# APPLICATION FOR FCC CERTIFICATION

# CLASS B TRANSMITTER DEVICE

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

## **MODEL:** PrestoPad USB RFID Mousepad Transmitter

## FCC ID: OCMPRESTOPADUSB02

***June 30, 1999***

| | | |
|---|---|---|
| **This report concerns (check one):** **Equipment Type**: **Transmitter** | **Original Grant:** X | **Class II Change:** |
| **Deferred grant requested per 47 CFR 0.457 (d) (1) (ii)?** | **Yes:** | **No**: X |
| **If yes, defer until:** | _____ ***Date*** | |
| **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:**

**EMI Technician: K. Franck Schuppius**
**Administrative Writer: Dixie L. Shetter**

**Rhein Tech Laboratories, Inc.**

*Document Number: 990322*

*No part of this report may be reproduced without the full written approval of Rhein Tech Laboratories, Inc.*

# TABLE OF CONTENTS

**1.0 GENERAL INFORMATION ..... 4**

1.1 RELATED SUBMITTAL(S)/GRANT(S) ..... 4
1.2 PRODUCT DESCRIPTION ..... 5
1.3 TEST SYSTEM DETAILS ..... 6
1.4 CONFIGURATION OF TESTED SYSTEM ..... 7
1.6 TEST METHODOLOGY ..... 8
1.7 TEST FACILITY ..... 8

**2.0 PRODUCT LABELING ..... 9**

**3.0 SYSTEM TEST CONFIGURATION ..... 10**

3.1 JUSTIFICATION ..... 10
3.2 EUT EXERCISE SOFTWARE ..... 10
3.3 SPECIAL ACCESSORIES ..... 10
3.4 SPURIOUS NOISE ..... 10
3.5 CONFORMANCE STATEMENT ..... 11

**4.0 MEASUREMENT PHOTOS ..... 13**

4.1 CONDUCTED MEASUREMENT PHOTOS ..... 13
4.2 RADIATED MEASUREMENT PHOTOS ..... 14

**5.0 CONDUCTED EMISSION DATA ..... 15**

**6.0 RADIATED EMISSION DATA ..... 16**

6.1 FIELD STRENGTH CALCULATION ..... 18

**7.0 PHOTOS OF EUT ..... 19**

## APPENDIX LISTING

**APPENDIX A:** SCHEMATICS OF PRESTOPAD USB RFID MOUSEPAD TRANSMITTER ..... 12
**APPENDIX B:** EMISSIONS EQUIPMENT LIST ..... 24
**APPENDIX C:** CONDUCTED AND RADIATED TEST METHODOLOGY ..... 25
**APPENDIX D:** USER'S MANUAL ..... 26

## FIGURE INDEX

**FIGURE 1:** FCC LABEL ..... 9
**FIGURE 2:** LOCATION OF LABEL ON EUT ..... 9
**FIGURE 3:** MOUSEPAD, TOP SIDE ..... 19
**FIGURE 4:** MOUSEPAD, PLASTIC HOUSING, INSIDE TOP HALF ..... 19
**FIGURE 5:** MOUSEPAD, BOTTOM SIDE ..... 20
**FIGURE 6:** MOUSEPAD, ANTENNA ..... 20
**FIGURE 7:** MOUSEPAD, PROCESSOR BOARD, COMPONENT SIDE ..... 21
**FIGURE 8:** MOUSEPAD, PROCESSOR BOARD, SOLDER SIDE ..... 21
**FIGURE 9:** TRANSPONDER, SIDE A ..... 22
**FIGURE 10:** TRANSPONDER, SIDE B ..... 22
**FIGURE 11:** MOUSEPAD, USB CONNECTOR ..... 23

## TABLE INDEX

**TABLE 1:** TEST SYSTEM DETAILS ..... 6
**TABLE 2:** CONDUCTED EMISSIONS ..... 15
**TABLE 3:** RADIATED EMISSIONS SPURIOUS NOISE-SPURIOUS NOISE ..... 16
**TABLE 4:** SPURIOUS NOISE (PART 15.209); FUNDAMENTAL AND HARMONICS; LOW FREQUENCY ..... 17

.

# 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 PrestoPad USB RFID Mousepad Transmitter , FCC ID:OCMPRESTOPADUSB02. The test results reported in this document relate only to the item that was tested.

