

TITLE: PLI Evaluation Report (RFI) **FCC ID: O725346U**
DRAWING: Q534611We.DWG.doc
BY: Laura Bramschreiber and Clyde Pineda

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Issued: 02 Jun 2004
Approved: Lee Pulver

This drawing consists of pages issued or re-issued on dates shown in the following list.
Italic underlined words indicate content changes or additions on revised pages.

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ISSUED

02 June 2004

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Pulver Laboratories Inc. (PLI) File Number: 5346

Pulver Laboratories Inc. (PLI) Project Number: C1034

Product Names: (1) TouchStrip Professional Reader (EUT)
(EUT = Equipment Under Test)

Model Numbers: (1) TCRZ

Serial Numbers: (1) 035000106

Pulver Laboratories Sample ID: (1) 5346C1034-01

Applicant: UPEK, Inc.
2001 Center Street, Suite 500
Berkeley, California 94704-1204
Telephone: 510.903.3226
Facsimile: 510.665.9730
www.upek.com

Location Certified: UPEK, Inc.
2001 Center Street, Suite 500
Berkeley, California 94704-1204
Telephone: 510.903.3226
Facsimile: 510.665.9730
www.upek.com

Manufacturing Location: Min Aik Technology Co, LTD
12F-1, #492-1, Sec 1
Wan Shou Rd.
Kuai Shan Shiang, Tao Yaun,
Hsian, Taiwan ROC
Telephone: 886-9-3381-0937
Contact: Johnson Lu

Pulver Laboratories Inc. (PLI) Control Number: 5346X

Equipment Category

- Information Technology Equipment including Electrical Business Equipment

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Evaluated to the Following Standards

PLI Certification.

Certified by Pulver Laboratories Inc. to comply with the following standards.

FCC Certification.

Federal Communications Commission (FCC, USA)

Category Classification: Class B – Residential
FCC ID number - FCC ID: O725346U (Pending)

- American National Standards Institute C63.4-2001 entitled Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
- Federal Communications Commission Rules and Regulations located in the Code of Federal Regulations, Title 47, Part 2 entitled Frequency Allocations and Radio Treaty Matters; General Rules and Regulations; and Part 15 entitled Radio Frequency Devices, 08 December 2003 Edition.

ICAN Verification.

Industry Canada (ICAN)

Category Classification: Class B - Residential

- Canadian Standards Association (CSA) C108.8-M1983 (R2000) entitled Electromagnetic Emissions for Data Processing Equipment and Electronic Office Machines.
- Canadian Standards Association (CSA) CAN3-C108.3.1-M84 (R2000) entitled Limits and Measurement Methods of Electromagnetic Noise from AC Power Systems.
- Industry Canada. Interference-Causing Equipment Standard: ICES-003, Issue 3, 22 Nov 97, entitled "Interference-Causing Equipment Standard for Digital Apparatus".
- Industry Canada (ICAN) Radio Interference Regulation amendment dated 15 September 1988 (Radio Act Registration SOR/88-475); 3862 01 Data Processing Equipment.

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CE Certification mark.

International Community

Category Classification: Class B - Residential

- EN55022 / CISPR 22 entitled Limits and methods of measurement of radio disturbance characteristics of information technology equipment, 1995 Edition.
- EN55022 / CISPR 22 entitled Limits and methods of measurement of radio disturbance characteristics of information technology equipment, 1998 Edition.

Referenced Test Standards

- EN55022 / CISPR 22 entitled Limits and methods of measurement of radio disturbance characteristics of information technology equipment, First Edition 1985.

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1.0 Engineering Considerations

1.1 General Engineering Considerations

1.1.1 This report deals with conformance to the:

- Code of Federal Regulations, 47 CFR, Part 2 and Part 15, issued 08 December 2003;
- American National Standards Institute standard number C63.4-2001 entitled Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz;
- EN55022 / CISPR 22 entitled Limits and methods of measurement of radio disturbance characteristics of information technology equipment, Second Edition 1993, with amendment A1, May 1995 Edition.

1.1.2 To assist the Federal Communications Commission in the continuing education of applicants and grantees, Pulver Laboratories has advised UPEK, Inc. to review a copy of the Rules and Regulations located in the Code of Federal Regulations, Title 47, Part 2 entitled Frequency Allocations and Radio Treaty Matters; General Rules and Regulations; and Part 15 entitled Radio Frequency Devices, issued 08 December 2003.

1.1.3 The manufacturer has a contractual obligation to Pulver Laboratories to incorporate into production all modifications photographed and outlined in this report with associated documentation.

1.1.4 The Pulver Laboratories Certificate of Conformance issued with this report allows the manufacturer to ship and sell product using the Pulver Laboratories Product Certification Label. This label can only be used if the manufacturer allows Pulver Laboratories to conduct a Follow Up Service at the manufacturing facilities and conduct an Electromagnetic Interference test of the finished product every six months.

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1.2 Specific Engineering Considerations

1.2.1 Climatic conditions:

Climatic Conditions	Limits	Readings
Ambient temperature	15°C to 35°C	32°C
Relative humidity	45% to 75%	29%
Atmospheric pressure	68 kPa (680 mbar) to 106 kPa (1060 mbar)	1014 mbar

1.2.2 Interconnecting low voltage cable lengths:

Cable Description	Length (feet)	Length (meters)	Shielded / Unshielded
EUT: USB (Data)	5.75	1.75	Unshielded
Computer (Power)	5.60	1.71	Shielded
Modem (Power)	6.00	1.83	Unshielded
Modem (Data)	6.00	1.83	Unshielded
Printer (Data)	5.60	1.71	Shielded
Keyboard (Data)	6.60	2.01	Unshielded
Monitor (Power)	5.75	1.75	Shielded
Monitor (Data)	5.40	1.65	Shielded
Mouse (Data)	6.00	1.83	Unshielded
USB Card Reader (Data)	5.40	1.65	Unshielded

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- 1.2.3 Input / Output (I / O) Cables coiled and wrapped to maximum lengths of 30 to 40 cm, at least 40 cm from ground plane as recommended by ANSI 63.4-1992.
- 1.2.4 Most severe cable orientation chosen when measuring unwanted radiated and conducted emissions.
- 1.2.5 Test Configuration with Monitor attached to input power mains radiated more electromagnetic interference than with the monitor connected to the CPU. Therefore, the data in this report reflects the monitor connected directly to the AC mains.
- 1.2.6 To meet the agency criteria listed in this PLI Evaluation Report, the following modifications were made to the original design of the Equipment Under Test:
 - 1.2.6.1 No modifications were required.
- 1.2.7 There is one possible Equipment Under Test (TouchStrip Professional Reader, TCRZ) input power configuration:
 - 1.2.7.1 A USB port on the host computer supplies the EUT with voltage.
- 1.2.8 There are two possible EUT test configurations:
 - 1.2.8.1 **Test Configuration #1:** consisted of the TouchStrip Professional Reader, model TCRZ connected to an IBM Compatible PC via the USB port. PC connected to 120VAC.
 - 1.2.8.1.1 Test Configuration #1 yielded one radiated and one conducted test.
 - 1.2.8.2 **Test Configuration #2:** identical to Test Configuration #1 except, PC connected to 220VAC.
 - 1.2.8.2.1 Test Configuration #2 yielded one radiated test.

