

APPLICATION FOR FCC CERTIFICATION

CLASS B TRANSMITTER DEVICE

Presto Technologies, Inc.
110 Pulpit Hill Road
Amherst, MA 01002
413-549-8780

MODEL: RFID Mousepad transmitter

FCC ID: OCMPRESTOPADUSB01

December 22, 1998

This report concerns (check one):		Original Grant: X	Class II Change:
Equipment Type: Transmitter			
Deferred grant requested per 47 CFR 0.457 (d) (1) (ii)?		Yes:	No: X
If yes, defer until:		_____	
		<i>Date</i>	
Company name agrees to notify the Commission by: _____ (date) of the intended date of announcement of the product so that the grant can be issued on that date.			
Transition Rules Request per 15.37? Yes:		No: X	
If no, assumed Part 15, subpart B for unintentional radiators - the new 47 CFR [10-1-90 Edition] provision..			

REPORT PREPARED BY:

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Rhein Tech Laboratories, Inc.

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Reference: QRTL98-174

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TABLE OF CONTENTS

1.0	GENERAL INFORMATION.....	4
1.1	RELATED SUBMITTAL(S)/GRANT(S)	4
1.3	TEST SYSTEM DETAILS.....	5
1.4	CONFIGURATION OF TESTED SYSTEM.....	6
1.5	TEST METHODOLOGY	7
1.6	TEST FACILITY.....	7
3.0	SYSTEM TEST CONFIGURATION	8
3.1	JUSTIFICATION	8
3.2	EUT EXERCISE SOFTWARE.....	8
3.3	SPECIAL ACCESSORIES	8
3.4	MODULATED BANDWIDTH.....	8
3.5	CONFORMANCE STATEMENT.....	9
5.0	CONDUCTED EMISSION DATA.....	10
6.0	RADIATED EMISSION DATA.....	11
6.1	FIELD STRENGTH CALCULATION.....	13

APPENDIX LISTING

APPENDIX B:	EMISSIONS EQUIPMENT LIST.....	14
APPENDIX C:	CONDUCTED AND RADIATED TEST METHODOLOGY	15

TABLE INDEX

TABLE 1: TEST SYSTEM DETAILS.....	5
TABLE 2: CONDUCTED EMISSIONS:	10
TABLE 3: RADIATED EMISSIONS: (SPURIOUS NOISE)	11
TABLE 4: RADIATED EMISSIONS (FUNDAMENTAL AND HARMONICS).....	12

1.0 GENERAL INFORMATION

The following Application for FCC Certification of a Class B transmitter is prepared on behalf of Presto Technologies, Inc. in accordance with Part 2, and Part 15, Subparts A and C of the Federal Communications Commissions rules and regulations. The Equipment Under Test (EUT) was the RFID Mousepad transmitter, FCC ID:OCMPRESTOPADUSB01. The test results reported in this document relate only to the item that was tested. The item consists of a RFID tag and a MOUSEPAD with two different types of antennas namely a PCB etched antenna and a wirewound antenna herein referred to as Mousepad and Mousepad Prototype. The manufacturer intends manufacturer intends to manufacture the EUT wit both types of antennas.

All measurements contained in this application were conducted in accordance with ANSI C63.4 Methods of Measurement of Radio Noise Emissions, 1992. The instrumentation utilized for the measurements conform with the ANSI C63.4 standard for EMI and Field Strength Instrumentation. Some accessories are used to increase sensitivity and prevent overloading of the measuring instruments. These are explained in the appendix of this report. Calibration checks are performed regularly on the instruments, and all accessories including the high pass filter, preamplifier and cables.

All radiated and conducted emission measurements were performed manually at Rhein Tech Laboratories, Inc. The radiated emission measurements required by the rules were performed on the 3/10 meter open field test ranges maintained by Rhein Tech Laboratories, Inc., 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. Complete description and site attenuation measurement data have been placed on file with the Federal Communications Commission. The power line conducted emission measurements were performed in a shielded enclosure also located at the Herndon, Virginia facility. Rhein Tech Laboratories is accepted by the FCC as a facility available to do measurement work for others on a contract basis.