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.

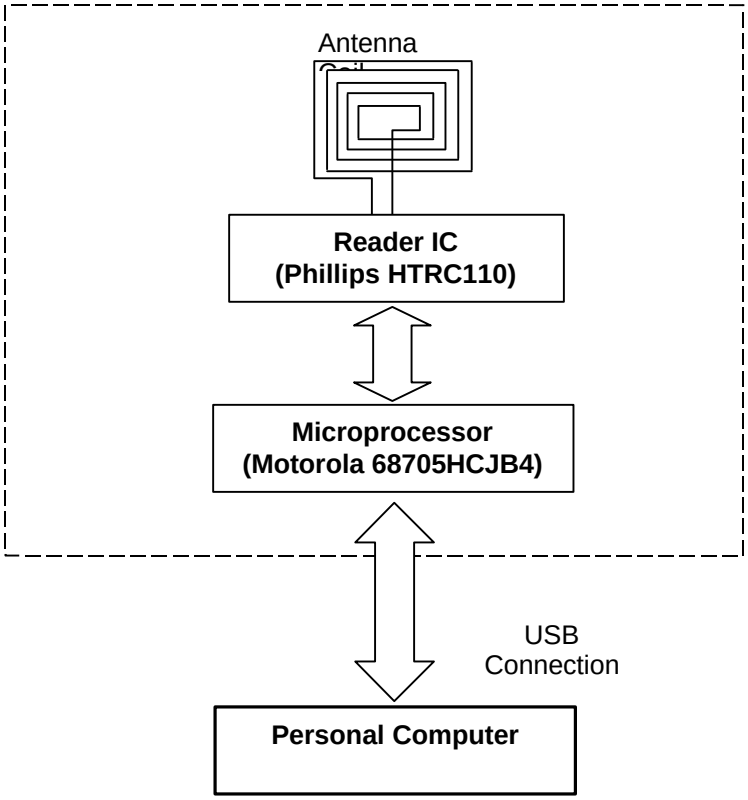
## 1.1 RELATED SUBMITTAL(S)/GRANT(S)

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

## 1.2 PRODUCT DESCRIPTION

The device, called PrestoPad USB™ is an RFID detection system. It is intended for use while connected to a Personal Computer. There are three major components to the system: a microphone, an antenna control chip and an antenna coil (see block diagram below).

In operation, the device emits a 125kHz RF field. When an appropriate transponder "tag" enters the field, the coil on the transponder couples with the RF field and sufficient potential is generated in the tag to allow communication of the tag's serial number and/or other information from the tag to the device. The device microprocessor then encapulates this information for transmission via the USB connection to the Personal Computer.