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1.2.9 This report does include measurement data to the 10th harmonic of the EUT.

1.3 Product Description and Intended Use

1.3.1 The UPEK, Inc. TouchStrip Professional Reader TCRZ (built on the TCS3 TouchChip Silicon Fingerprint Strip Sensor and TCD41 Companion Processor) is a fast, reliable and inexpensive fingerprint authentication peripheral, optimized for low cost. Fingerprints are reconstructed as the user swipes his finger across two rows of sensing pixels.

1.3.2 The TouchStrip Professional Reader has been designed for demanding applications such as Desktop Security, Network Security, Commercial Verification, and Identification Systems.

1.3.3 The TouchStrip Professional Reader is a fully integrated biometric PC peripheral, which includes all the typical biometric system: fingerprint sensing, image optimization, and matching.

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1.4 List of Photographs Contained in this Report

FIGURE 1: PLI Photograph Number 5346C1034SJ-08 illustrates the rear view of the Equipment Under Test with all peripherals attached in radiated Electromagnetic Interference **Test Configurations #1 and #2**.

FIGURE 2: PLI Photograph Number 5346C1034SJ-07 illustrates the rear view of the Equipment Under Test with all peripherals attached in conducted Electromagnetic Interference **Test Configuration #1**. (Second LISN for peripherals not show).

FIGURE 3: PLI Photograph Number 5346C1034SJ-11 illustrates the top view of the EUT.

FIGURE 4: PLI Photograph Number 5346C1034SJ-12 illustrates the component side of the Input/Output Printed Circuit Assembly and the bottom cover of the EUT.

FIGURE 5: PLI Photograph Number 5346C1034SJ-14 illustrates the circuit side of the Input/Output Printed Circuit Assembly.

1.5 Equipment used during measurements calibrated according to internationally acceptable laboratory procedures. Calibration data along with Certificates of conformance and traceability are on file at the testing facility. Each calibrated equipment item is individually labeled with date calibrated; due date for next calibration; initials of person who calibrated the equipment; and the name of the organization that performed the calibration service.

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- 1.6 List of Exhibits accompanying this report for FCC submission to help describe and clarify the Equipment Under Test.
 - 1.6.1 Schematics or detailed block diagrams.
 - 1.6.2 Equipment manual for operator or user showing enough detail to operate the equipment.
 - 1.6.3 Currently dated and originally signed FCC Application for Certification (Form 731) along with the FCC Certification fee (already submitted electronically).
 - 1.6.4 Current Agent Authorization letter.
 - 1.6.5 Proposed identification label representative of the production label to be placed on the equipment upon grant of the application. Positioned on equipment as shown in block rough in Section 2.1 of this report.

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Table of Laboratory Test Equipment

Equipment Type	Manufacturer	Model Number	Frequency Range
Spectrum Analyzer	Hewlett-Packard	8568A	100 Hz - 1.5 GHz
Quasi-peak Adapter	Hewlett-Packard	85650A	10 kHz - 1.00 GHz
Biconical Antenna	EMCO	3109	30 - 200 MHz
Log Periodic Antenna	EMCO	3146	200 - 1000 MHz
Magnetic Loop Antenna	Electro-Metrics	ALR-25M	10 kHz - 30 MHz
Amplifier	Hewlett-Packard	8447D Option 010	0.1 - 1300 MHz
Spectrum Analyzer	Hewlett-Packard	8565A	10 MHz – 22 GHz
Amplifier	Hewlett-Packard	8349A	1 - 20 GHz
Double Ridge Horn Antenna	EMCO	3115	1 – 18 GHz
Oscilloscope Camera	Tektronix	C-5C	
Attenuator	Narda	757C (35797)	3 dB (DC - 12.4 GHz)

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Equipment Type	Manufacturer	Model Number	Frequency Range
Attenuator	Narda	757C (36808)	6 dB (DC - 12.4 GHz)
Attenuator	Narda	757C (40604)	10 dB (DC - 12.4 GHz)
Attenuator	Narda	757C (40998)	20 dB (DC - 12.4 GHz)
Close Field Antenna	Electro-Metrics	EFP-25	
Oscilloscope	Tektronix	2445	up to 150 MHz
Capacitor/ Inductor Z Meter	Sencore		1 pF to 200,000 μ F 1 μ H to 10 H
L.I.S.N	Solar Electronics Co.	8012-50-R-24 BNC	50 - 60 Hz
Equipment Testing Turn Table	EMCO	1061-06	
Antenna Positioning Tower	EMCO	1050	
Radio Interference Receiver	PRD Electronics Inc.	R-1040/URM-85	(two complete systems)
Antenna Coupler	PRD Electronics Inc.	CU-893/URM-85	80 - 220 MHz
Antenna Coupler	PRD Electronics Inc.	MT-2459/URM-85	

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Equipment Type	Manufacturer	Model Number	Frequency Range
Frequency Converter	Empire Devices Products Corp.	CV-1102/URM-85	20 - 220 MHz
Frequency Converter	PRD Electronics Inc.	CV-1104A/URM-85	400 - 1000 MHz
Frequency Converter	PRD Electronics Inc.	CV-1101A/URM-85	0.15 - 30 MHz
Frequency Converter	PRD Electronics Inc.	CV-1103/URM-85	200 - 400 MHz
Frequency Converter	PRD Electronics Inc.	CV-1102A/URM-85	20 - 220 MHz
Antenna Coupler (two systems)	PRD Electronics Inc.	CU-890/URM-85	0.15 - 30 MHz
Loop Antenna (two systems)	PRD Electronics Inc.	AT-1026/URM-85	0.15 - 30 MHz
Frequency Comb Generator	Hewlett-Packard	8406A	20 - 1200 MHz
Tunable Band Pass Filter	K & L Microwave Inc.	5BT-95/190-5/B	95 - 195 MHz
Tunable Band Pass Filter	K & L Microwave Inc.	5BT-48/95-5/B	50 - 95 MHz
High Pass Filter	Solar Electronics Co.	7801-5.0	5 kHz
Absorbing Clamp	Schaffner EMC Inc.	MDS-21	30 - 1000 MHz