1.1 RELATED SUBMITTAL(S)/GRANT(S)

N/A. This is an original submission for Certification.

1.3 TEST SYSTEM DETAILS

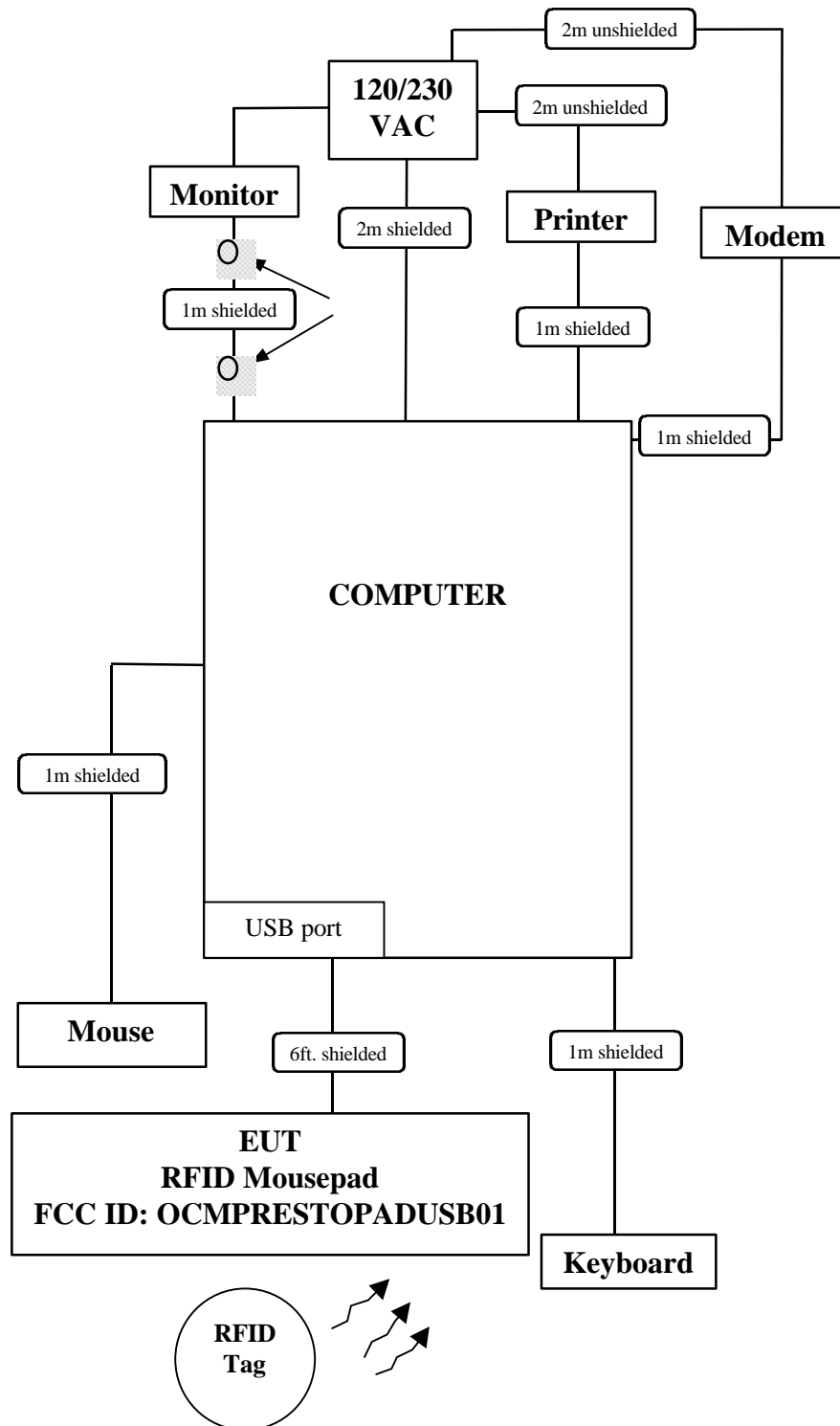
Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test.