## 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

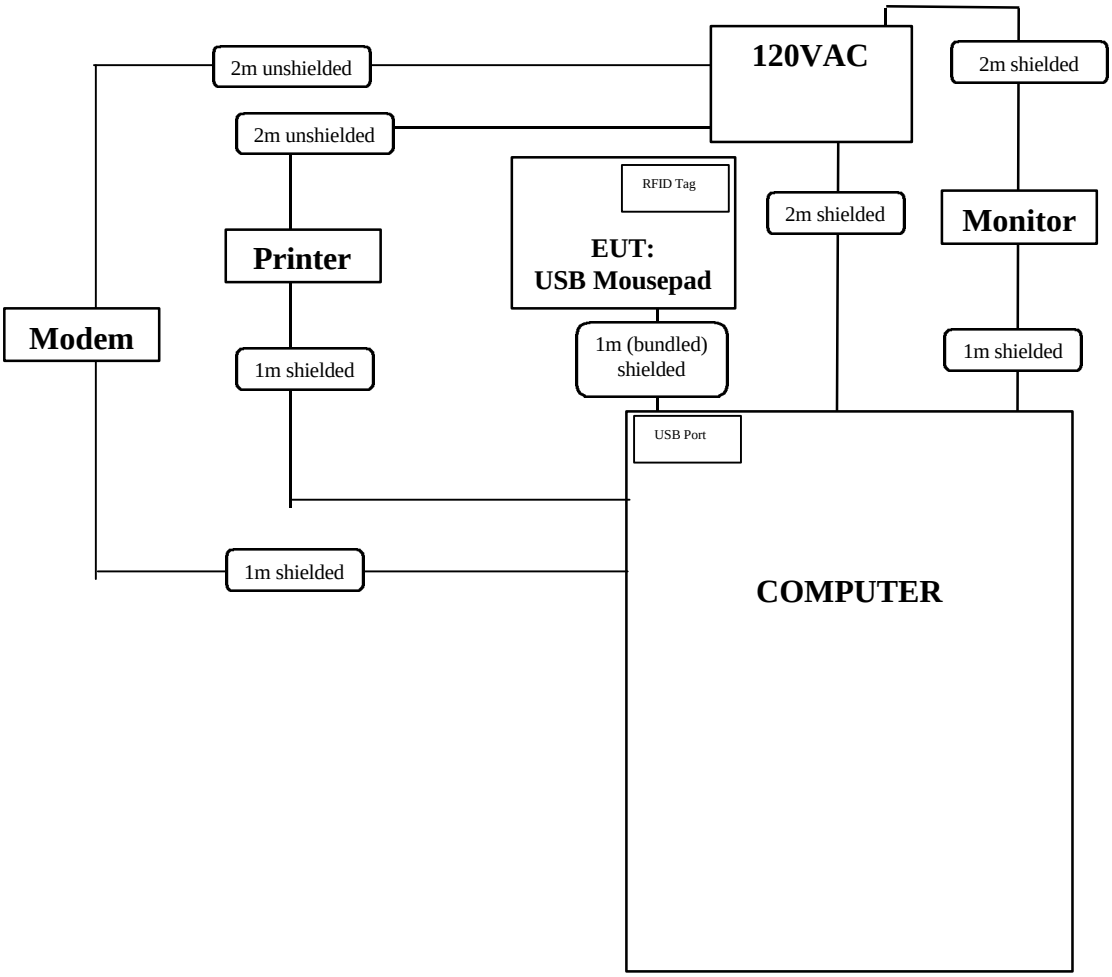
### External Components

| PART | MANUFACTURER | MODEL | SERIAL NUMBER | FCC ID | CABLE DESCRIPTION | RTL BAR CODE |
|---|---|---|---|---|---|---|
| **TRANSPONDER (EUT)** | **PRESTO TECHNOLOGIES, INC.** | **N/A** | **N/A** | **N/A** | **N/A** | **010532** |
| **MOUSE PAD (EUT)** | **PRESTO TECHNOLOGIES, INC.** | **00.10** | **0002-00.00108** | **N/A** | **SHIELDED I/O** | **010776** |
| MODEM | US ROBOTICS | 0413 | 8390364645141 | DOC | SHIELDED I/O UNSHIELDED POWER | 900421 |
| MOUSE | MICROSOFT | 97599 | 0821037-300000 | C3KKMP5 | SHIELDED I/O | 009870 |
| KEYBOARD | KEY TRONIC CORP. | E06150US016-C (MULTIFUNCTION) | J8288F0345 | DOC | SHIELDED I/O | 009897 |
| PRINTER | HEWLETT PACKARD | 2225C | 2804S03388 | DSI6XU2225 | SHIELDED I/O UNSHIELDED POWER | 900135 |
| MONITOR | MAG TECHNOLOGY INC. | E5005 (EV500) | SAM588000016 | DOC | SHIELDED, FERRITE BOTH ENDS I/O SHIELDED POWER | 009718 |
| SYSTEM | GATEWAY 2000, INC. | LP MINI-DESKTOP | N/A | N/A | | 008746 |

### Internal Components

| PART | MANUFACTURER | MODEL | SERIAL NUMBER | FCC ID | CABLE DESCRIPTION | RTL BAR CODE |
|---|---|---|---|---|---|---|
| CPU | INTEL | PENTIUM 233MHZ | C803053W-0709 | N/A | N/A | 008753 |
| MOTHERBOARD | ANIGMA | LAWMAN | LMXA14475Q6 | N/A | INTERNAL I/O INTERNAL POWER | 008751 |
| CD-ROM DRIVE | TOSHIBA | XM-6102B | 7C2157839 | CJ6AT97-027 | INTERNAL I/O INTERNAL POWER | 009049 |
| POWER SUPPLY | ASTEC | ATX202-3515 | 2580003335 | N/A | UNSHIELDED POWER | 008106 |
| HARD DRIVE | WESTERN DIGITAL | WDAC22000-00LA | WT3690-42-2148 | N/A | INTERNAL I/O INTERNAL POWER | 007834 |
| FLOPPY DRIVE | PANASONIC | JU-256A216P | 00307260 | N/A | INTERNAL I/O INTERNAL POWER | 008749 |