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Equipment Type	Manufacturer	Model Number	Frequency Range
Line Probe	EMCO	3701	
Antenna Set	EMCO	3121C	30 - 1000 MHz
L.I.S.N	Solar Electronics Co.	8328-50-TS-50-N	
Frequency Generator	Hewlett-Packard	TS-418B/U	400 - 1000 MHz
Frequency Generator	Hewlett-Packard	TS-510A/U	10 - 420 MHz
Antenna Set	Electro-Metrics	TDA-25	30 - 200 MHz
Antenna Set	Electro-Metrics	TDS-25-1	200 - 500 MHz
Antenna Set	Electro-Metrics	TDS-25-2	500 - 1000 MHz
Antenna (two sets)	PRD Electronics Inc.	AT-1030/URM-85	400 - 1000 MHz
Coupler Antenna	PRD Electronics Inc.	CU-895/URM-85	20 - 1000 MHz
Electronic Field Probe	PRD Electronics Inc.	MX-3411/URM-85	0.15 - 1000 MHz
Fixed Attenuator	PRD Electronics Inc.	CN-721/URM-85	0.15 - 1000 MHz

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Magnetic Field Probe	PRD Electronics Inc.	MX-3412/URM-85	20 - 1000 MHz
Coupler	PRD Electronics Inc.	CU-896/URM-85	20 - 1000 MHz
Coupler	PRD Electronics Inc.	CU-897/URM-85	20 - 1000 MHz
Ground Rod	PRD Electronics Inc.	GP-117/URM-85	
Coupler Antenna	PRD Electronics Inc.	CU-894/URM-85	200 - 400 MHz
Reflector Antenna	PRD Electronics Inc.	AT-1027/URM-85	0.15 - 30 MHz
Cable Assembly Set	PRD Electronics Inc.	MX-3410/URM-85	
Cord Assembly	PRD Electronics Inc.	CX-4305/U	
Mega Cycle Tape	Disston Carlson	TM6625-351-12-8	17 - 1000 MHz
Antenna Discone	Empire Devices Products Corp.	AS-1158/URM-85	Broad Band
Headset	Empire Devices Products Corp.	H-113/U	
Mast Section	Empire Devices Products Corp.	AB-21/GR	

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Equipment Type	Manufacturer	Model Number	Frequency Range
Antenna Tripod			
EMI Line Filter	Stanford Applied Engineering	D30B	50 - 60 Hz, 3 phase
Digital Power Meter	Fluke and Phillips	FLUKE 39	
Multimeter	Fluke and Phillips	FLUKE 87 True RMS	
Feed Through Caps	Solar Electronics Co.	6512-106 R 10 μ F capacitors	275V RMS, 60 Hz
Multimeter	Beckman Industrial Corp.	Circuitmate DM15B	250V RMS, 400 Hz
RMS Multimeter	Beckman Industrial Corp.	Tech 310	
Multimeter	Fluke and Phillips	FLUKE 85	
ELF Field Monitor	Walker Magnetic Group	ELF-50D	

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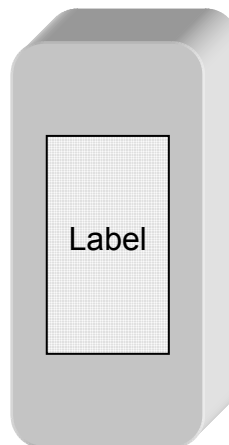
2.0 Mandatory Labeling and Operators' Manual Information and Shipping Documents

2.1 Label

The illustration on the next page shows the actual label with the appropriate wording. Note the letters "EMI" on the label, which abbreviate "Electromagnetic Interference". Organizations like the Federal Communications Commission and their respective limits are listed on the label.

Also notice the letters "NRTL", which abbreviate "Nationally Recognized Testing Laboratory" as recommended by OSHA and the National Electrical Code for the United States. For Pulver Laboratories product Certification labels used for safety Certification, the phrase "SAFETY" appears on the label. Safety Certifying organizations like Pulver Laboratories are listed on the label adjacent to the testing standards used during equipment evaluation.

A rough sketch of the label location is shown below.



Base Plate of EUT

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2.2 **Operators' Manual Information**

2.2.1 The following information is inserted directly into the equipment user instruction manual to meet the requirements of product safety and Radio Frequency Interference (RFI) rules and regulations.

WARNING - For reduced unwanted RF emissions, use a shielded power cord to connect AC power to the host computer.

2.3 **FCC User Information** - Place the following statements in the front of the operators' manual so that the user of the EUT is aware of its interference potential. If available, provide additional information to the user about corrective measures.

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For a Class B Digital Device or Peripheral

**FCC NOTICE
INFORMATION FOR THE USER**

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

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

The user may find the following publication prepared by the Federal Communications Commission helpful:

"How to Identify and Resolve Radio-TV Interference Problems" (Stock Number 004-000-00345-4).

Available exclusively from the Superintendent of Documents, Government Printing Office, Washington, DC 20402 (telephone 202-512-1800).

FCC WARNING

Changes or modifications not expressly approved by the party responsible for compliance to Part 15 of the FCC Rules could void the user's authority to operate the equipment.

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For a Class B or Class 2 Digital Device

**CE NOTICE
INFORMATION FOR THE USER**

This equipment has been tested and found to comply with the limits for a Class B or Class 2 digital device, pursuant to EN 55022 Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at the expense of the user.

The user may find the following publication prepared by the Federal Communications Commission helpful:

"How to Identify and Resolve Radio-TV Interference Problems"
(Stock Number 004-000-00345-4).

Available exclusively from the Superintendent of Documents, Government Printing Office, Washington, DC 20402 (telephone 202-512-1800).

WARNING

Changes or modifications not expressly approved by the party responsible for compliance to EN 55022 Rules could void the user's authority to operate the equipment.

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- 2.4 **Industry Canada** - Provide the ICAN statements that follow this paragraph along with the Pulver Laboratories Certificate of Conformance (in this report) in the first pages of the operators' manual and place with the shipping documents accompanying each product.