TABLE 1: TEST SYSTEM DETAILS

External Components

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
SYSTEM	GATEWAY 2000, INC.	LP MINI-DESKTOP	N/A	N/A	SHIELDED POWER	8746
MONITOR	MAG TECHNOLOGIES INC.	E5005 (EV500)	SAM588000020	DoC	SHIELDED I/O, FERRITE BOTH ENDS SHIELDED POWER	9752
PRINTER	EPSON	P950A	3JU1120100	BKMFBP950A	SHIELDED I/O UNSHIELDED POWER	7701
KEYBOARD	MAXI SWITCH	2196003-00-003	51162768	D7J2196003-XX	SHIELDED I/O	9868
MOUSE	MICROSOFT	INTELLIMOUSE 1.1A	01569545	C3KKMP5	SHIELDED I/O	8875
MODEM	US ROBOTICS	0413	8390364644770	DoC	SHIELDED I/O UNSHIELDED POWER	900425
USB MOUSE PAD 1 (EUT)	PRESTO TECHNOLOGIES, INC.	RFID MOUSEPAD 1	N/A	OCMPRESTOPADUSB01	6' BRAID & FOIL SHIELDED I/O COPARTNER 28AWG, AWM 2725, EL188601	10034
USB MOUSE PAD 2 (EUT)	PRESTO TECHNOLOGIES, INC.	RFID MOUSEPAD 1	N/A	OCMPRESTOPADUSB01	6' BRAID & FOIL SHIELDED I/O COPARTNER 28AWG, AWM 2725, EL188601	10043
RFID TAG (EUT)	PRESTO TECHNOLOGIES, INC.	TAG	N/A	N/A	N/A	N/A

1.4 CONFIGURATION OF TESTED SYSTEM



1.5 TEST METHODOLOGY

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 1992. Radiated testing was performed at an antenna to EUT distance of one meter. FCC 15.31 F(2) was used to extrapolate the new limit at one meter using the square of an inverse linear distance extrapolation factor since FCC 15.209 general radiation emission limit specify the limit at 300 meters. For conducted emission was performed on the host computer power line since the EUT does not have a power supply. Its DC power is provided by the USB port.

1.6 TEST FACILITY

The open area test sites and conducted measurement facility used to collect the radiated data is located on the rear lot of Rhein Tech Laboratories, Inc., 360 Herndon Parkway, Suite 1400 in Herndon, Virginia. Our Open area test site 1 and 2 are approved by the FCC abeen fully desc dated approved by the Federal Communication Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 1992).

3.0 SYSTEM TEST CONFIGURATION

3.1 JUSTIFICATION

To make measurement below 30 MHz as required by the FCC the transmitter was tested at one meter EUT to antenna distance. Since the EUT does not have a power supply for an AC power, the conducted emissions measurement was performed on the computers AC power line. The unit was also tested in all two orthogonal planes namely vertical and horizontal.

3.2 EUT EXERCISE SOFTWARE

The EUT was install as a USB peripheral device using Microsoft windows USB device driver. Using the manufacturers exercise software the EUT constantly read an RFID transponder by placing the RFID transponder on the mat of the Mousepad. The digital identification of the transponder was constantly being displayed on the monitor scrolling from top to bottom. When the transponder was removed from the RFID Mousepad mat the identification stop scrolling on the computer screen. Worst case emissions are recorded in the data tables for MOUSEPAD and MOUSEPAD PROTOTYPE.

3.3 SPECIAL ACCESSORIES

The interface cable on the EUT is 6 feet long made out of braid and foil shielded cable with a USB connector. The drain wire terminates on the USB connector. The USB connector provides a 360 degree termination with the host computer. The following information is from the cable: E1188601, AWM 2725, type CM.