## 1.4 CONFIGURATION OF TESTED SYSTEM



## 1.6 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 three meters per FCC 15.209. Conducted emissions were performed on the host computer power lines since the EUT does not have a power supply. It's DC power is provided by the USB port. (FCC 15.207 used for conducted emissions.)

## 1.7 TEST FACILITY

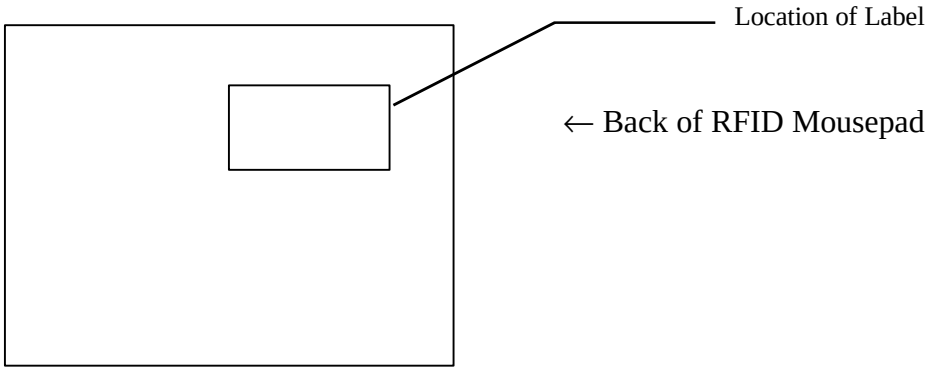
The open area test sites and conducted measurement facility used to collect the radiated data is located on the rear lot of Rhein Tech Laboratories, Inc., 360 Herndon Parkway, Suite 1400 in Herndon, Virginia. Our Open area test site 1 and 2 are approved by the FCC abeen fully desc dated approved by the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

## 2.0 PRODUCT LABELING

### FIGURE 1: FCC LABEL

This device complies with the FCC, part 15 rules.
Operation is subject to the following two conditions:
1) This device may not cause harmful interference.
2) This device must accept any interference received, including interference that may cause undesired operation.
FCC ID: OCMPRESTOPADUSB02

### FIGURE 2: LOCATION OF LABEL ON EUT



# 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 the Mousepad.

## 3.3 SPECIAL ACCESSORIES

The interface cable on the EUT is 1 meter 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.

## 3.4 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 mesurement. The resolution and video bandwidth was set at 3 KHz and 10 KHz respectively. The sweeptime 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.

## 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: July 14, 1999

Typed/Printed Name: Desmond A. Fraser Position: President (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.**

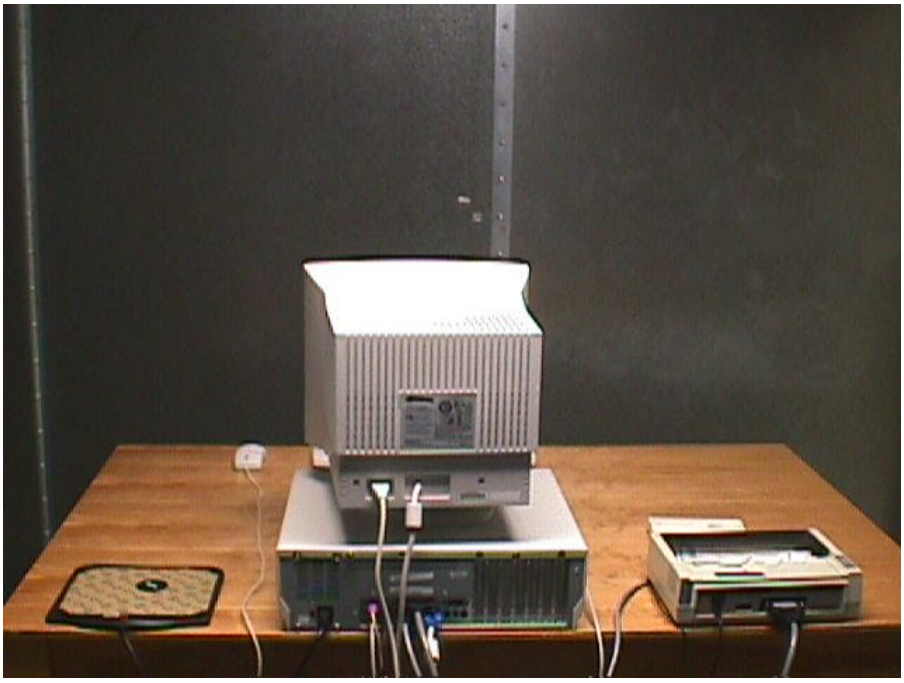
# APPENDIX A:

# SCHEMATICS OF PRESTOPADUSB RFID

# MOUSEPAD TRANSMITTER

# 4.0 MEASUREMENT PHOTOS

## 4.1 CONDUCTED MEASUREMENT PHOTOS



## 4.2 RADIATED MEASUREMENT PHOTOS

## 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 representes the worst case data for both Mousepads.

### TABLE 2: CONDUCTED EMISSIONS

L1

| EMISSION FREQUENCY (MHz) | TEST DETECTOR | ANALYZER READING (dBuV) | SITE CORRECTION FACTOR (dB) | EMISSION LEVEL (dBuV) | FCC 15.207 QP LIMIT (dBuV) | FCC 15.207 QP MARGIN (dBuV) | FCC 15.207 AVERAGE LIMIT (dBuV) | FCC 15.207 AVERAGE MARGIN (dBuV) |
|---|---|---|---|---|---|---|---|---|
| 0.712 | Pk | 29.5 | 0.7 | 30.2 | 56.0 | -25.8 | 46.0 | -15.8 |
| 1.017 | Pk | 30.2 | 0.9 | 31.1 | 56.0 | -24.9 | 46.0 | -14.9 |
| 21.739 | Pk | 33.9 | 3.9 | 37.8 | 60.0 | -22.2 | 50.0 | -12.2 |
| 22.137 | Pk | 32.4 | 3.9 | 36.3 | 60.0 | -23.7 | 50.0 | -13.7 |
| 22.387 | Pk | 28.9 | 3.9 | 32.8 | 60.0 | -27.2 | 50.0 | -17.2 |
| 29.933 | Pk | 36.7 | 4.1 | 40.8 | 60.0 | -19.2 | 50.0 | -9.2 |

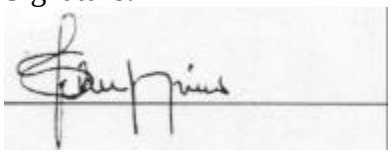
L2

| EMISSION FREQUENCY (MHz) | TEST DETECTOR | ANALYZER READING (dBuV) | SITE CORRECTION FACTOR (dB) | EMISSION LEVEL (dBuV) | FCC 15.207 QP LIMIT (dBuV) | FCC 15.207 QP MARGIN (dBuV) | FCC 15.207 AVERAGE LIMIT (dBuV) | FCC 15.207 AVERAGE MARGIN (dBuV) |
|---|---|---|---|---|---|---|---|---|
| 0.586 | Pk | 35.2 | 0.6 | 35.8 | 56.0 | -20.2 | 46.0 | -10.2 |
| 0.710 | Pk | 33.3 | 0.6 | 33.9 | 56.0 | -22.1 | 46.0 | -12.1 |
| 2.028 | Pk | 27.8 | 1.2 | 29.0 | 56.0 | -27.0 | 46.0 | -17.0 |
| 9.566 | Pk | 28.4 | 2.5 | 30.9 | 60.0 | -29.1 | 50.0 | -19.1 |
| 21.749 | Pk | 34.3 | 3.7 | 38.0 | 60.0 | -22.0 | 50.0 | -12.0 |
| 29.682 | Pk | 36.6 | 3.8 | 40.4 | 60.0 | -19.6 | 50.0 | -9.6 |
| 29.932 | Pk | 37.1 | 3.8 | 40.9 | 60.0 | -19.1 | 50.0 | -9.1 |