ICAN Class B Digital Equipment

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

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2.5 **RegTP Declaration (for Germany)**

- 2.5.1 This declaration addresses the Electromagnetic Compatibility defined by RegTP's main functions under the Telecommunications Act ("TKG") and the Postal Act ("PostG") associated with Department 4 dealing with Technical Telecommunications Regulation.
- 2.5.2 This declaration for the newly formed RegTP in English and German shown on the next pages will be provided to the operator of the Equipment Under Test.
- 2.5.3 This declaration shall be provided along with the Pulver Laboratories Certificate of Conformance in a conspicuous location in the operators' manual and be placed with the shipping documents of each unit marketed in Germany and the European Community and specifically Argentina, Australia, Austria, Belgium, Bolivia, Brazil, Chile, Denmark, Dominican Republic, Finland, France, Greece, Guatemala, Haiti, Hong Kong, Iceland, India, Indonesia, Ireland, Israel, Italy, Jamaica, Kuwait, Luxembourg, Netherlands, New Zealand, Norway, Pakistan, Paraguay, Peru, Philippines, Portugal, Singapore, Saudi Arabia, South Africa, Spain, Sweden, Switzerland, Syria, Taiwan, Turkey, United Kingdom, and Uruguay.
- 2.5.4 THE FOLLOWING STATEMENTS CAN ONLY BE USED IF Pulver Laboratories CERTIFIES THAT THE PRODUCT CONFORMS TO EUROPEAN SAFETY. This report is strictly for Electromagnetic Interference and does not cover safety.

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RegTP Declaration by Pulver Laboratories Inc. and Manufacturer or Importer in English:

Pulver Laboratories Inc. and UPEK, Inc. hereby certify that the TouchStrip Professional Reader, TCRZ (Equipment, Type, Model Number) is in compliance with VFG 523/1969, DIN 57871 / VDE 0871 / 09.84, and DIN 57875 Part 1 A2 / 10.90 (product standards) and is RFI suppressed.

The marketing and sale of this equipment in Germany has been reported to the German Postal service. They have also been given the right to retest this equipment to verify compliance with product regulations.

Compliance with applicable regulations depends on the use of shielded cables. The user is responsible for procuring the appropriate cables.

This equipment has been tested concerning compliance with the relevant RFI protection requirements both individually and on a system level (to simulate normal operation conditions). However, it is possible that these RFI requirements are not met under certain unfavorable conditions in other installations. The user is responsible for compliance of his particular installation.

Pulver Laboratories Inc.
Testing and Certification Laboratories

UPEK, Inc.
Name of Manufacturer or Importer

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RegTP Declaration by Pulver Laboratories Inc. and Manufacturer or Importer in German:

Bescheinigung des Pulver Laboratories Inc. und UPEK, Inc. hiermit wird bescheinigt, dass die TouchStrip Professional Reader TCRZ in Übereinstimmung mit den Bestimmungen der VFG 523/1969, DIN 57871 / VDE 0871 / 09.84, und DIN 57875 Part 1 A2 / 10.90 (Amtsblattvertugung) funk-entstört ist.

Der Deutschen Bundespost wurde das Inverkehrbringen dieses Geräts angezeigt und die Berechtigung zur Überprüfung der Serie auf Einhaltung der Bestimmungen eingeräumt.

Einhaltung mit betreffenden Bestimmungen kommt darauf an, dass geschirmte Ausführungen gebraucht werden. Für die Beschaffung richtiger Ausführungen ist der Betreiber Verantwortlich.

Dieses Gerät wurde sowohl einzeln als auch in einer Anlage, die einen normalen Anwendungsfall nachbildet, auf die Einhaltung der Funk-entstörbestimmungen geprüft. Es ist jedoch möglich, dass die Funk-entstörbestimmungen unter Ungünstigen Umständen bei anderen Gerätekombinationen nicht Eingehalten werden. Der Betreiber ist für die Einhaltung der funk-eutstörungsbestimmungen seiner gesamten Anlage verantwortlich, in der dieses Gerät betrieben wird.

Pulver Laboratories Inc.
Testing and Certification Laboratories

UPEK, Inc.
Name des Herstellers / Importeurs

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FIGURE 1: PLI Photograph Number 5346C1034SJ-08 illustrates the rear view of the Equipment Under Test with all peripherals attached in radiated Electromagnetic Interference **Test Configurations #1 and #2**.



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FIGURE 2: PLI Photograph Number 5346C1034SJ-07 illustrates the rear view of the Equipment Under Test with all peripherals attached in conducted Electromagnetic Interference **Test Configuration #1**. (Second LISN for peripherals not show).



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FIGURE 3: PLI Photograph Number 5346C1034SJ-11 illustrates the top view of the EUT.



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FIGURE 4: PLI Photograph Number 5346C1034SJ-12 illustrates the component side of the Input/Output Printed Circuit Assembly and the bottom cover of the EUT.