3.4 OCCUPIED BANDWIDTH AND SPURIOUS NOISE

The EUT was set up as per section 1.4 and the transmitter carrier at 125 KHz measured per ANSI 63.4 occupied bandwidth measurement. The resolution and video bandwidth was set at 3 KHz and 10 KHz respectively. The sweep time was set so that the receiver filters were properly charged. The carrier modulation was set by placing the transponder on the MOUSEPAD mat which started the transmission. The carrier frequency, harmonics up to 10 times the carrier frequency, and the restricted band per FCC 15.205 were investigated and measured. The carrier frequency and harmonics are reported in this report. All other spurious noise were at least 60 dB below the carrier frequency. See occupied bandwidth plots.

3.5 CERTIFICATION STATEMENT

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this attached test record. No modifications were made during testing to the equipment in order to achieve compliance with these standards.

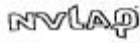
Furthermore, there was no deviation from, additions to or exclusions from the ANSI C63.4 test methodology.

Signature: _____

Date: December 29, 1998

Typed/Printed Name: Bruno Clavier

Position: Quality Manager
(NVLAP Signatory)



Accredited by the National Voluntary Accreditation Program for the specific scope of accreditation under Lab Code 20061-0.

Note: This report may not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

5.0 CONDUCTED EMISSION DATA

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. If the conducted emissions exceed the limit with the instrument set to the quasi-peak mode, then measurements are made in the average mode. If the quasi-peak measurement is at least 6dB higher than the amplitude in the average mode, the level measured in the quasi-peak mode may be reduced by 13dB before comparing it to the limit.

The conducted test was performed on RFID Mousepad and Mousepad Prototype with the exercise program loaded, and the emissions were scanned between 450 kHz to 30 MHz on AC power line NORMAL SIDE and HOT SIDE, herein referred to as L1 and L2, respectively of the host computer. The data below represents the worst case data for both Mousepads.

TABLE 2: CONDUCTED EMISSIONS:

NEUTRAL SIDE (Line 1)

EMISSION FREQUENCY (MHz)	TEST DETECTOR	ANALYZER READING (dBuV)	SITE CORRECTION FACTOR (dB)	EMISSION LEVEL (dBuV)	FCC LIMIT (dBuV)	FCC MARGIN (dBuV)
0.568	Pk	36.3	0.9	37.2	48.0	-10.8
12.595	Pk	35.3	2.6	37.9	48.0	-10.1
21.630	Pk	33.1	3.4	36.5	48.0	-11.5
23.143	Qp	37.0	3.4	40.4	48.0	-7.6
23.399	Pk	33.4	3.4	36.8	48.0	-11.2
23.903	Pk	33.1	3.5	36.6	48.0	-11.4
25.161	Pk	33.7	3.7	37.4	48.0	-10.6
26.415	Pk	34.0	3.5	37.5	48.0	-10.5
28.685	Pk	31.8	3.4	35.2	48.0	-12.8

HOT SIDE (Line 2)

EMISSION FREQUENCY (MHz)	TEST DETECTOR	ANALYZER READING (dBuV)	SITE CORRECTION FACTOR (dB)	EMISSION LEVEL (dBuV)	FCC LIMIT (dBuV)	FCC MARGIN (dBuV)
0.607	Pk	31.6	0.8	32.4	48.0	-15.6
0.710	Pk	32.3	0.9	33.2	48.0	-14.8
1.104	Pk	32.8	0.9	33.7	48.0	-14.3
5.055	Pk	28.8	1.8	30.6	48.0	-17.4
11.640	Pk	31.9	2.6	34.5	48.0	-13.5
23.220	Pk	42.0	3.4	45.4	48.0	-2.6
24.406	Pk	31.3	3.6	34.9	48.0	-13.1

⁽¹⁾Pk = Peak; QP = Quasi-Peak; Av = Average

WORST CASE EMISSION DATA

TEST PERSONNEL:

Signature: _____

Date: 12/22/98

Typed/Printed Name: K. Franck Schuppius

6.0 RADIATED EMISSION DATA

The following data lists the worst case emission frequencies, measured levels, correction factor (includes cable and antenna corrections), the corrected reading, plus the limit. Explanation of the Correction Factor is given in paragraph 6.1.

