related app for household and similar general use.
0825 1990	Radiation safety of laser products, equipment Classification, requirements and user's guide
825-1 1994	Safety of laser products Part 1: equipment Classification, require
825-1 2001	and user's guide.
0825-2 2000-5	Safety of laser products – Part 2: Safety of optical communicatio
s	
0825-4 1997-11	Safety of laser products – Part 4: Laser guards
0335-1 1995	Safety of household and similar electrical appliances
ding AM2 – 1997 & AM 12 – 1997)	Part 1: General requirements
335-1 2001	
335-1 1998	
CSA E335-1 1994	

010A-1 : 2002	Electrical equipment for laboratory use; part 1: General requirements
010-1 : 2001	Safety requirements for electrical equipment for measurem control, and laboratory use - Part 1: General requirements
ZS 60950 : 2000	Safety information technology equipment

nmental [2]

nmental Standards	Title
-CORE	NEBS Requirements: Physical Protection
00 019	Environmental conditions and environmental tests For
ion up to 1000Hz)	telecommunications equipment

onmental testing is performed at the satellite facility located at 168 Ayer Rd, Littleton, MA 01460