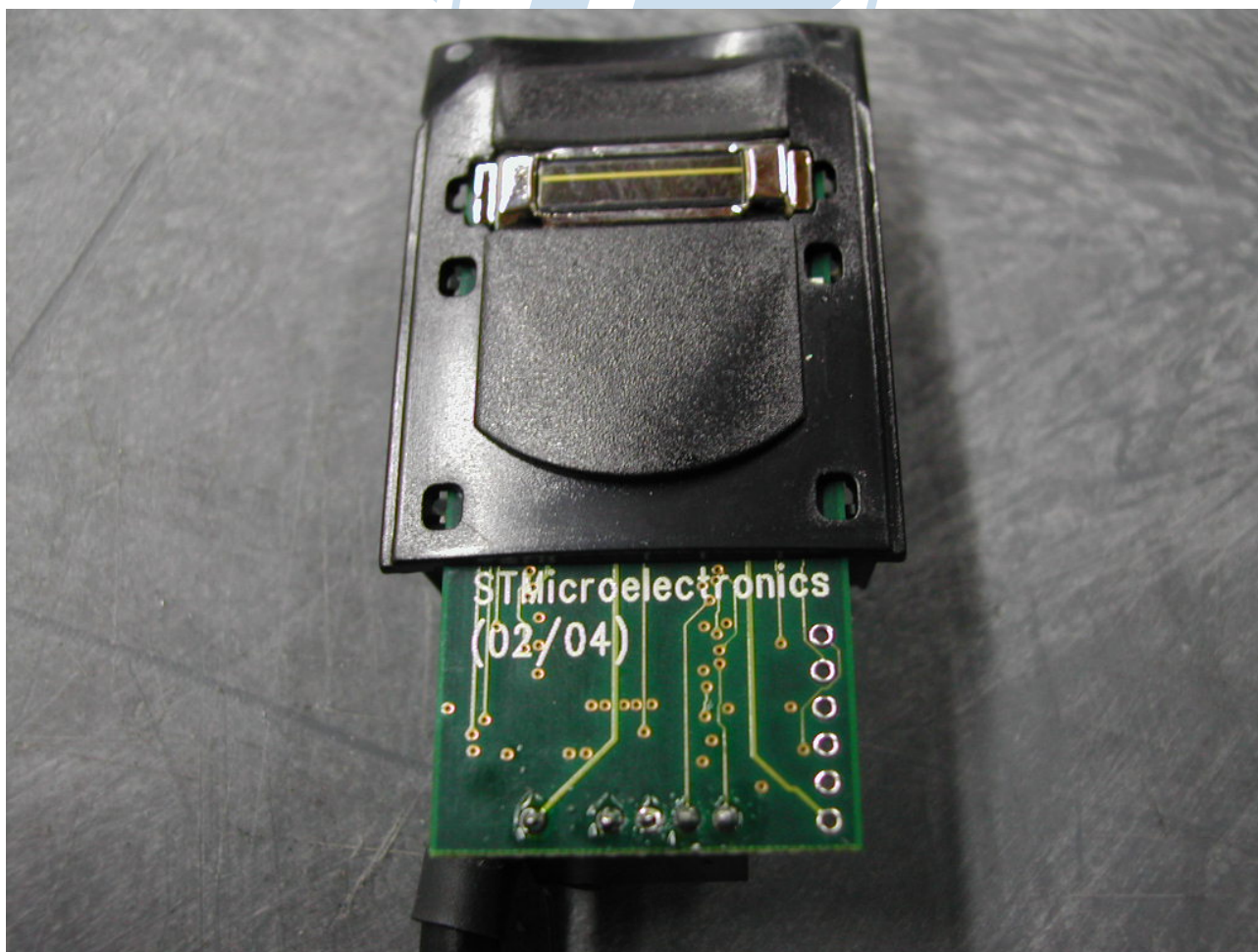


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FIGURE 5: PLI Photograph Number 5346C1034SJ-14 illustrates the circuit side of the Input/Output Printed Circuit Assembly.



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Clock Oscillators and Frequencies of Operation

Frequency	Component # / Location	Description of Use
12MHz	Main Printed Circuit Assembly	
Use this table to simplify locating the oscillators in the accompanying schematics.		

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Equipment Under Test Orientation and Configuration

Refer to PLI Photograph Number 5346C1034SJ-08

3.0 Radiated Electromagnetic Interference (EMI) - Test Configuration

- 3.1 PLI placed the Equipment Under Test (EUT) on an 80 centimeter high table located on a 12.70 millimeter (0.5 inch) thick, 1.83 meter (6.00 foot) diameter, remote controlled steel turntable positioned 3.00 meters away from a receiving antenna assembly. This steel gear driven turntable has a 2400 pound capacity. The grounded turntable top surface is flush with a grounded screen consisting of 6.35 millimeter (0.25 inch) squares forming a wire mesh. The automated 4.00 meter mast and antenna assembly connects to an RF amplifier attached to a spectrum analyzer with quasi-peak adapter.
- 3.2 The Equipment Under Test (EUT) was operated at its specified load condition for which it was designed. After 30 minutes of continuous operation the EUT reached normal operating temperature. PLI recorded EMI data in this report during the normal load and operating temperature of the EUT.
- 3.3 The EUT and system configuration follows:
- 3.3.1 The computer was connected to 120VAC mains power for Test Configuration #1 or 220VAC for Test Configuration #2.
 - 3.3.2 The EUT (TouchStrip Professional Reader) was plugged into the USB port of the host computer.
 - 3.3.3 A color monitor, keyboard, mouse, modem, and printer were connected to the host computer.
 - 3.3.4 The host computer was powered "ON" and the Windows XP operating system loaded.
 - 3.3.5 Following initialization of the Windows XP operating system, the software for capturing a fingerprint was loaded and directed to continuously send an input signal from the fingerprint sensor connected to the USB port to the digital video fingerprint display on the monitor using the following sequence:
 - Double click "ESS_Evaluator" icon
 - Click the "right arrow" button until the "Navigate" screen appears
 - Click the "Navigate" button to activate the EUT
 - Place finger over sensor to assure movement (the pointer on the screen will move).
 - 3.3.6 For the duration of the test program, the EUT remained active and waited to detect finger movement.

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3.4 The following equipment list defines the system configuration:

EUT :TouchStrip Professional Reader
Model Number :TCRZ
Serial Number :035000106
PLI Sample ID :5346C1034-01
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Manufacturer :UPEK, Inc.

Product :Personal Computer System
Model Number :Dimension 2100 Series MCM
Serial Number :560C711
FCC ID Number :FCC DOC Authorized
Manufacturer :DELL

Product :Monitor
Model Number :E551C
Part Number :DP/n 07G076 CN/Rev A00
FCC ID Number :FCC DOC Authorized
Manufacturer :DELL

Product Name :Keyboard
Model Number :SK-8100 (DP/N 09C487)
Serial Number :None
FCC ID Number :FCC DOC Authorized
Manufacturer :DELL

Product :Mouse
Model Number :63618-OEM (PN X06-08477)
Serial Number :None
FCC ID Number :FCC DOC Authorized
Manufacturer :DELL

Product Name :Supra Fax Modem
Model Number :144LC
Serial Number :124518
FCC ID Number :FCZ5D3144FX
Manufacturer :Supra Corporation

Product :Printer
Model Number :KX-P1091i
Serial Number :None
FCC ID Number :ACJ5Z6KX-P1091i
Manufacturer :Matsushita Electric Industrial Co.

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Product :USB Card Reader
Model Number :F5U140
Serial Number :31620209701395
FCC ID Number :FCC DOC Authorized
Manufacturer :Belkin

- 3.5 The Equipment Under Test was evaluated per the American National Standards Institute standard number C63.4-2001 entitled Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz. To maximize Electromagnetic Interference signal strength, PLI rotated the System Under Test 360 degrees and then adjusted the receiving antenna height until the maximum signal appeared on the spectrum analyzer. The input/output interface cables between units of the system were always positioned to yield maximum field strength.

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4.0 Radiated EMI – Results

- 4.1 The investigated frequency spectrum revealed radiated EMI signals. The highest interference in the horizontal polarization occurred when the front of the unit was facing 180 degrees clockwise with respect to the antenna. The highest interference in the vertical polarization occurred when the front of the unit was facing 180 degrees clockwise with respect to the antenna.
- 4.2 The "ACF" (Antenna Correction Factor) shown in the test data in this report includes compensation for the antenna factor; cable attenuation; the series RF attenuator; the RF amplifier; and pre-selector system losses. PLI shows the spectrum analyzer data as quasi-peak amplitudes.
- 4.3 The test facility is FCC registered; the procedures are CISPR registered, ICAN registered, VCCI registered, VDE approved, and RegTP approved.