TABLE 3: RADIATED EMISSIONS: (SPURIOUS NOISE)

(Temperature: 43°F, Humidity: 27%)

EMISSION FREQUENCY (MHz)	ANTENNA POLARITY (H/V)	ANALYZER READING (dBuV)	SITE CORRECTION FACTOR (dB/m)	EMISSION LEVEL (dBuV/m)	FCC LIMIT (dBuV/m)	FCC MARGIN (dBuV/m)
33.720	V	50.2	-19.9	30.3	40.0	-9.7
52.332	V	65.0	-33.0	32.0	40.0	-8.0
59.130	V	58.0	-25.9	32.1	40.0	-7.9
65.938	V	63.7	-28.0	35.7	40.0	-4.3
72.715	V	64.7	-30.3	34.4	40.0	-5.6
86.794	H	59.9	-27.9	32.0	40.0	-8.0
113.845	V	56.8	-23.6	33.2	43.5	-10.3
120.758	V	55.2	-23.8	31.4	43.5	-12.1
167.095	H	47.4	-25.6	21.8	43.5	-21.7
401.077	V	42.0	-14.6	27.4	46.0	-18.6
534.770	V	44.0	-10.7	33.3	46.0	-12.7
668.438	V	42.8	-8.3	34.5	46.0	-11.5
735.289	V	43.2	-6.6	36.6	46.0	-9.4

**All readings are quasi-peak unless, stated otherwise. See Appendix B for Radiated Test Methodology.*

WORST CASE EMISSION DATA

TEST PERSONNEL:

Signature: _____

Date: 12/22/98

Typed/Printed Name: K. Franck Schuppius

TABLE 4: RADIATED EMISSIONS MOUSEPAD (FUNDAMENTAL AND HARMONICS)

(Temperature: 25°F, Humidity: 70%)

EMISSION FREQUENCY (KHz)	ANTENNA POLARITY (H/V)	ANALYZER READING (dBuV)	SITE CORRECTION FACTOR (dB/m)	EMISSION LEVEL (dBuV/m)	FCC 15.209 LIMIT (dBuV/m)	FCC 15.209 MARGIN (dBuV/m)
⁽¹⁾ 125.750	V	99.53	4.1	103.60	124.63	-21.03
⁽²⁾ 126.355	V	89.85	4.1	93.45	124.66	-31.21
⁽¹⁾ 251.700	V	68.90	4.0	72.20	118.67	-46.47
⁽²⁾ 252.060	V	65.60	4.0	69.60	118.66	-49.06
⁽¹⁾ 377.600	V	61.70	4.0	65.70	115.15	-49.45
⁽²⁾ 378.065	V	58.42	4.0	62.40	115.14	-52.74
⁽¹⁾ 503.200	V	55.90	4.0	59.90	132.65	-72.75
⁽²⁾ 504.340	V	52.70	4.0	56.70	132.63	-75.93
⁽¹⁾ 754.800	V	57.80	4.1	61.90	129.13	-67.23
⁽²⁾ 756.960	V	55.90	4.1	60.00	129.11	-69.11
⁽¹⁾ 880.550	V	58.40	4.3	62.70	127.79	-65.09
⁽²⁾ 883.270	V	56.90	4.3	61.20	127.77	-66.57

**All readings are quasi-peak unless, stated otherwise. See Appendix B for Radiated Test Methodology.*

Mesurements were made at 1 meter distance using a rod antenna. The results were then extrapolated using FCC 15.31 f(2). The square of the inverse linear distance extraploation factor.