Type of Test	Radiated Electromagnetic Interference
Specification	FCC, ICAN, and EN55022 Class B
Date Data Collected	26 April 2004
Detection Technique	Spectrum Analyzer with Quasi-peak Adapter
Resolution Bandwidth	100 kHz
Video Bandwidth	100 kHz
Antennas	30 to 200 MHz High Field Biconical Antenna 200 to 1000 MHz Log-Periodic Antenna 1 to 18 GHz Double Ridge Guide Horn

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Test Configuration #1

Frequency MHz	EMI Data dB μ V/M	ACF	Field Strength dB μ V/M	FCC Limit dB μ V/M	FCC Margin to Limit dB μ V/M	EN Limit dB μ V/M	EN Margin to Limit dB μ V/M
Horizontal							
35.50	37.80	-8.62	29.18	40.00	-10.82	40.46	-11.28
55.05	38.30	-10.45	27.85	40.00	-12.15	40.46	-12.61
57.18	39.80	-10.59	29.21	40.00	-10.79	40.46	-11.25
57.73	41.40	-10.63	30.77	40.00	-9.23	40.46	-9.69
58.23	41.00	-10.66	30.34	40.00	-9.66	40.46	-10.12
58.78	44.50	-10.70	33.80	40.00	-6.20	40.46	-6.66
64.38	41.20	-11.40	29.80	40.00	-10.20	40.46	-10.66
67.10	45.90	-11.79	34.11	40.00	-5.89	40.46	-6.35
77.45	42.40	-13.53	28.87	40.00	-11.13	40.46	-11.59
179.80	41.60	-7.02	34.58	43.50	-8.92	40.46	-5.88
181.33	37.50	-7.24	30.26	43.50	-13.24	40.46	-10.20
191.83	41.40	-9.52	31.88	43.50	-11.62	40.46	-8.58
451.78	31.00	-1.78	29.22	46.00	-16.78	47.46	-18.24
533.35	35.70	-1.08	34.62	46.00	-11.38	47.46	-12.84
583.80	34.80	-0.72	34.08	46.00	-11.92	47.46	-13.38
601.83	37.40	-0.58	36.82	46.00	-9.18	47.46	-10.64
654.23	28.80	-0.46	28.34	46.00	-17.66	47.46	-19.12
655.85	34.60	-0.37	34.23	46.00	-11.77	47.46	-13.23
678.40	35.20	0.81	36.01	46.00	-9.99	47.46	-11.45
751.85	28.30	1.14	29.44	46.00	-16.56	47.46	-18.02

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Test Configuration #1

Frequency MHz	EMI Data dB μ V/M	ACF	Field Strength dB μ V/M	FCC Limit dB μ V/M	FCC Margin to Limit dB μ V/M	EN Limit dB μ V/M	EN Margin to Limit dB μ V/M
Vertical							
33.63	37.20	-8.47	28.73	40.00	-11.27	40.46	-11.73
52.45	40.70	-9.05	31.66	40.00	-8.34	40.46	-8.80
52.95	38.70	-9.10	29.61	40.00	-10.40	40.46	-10.85
53.53	39.40	-9.15	30.25	40.00	-9.75	40.46	-10.21
54.05	41.00	-9.21	31.80	40.00	-8.21	40.46	-8.66
54.60	42.20	-9.26	32.94	40.00	-7.06	40.46	-7.52
68.53	42.70	-10.23	32.47	40.00	-7.53	40.46	-7.99
80.18	42.40	-9.59	32.81	40.00	-7.19	40.46	-7.65
80.70	41.80	-9.57	32.23	40.00	-7.77	40.46	-8.23
111.98	41.50	-8.22	33.28	43.50	-10.22	40.46	-7.18
414.35	36.60	0.43	37.03	46.00	-8.97	47.46	-10.43
600.55	35.40	4.06	39.46	46.00	-6.54	47.46	-8.00
762.28	31.50	7.20	38.70	46.00	-7.30	47.46	-8.76
794.83	30.80	7.87	38.67	46.00	-7.33	47.46	-8.79
795.83	31.40	7.89	39.29	46.00	-6.71	47.46	-8.17
798.93	31.40	7.96	39.36	46.00	-6.64	47.46	-8.10
801.95	28.40	8.02	36.42	46.00	-9.58	47.46	-11.04
816.05	31.10	8.28	39.38	46.00	-6.62	47.46	-8.08
947.10	27.70	10.91	38.61	46.00	-7.39	47.46	-8.85
959.28	27.90	11.16	39.06	46.00	-6.94	47.46	-8.40

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Test Configuration #2

Frequency MHz	EMI Data dB μ V/M	ACF	Field Strength dB μ V/M	FCC Limit dB μ V/M	FCC Margin to Limit dB μ V/M	EN Limit dB μ V/M	EN Margin to Limit dB μ V/M
Horizontal							
56.83	38.90	-10.57	28.33	40.00	-11.67	40.46	-12.13
59.98	40.60	-10.78	29.82	40.00	-10.18	40.46	-10.64
71.80	41.90	-12.53	29.37	40.00	-10.63	40.46	-11.09
77.35	45.20	-13.51	31.69	40.00	-8.31	40.46	-8.77
81.88	37.60	-14.07	23.53	40.00	-16.47	40.46	-16.93
132.95	45.60	-9.82	35.78	43.50	-7.72	40.46	-4.68
153.38	42.30	-8.60	33.70	43.50	-9.80	40.46	-6.76
203.10	47.30	-11.10	36.20	43.50	-7.30	40.46	-4.26
233.25	38.40	-9.17	29.23	46.00	-16.77	47.46	-18.23
299.90	36.70	-5.59	31.11	46.00	-14.89	47.46	-16.35
333.25	32.30	-6.06	26.24	46.00	-19.76	47.46	-21.22
366.63	41.50	-5.23	36.27	46.00	-9.73	47.46	-11.19
400.00	33.50	-3.09	30.41	46.00	-15.59	47.46	-17.05
466.68	41.00	-1.61	39.39	46.00	-6.61	47.46	-8.07
518.35	37.70	-1.14	36.56	46.00	-9.44	47.46	-10.90
705.65	28.90	1.84	30.74	46.00	-15.26	47.46	-16.72
758.85	28.20	1.31	29.51	46.00	-16.49	47.46	-17.95
828.55	28.20	3.21	31.41	46.00	-14.59	47.46	-16.05
892.95	29.20	4.74	33.94	46.00	-12.06	47.46	-13.52

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Test Configuration #2

Frequency MHz	EMI Data dBμV/M	ACF	Field Strength dBμV/M	FCC Limit dBμV/M	FCC Margin to Limit dBμV/M	EN Limit dBμV/M	EN Margin to Limit dBμV/M
Vertical							
32.10	38.50	-8.43	30.07	40.00	-9.93	40.46	-10.39
34.80	40.00	-8.49	31.51	40.00	-8.49	40.46	-8.95
37.63	39.90	-8.55	31.35	40.00	-8.65	40.46	-9.11
38.13	38.40	-8.56	29.84	40.00	-10.16	40.46	-10.62
39.68	41.70	-8.59	33.11	40.00	-6.89	40.46	-7.35
53.33	39.90	-9.13	30.77	40.00	-9.23	40.46	-9.69
69.48	43.00	-10.27	32.73	40.00	-7.27	40.46	-7.73
73.28	42.90	-10.07	32.83	40.00	-7.17	40.46	-7.63
79.90	42.60	-9.61	32.99	40.00	-7.01	40.46	-7.47
82.90	41.90	-9.48	32.42	40.00	-7.58	40.46	-8.04
83.45	42.60	-9.46	33.14	40.00	-6.86	40.46	-7.32
154.90	32.30	-5.76	26.54	43.50	-16.96	40.46	-13.92
232.25	37.20	-3.50	33.70	46.00	-12.30	47.46	-13.76
233.25	38.70	-3.48	35.22	46.00	-10.78	47.46	-12.24
406.28	38.80	0.26	39.06	46.00	-6.94	47.46	-8.40
483.03	33.10	1.84	34.94	46.00	-11.06	47.46	-12.52
496.03	34.70	2.11	36.81	46.00	-9.19	47.46	-10.65
619.00	35.00	4.40	39.40	46.00	-6.60	47.46	-8.06
720.08	32.10	6.38	38.48	46.00	-7.52	47.46	-8.98
761.88	31.70	7.19	38.89	46.00	-7.11	47.46	-8.57
764.93	31.20	7.25	38.45	46.00	-7.55	47.46	-9.01
765.98	31.80	7.27	39.07	46.00	-6.93	47.46	-8.39
797.66	30.90	7.93	38.83	46.00	-7.17	47.46	-8.63
922.30	29.60	10.40	40.00	46.00	-6.00	47.46	-7.46
943.03	28.30	10.83	39.13	46.00	-6.87	47.46	-8.33

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4.4 **Calculations and Notes Concerning Data Presentation**

4.4.1 "ACF" means the Antenna Correction Factor for either Horizontal or Vertical antenna orientation.

4.4.2 "H" designates the Horizontal antenna orientation.

4.4.3 "V" designates the Vertical antenna orientation.

4.4.4 "*" means the data shown in the "Margin to Limit" column exceeds the data in the "EN Limit" column, or exceeds the data in the "FCC Limit" column. "*" could also mean that the Margin to the Limit is greater than -2.00 dB μ V per meter.

4.4.5 "A" designates an ambient signal.

4.4.6 "(-.-)" means the signal level is lower than the adjacent data or within the background ambients.

4.4.7 "EMI DATA" plus "ACF" equals "Field Strength".

4.4.8 "Field Strength" minus "EN Limit" and/or minus "FCC Limit" equals "Margin to Limit".

4.4.9 "Margin to Limit" negative numbers show Equipment Under Test "Field Strength" below the "EN Limit" and/or below the "FCC Limit". "Margin to Limit" positive numbers show Equipment Under Test "Field Strength" above the "EN Limit" and/or above the "FCC Limit".

4.5 The field strengths in this section were measured at 3.0 meters. None of the Electromagnetic Interference quasi-peaks are in excess of the ICAN (Industry Canada), FCC (Federal Communications Commission), and EC (European Community) Class B maximums, even when the field strength readings in the above table are reduced by 20 dB μ V (to represent 30 meter test site measurements, since an antenna positioned at 30.0 meters receives one tenth of the field strength recorded at 3.0 meters).

4.6 **Conclusion** - The radiated Electromagnetic Interference of the Equipment Under Test meets the requirements for Industry Canada (ICAN), Federal Communications Commission (FCC), and the European Community (EC) Class B devices.

5.0 Conducted EMI - Test Configuration

- 5.1 Current input power leads of the Equipment Under Test were connected to a Line Impedance Stabilization Network (LISN), which isolate and couple the conducted interference from the power lines to a spectrum analyzer. The LISN and the Equipment Under Test were connected and positioned according to the Industry Canada and the Federal Communications Commission test recommendations. The Equipment Under Test was configured exactly as outlined in the Radiated Electromagnetic Interference Section of this report. The spectrum analyzer data is shown in the following table as quasi-peak amplitudes.
- 5.2 To increase data integrity and also meet the recommendations of the American National Standards Institute standard number C63.4-2001, all electrical devices comprising the system being tested with the Equipment Under Test were connected to the VAC mains using a second Line Impedance Stabilization Network.

6.0 Conducted EMI – Results

- 6.1 Investigation of the EUT revealed conducted interference levels as shown in the table below.

Type of Test	Conducted Electromagnetic Interference
Specification	FCC, ICAN, and EN55022 Class B
Date Data Collected	26 April 2004
Detection Technique	Spectrum Analyzer with Quasi-peak Adapter
Frequency Range	0.150 to 30.0 MHz
Resolution Bandwidth	10 kHz
Video Bandwidth	10 kHz
Line Impedance Stabilization Network	50 micro Henry; 50 ohm

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Test Configuration #1

Frequency MHz	Line Data dBμV	Neutral Data dBμV	FCC / EN Limit dBμV	FCC / EN Margin to Limit (Line) dBμV	FCC / EN Margin to Limit (Neutral) dBμV
0.17	43.20	--	66.47	-23.27	--
0.27	44.90	--	68.91	-24.01	--
0.42	45.70	--	73.33	-27.63	--
0.80	40.10	--	56.00	-15.90	--
1.59	37.30	--	56.00	-18.70	--
1.82	29.60	--	56.00	-26.40	--
2.87	32.60	--	56.00	-23.40	--
8.61	26.90	--	60.00	-33.10	--
12.09	23.20	--	60.00	-36.80	--
13.60	31.00	--	60.00	-29.00	--
15.00	33.70	--	60.00	-26.30	--
17.88	33.00	--	60.00	-27.00	--
0.17	--	42.20	66.53	--	-24.33
0.42	--	46.10	73.32	--	-27.22
0.51	--	32.30	56.00	--	-23.70
1.20	--	28.90	56.00	--	-27.10
1.59	--	38.00	56.00	--	-18.00
2.14	--	28.00	56.00	--	-28.00
3.34	--	27.40	56.00	--	-28.60
6.20	--	26.20	60.00	--	-33.80
11.90	--	28.10	60.00	--	-31.90
12.77	--	29.90	60.00	--	-30.10
13.45	--	32.60	60.00	--	-27.40
15.12	--	28.10	60.00	--	-31.90
20.49	--	25.20	60.00	--	-34.80