⁽¹⁾ *Mousepad*

⁽²⁾ *Mousepad Prototype*

WORST CASE EMISSION DATA

TEST PERSONNEL:

Signature: _____

Date: 12/23/98

Typed/Printed Name: K. Franck Schuppius

6.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FI(\text{dBuV/m}) = SAR(\text{dBuV}) + SCF(\text{dB/m})$$

FI = Field Intensity

SAR = Spectrum Analyzer Reading

SCF = Site Correction Factor

The Site Correction Factor (SCF) used in the above equation is determined empirically, and is expressed in the following equation:

$$SCF(\text{dB/m}) = -PG(\text{dB}) + AF(\text{dB/m}) + CL(\text{dB})$$

SCF = Site Correction Factor

PG = Pre-amplifier Gain

AF = Antenna Factor

CL = Cable Loss

The field intensity in microvolts per meter can then be determined according to the following equation:

$$FI(\text{uV/m}) = 10^{FI(\text{dBuV/m})/20}$$

For example, assume a signal at a frequency of 125 MHz has a received level measured as 49.3 dBuV. The total Site Correction Factor (antenna factor plus cable loss minus preamplifier gain) for 125 MHz is -11.5 dB/m. The actual radiated field strength is calculated as follows:

$$49.3 \text{ dBuV} - 11.5 \text{ dB} = 37.8 \text{ dBuV/m}$$

$$10^{37.8/20} = 10^{1.89} = 77.6 \text{ uV/m}$$

APPENDIX B: Emissions Equipment List

DESCRIPTION	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. LAB
AMPLIFIER	HEWLETT PACKARD	11975A	2304A00348	TEST EQUITY
AMPLIFIER (S/A 1)	RHEIN TECH	PR-1040	00001	RTL
AMPLIFIER (S/A 2)	RHEIN TECH	RTL2	900723	RTL
AMPLIFIER (S/A 3)	RHEIN TECH	8447F	2944A03783	RTL
AMPLIFIER (S/A 4)	RHEIN TECH	8447D	2727A05397	RTL
BICONICAL/LOG ANTENNA 1	ANTENNA RESEARCH	LPB-2520	1037	LIBERTY LABS
BICONICAL/LOG ANTENNA 2	ANTENNA RESEARCH	LPB-2520	1036	LIBERTY LABS
FIELD SITE SOURCE	EMCO	4610	9604-1313	RTL
FILTER (ROOM 1)	SOLAR	8130	947305	RTL
FILTER (ROOM 2)	SOLAR	8130	947306	RTL
HARMONIC MIXER 1	HEWLETT PACKARD	11970K	2332A00563	TELOGY
HARMONIC MIXER 2	HEWLETT PACKARD	11970A	2332A01199	TELOGY
HORN ANTENNA 1	EMCO	3160-10	9606-1033	EMCO
HORN ANTENNA 2	EMCO	3160-9	9605-1051	EMCO
ROD ANTENNA	EMCO			
HORN ANTENNA 3	EMCO	3160-7	9605-1054	EMCO
HORN ANTENNA 4	EMCO	3160-8	9605-1044	EMCO
HORN ANTENNA 5	EMCO	3160-03	9508-1024	EMCO
LISN (ROOM 1/L1)	SOLAR	7225-1	900727	ACUCAL
LISN (ROOM 1/L2)	SOLAR	7225-1	900726	ACUCAL
LISN (ROOM 2/L1)	SOLAR	7225-1	900078	ACUCAL
LISN (ROOM 2/L2)	SOLAR	7225-1	900077	ACUCAL
PRE-AMPLIFIER	HEWLETT PACKARD	8449B OPT	3008A00505	TELOGY
QUASI-PEAK ADAPTER (S/A 1)	HEWLETT PACKARD	85650A	3145A01599	ACUCAL
QUASI-PEAK ADAPTER (S/A 2)	HEWLETT PACKARD	85650A	2811A01276	ACUCAL
QUASI-PEAK ADAPTER (S/A 3)	HEWLETT PACKARD	85650A	2521A00473	ACUCAL
QUASI-PEAK ADAPTER (S/A 4)	HEWLETT PACKARD	85650A	2521A01032	ACUCAL
RF PRESELECTOR (S/A 1)	HEWLETT PACKARD	85685A	3146A01309	ACUCAL
SIGNAL GENERATOR (HP)	HEWLETT PACKARD	8660C	1947A02956	ACUCAL
SIGNAL GENERATOR (WAVETEK)	WAVETEK	3510B	4952044	ACUCAL
SPECTRUM ANALYZER 1	HEWLETT PACKARD	8566B	3138A07771	ACUCAL
SPECTRUM ANALYZER 2	HEWLETT PACKARD	8567A	2841A00614	ACUCAL
SPECTRUM ANALYZER 4	HEWLETT PACKARD	8567A	2727A00535	ACUCAL
TUNABLE DIPOLE	EMCO	3121	274	LIBERTY LABS