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6.2 Calculations and Notes Concerning Data Presentation

- 6.2.1 "*" means the "Margin to Limit" Exceeds the "FCC Limit" and/or Exceeds the "EN Limit" or is within a -2 dB μ V margin.
- 6.2.2 "(-.-)" means the signal level is lower than the adjacent data or within the background ambients.
- 6.2.3 "Line Data" minus "FCC Limit" and/or minus "EN Limit" equals "Margin to Limit" for the Line side of the input power cord.
- 6.2.4 "Neutral Data" minus "FCC Limit" and/or minus "EN Limit" equals "Margin to Limit" for the Neutral side of the input power cord.
- 6.2.5 "Margin to Limit" negative numbers show Equipment Under Test "Field Strength" **below** the "FCC Limit" and/or **below** the "EN Limit". "Margin to Limit" positive numbers show Equipment Under Test "Field Strength" **above** the "FCC Limit" and/or **above** the "EN Limit".
- 6.2.6 "A" means an Ambient signal.
- 6.2.7 The symbol " Σ " adjacent to a line of conducted Electromagnetic Interference data means that the "Field Strength" was recorded directly as a quasi-peak measurement, and then reduced by 13 dB μ V. The data obtained in quasi-peak mode was 6 dB μ V or higher than the level of the same emission measured with the spectrum analyzer detector function set to the average mode. The emission was considered broadband, since the quasi-peak mode bandwidth setting was identical to the average mode bandwidth setting. 100 samples were recorded represented by the following equation:

$$\left(\frac{1}{n}\right)\sum_{i=1}^n X_i$$

- 6.3 **Conclusion** - The conducted Electromagnetic Interference of the Equipment Under Test meets the requirements for Industry Canada (ICAN), Federal Communications Commission (FCC), and the European Community (EC) Class B devices.
- 6.4 Graphs of PEAK conducted Electromagnetic Interference for frequency ranges on Line and Neutral are shown on the following pages.

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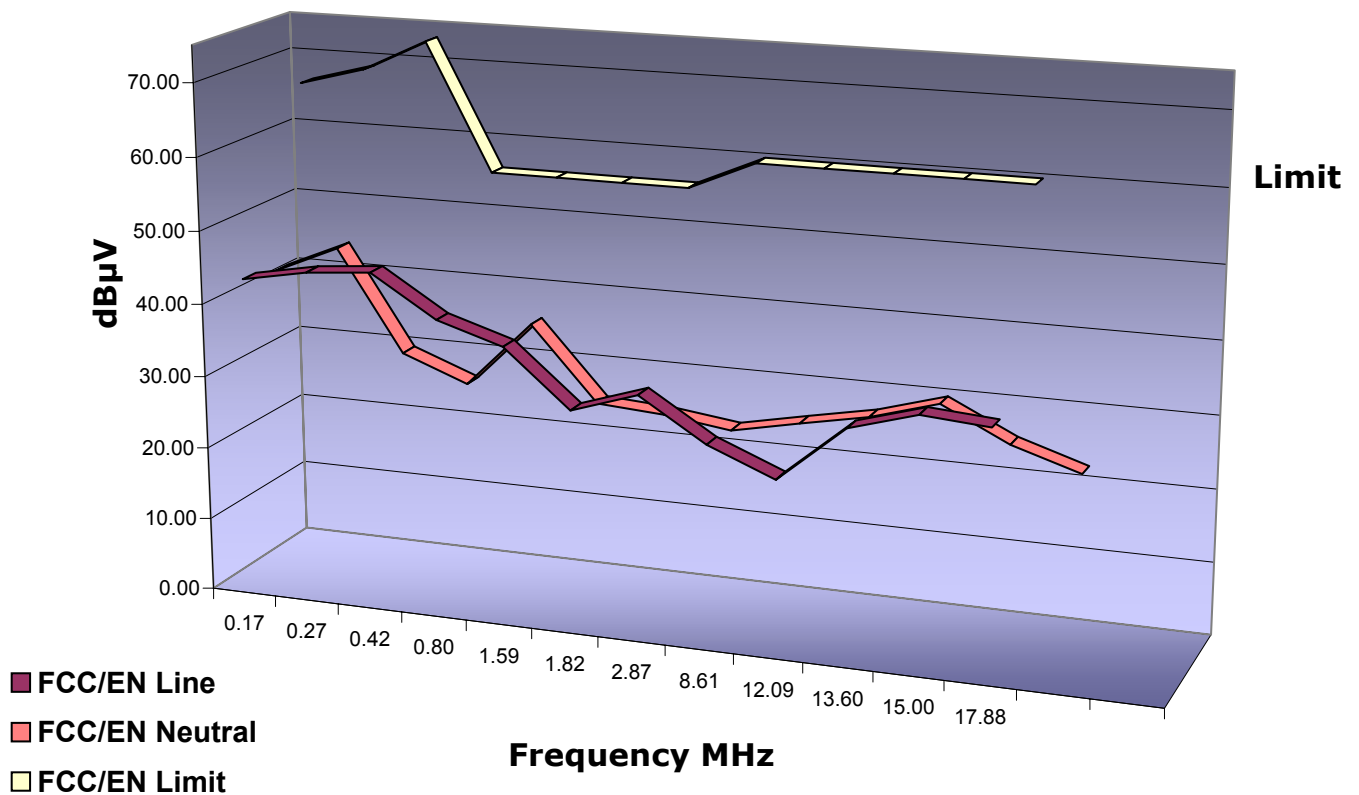
- 6.5 The recorded conducted data utilized a quasi-peak measurement procedure. Hence, any differences between the graphs and the data are merely the differences between peak and quasi-peak measurements.
- 6.6 There are 33 AM and 56 FM radio stations in the immediate San Jose, California, area which create large ambient signals. Typical radio stations are:
- 0.810 MHz KGO
 - 1.170 MHz KLOK
 - 1.370 MHz KEEN
 - 1.500 MHz KHTT
 - 1.590 MHz KLIV
- 6.7 The conducted Electromagnetic Interference graphs in this report show some of the large ambient signals for several of these radio stations.
- 6.8 The final Electromagnetic Interference conducted test and measurement equipment configuration was evaluated to assure that Data Compression or Intermodulation Distortion did not occur due to these large ambient signals.

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Conducted EMI Data Graphic Configuration #1 (EN/FCC)



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Signature Page - Last Page of Report

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