APPENDIX C: Conducted and Radiated Test Methodology

CONDUCTED EMISSIONS MEASUREMENTS

The power line conducted emission measurements were performed in a Series 81 type shielded enclosure manufactured by Rayproof. The EUT was assembled on a wooden table 80 centimeters high. Power was fed to the EUT through a 50 ohm / 50 microhenry Line Impedance Stabilization Network (LISN). The EUT LISN was fed power through an A.C. filter box on the outside of the shielded enclosure. The filter box and EUT LISN housing are bonded to the ground plane of the shielded enclosure. A second LISN, the peripheral LISN, provides isolation for the EUT test peripherals. This peripheral LISN was also fed A.C. power. A metal power outlet box, which is bonded to the ground plane and electrically connected to the peripheral LISN, powers the EUT host peripherals.

The spectrum analyzer was connected to the A.C. line through an isolation transformer. The 50-ohm output of the EUT LISN was connected to the spectrum analyzer input through a Solar 400 kHz high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 400 kHz. Conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable). The analyzer's 6 dB bandwidth was set to 9 kHz. No video filter less than 10 times the resolution bandwidth was used. Average measurements are performed in linear mode using a 10 kHz resolution bandwidth, a 1 Hz video bandwidth, and by increasing the sweep time in order to obtain a calibrated measurement. The emission spectrum was scanned from (150/450) kHz to 30 MHz. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in this report.

RADIATED EMISSIONS MEASUREMENTS

Before final measurements of radiated emissions were made on the open-field three/ten meter range; the EUT was scanned indoors at one meter distance. This was done in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated at one meter distance during final radiated emissions measurements on the open-field range, at each frequency, in order to insure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the open-field test site at an antenna to EUT distance of 1 meter since the EUT transmit at 125 KHz. The EUT was placed on a nonconductive turntable 0.8 meters above the ground plane. The spectrum was examined from 9 KHz to 1000 MHz. All other spurious noise with in and outside the restricted band was investigated. The square of inverse linear distance was used to extrapolate the new limit since the limit per FCC 15.209 is given at 300 meters.

At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters in order to determine the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarizations. The spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. No video filter less than 10 times the resolution bandwidth was used. When any clock exceeds 108 MHz, the EUT was tested between 1 to 2 Gigahertz in peak mode with the resolution bandwidth set at 1 MHz as stated in ANSI C63.4. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Note: Rhein Tech Laboratories, Inc. has implemented procedures to minimize errors that occur from test instruments, calibration, procedures, and test setups. Test instrument and calibration errors are documented from the manufacturer or calibration lab. Other errors have been defined and calculated within the Rhein Tech quality manual, section 6.1. Rhein Tech implements the following procedures to minimize errors that may occur: yearly as well as daily calibration methods, technician training, and emphasis to employees on avoiding error.