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

**TEST PERSONNEL:**

Signature: **Date:** 6/22/99



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**

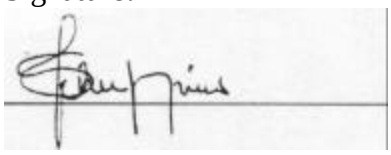
(Temperature: 75°F, Humidity: 35%)

| EMISSION FREQUENCY (MHz) | 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) |
|---|---|---|---|---|---|---|
| 32.697 | V | 57.8 | -25.4 | 32.4 | 40.0 | -7.6 |
| 33.957 | V | 60.9 | -24.9 | 36.0 | 40.0 | -4.0 |
| 34.209 | V | 62.0 | -24.8 | 37.2 | 40.0 | -2.8 |
| 34.711 | V | 60.2 | -24.6 | 35.6 | 40.0 | -4.4 |
| 48.537 | V | 50.2 | -21.6 | 28.6 | 40.0 | -11.4 |
| 167.117 | V | 45.2 | -14.1 | 31.1 | 43.5 | -12.4 |
| 233.954 | V | 47.5 | -9.1 | 38.4 | 46.0 | -7.6 |
| 334.219 | V | 37.1 | -5.9 | 31.2 | 46.0 | -14.8 |

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

**TEST PERSONNEL:**

Signature: **Date:** 6/23/99



Typed/Printed Name: K. Franck Schuppius

## TABLE 4: SPURIOUS NOISE (PART 15.209); FUNDAMENTAL AND HARMONICS; LOW FREQUENCY

Test Distance: 1 Meter

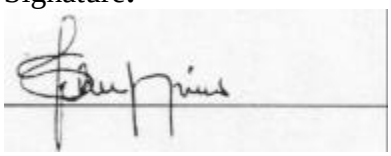
| EMISSION FREQUENCY (KHz) | ANTENNA POLARITY (H/V) | ANALYZER READING (dBuV) | SITE CORRECTION FACTOR (dB/m) | EMISSION LEVEL (dBuV/m) | FCC 15.209 LIMIT (dBuV/m) | FCC 15.209 MARGIN (dBuV/m) |
|---|---|---|---|---|---|---|
| 0.125 | V | 94.4 | -6.0 | 88.4 | 105.7 | -17.3 |
| 0.250 | V | 53.6 | -6.1 | 47.5 | 99.6 | -52.1 |
| 0.375 | V | 33.9 | -6.1 | 27.8 | 96.1 | -68.3 |
| 0.500 | V | 19.6 | -6.1 | 13.5 | 73.6 | -60.1 |
| 0.625 | V | 42.5 | -6.0 | 36.5 | 71.7 | -35.2 |
| 0.750 | V | 47.5 | -6.0 | 41.5 | 70.1 | -28.6 |
| 0.875 | V | 25.6 | -5.9 | 19.7 | 68.8 | -49.1 |
| 1.000 | V | 37.8 | -5.8 | 32.0 | 67.6 | -35.6 |
| 1.252 | H | 49.2 | -9.6 | 39.6 | 65.7 | -26.1 |
| 2.006 | H | 47.1 | -9.6 | 37.5 | 69.5 | -32.0 |
| 5.000 | H | 51.8 | -9.5 | 42.3 | 69.5 | -27.2 |
| 6.420 | V | 48.1 | -3.6 | 44.5 | 69.5 | -25.0 |
| 12.170 | V | 51.3 | -2.3 | 49.0 | 69.5 | -20.5 |

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

**Note: 0.09MHz to 30MHz with use of rod antennas.**

**TEST PERSONNEL:**

Signature: **Date:** 6/30/99



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:

$$FI(dBuV/m) = SAR(dBuV) + SCF(dB/m)$$

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:

$$SCF(dB/m) = -PG(dB) + AF(dB/m) + CL(dB)$$

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:

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

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:

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

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

# 7.0 PHOTOS OF EUT

**FIGURE 3:** Mousepad, Top Side

**FIGURE 4:** Mousepad, Plastic Housing, Inside Top Half

**FIGURE 5:** Mousepad, Bottom Side

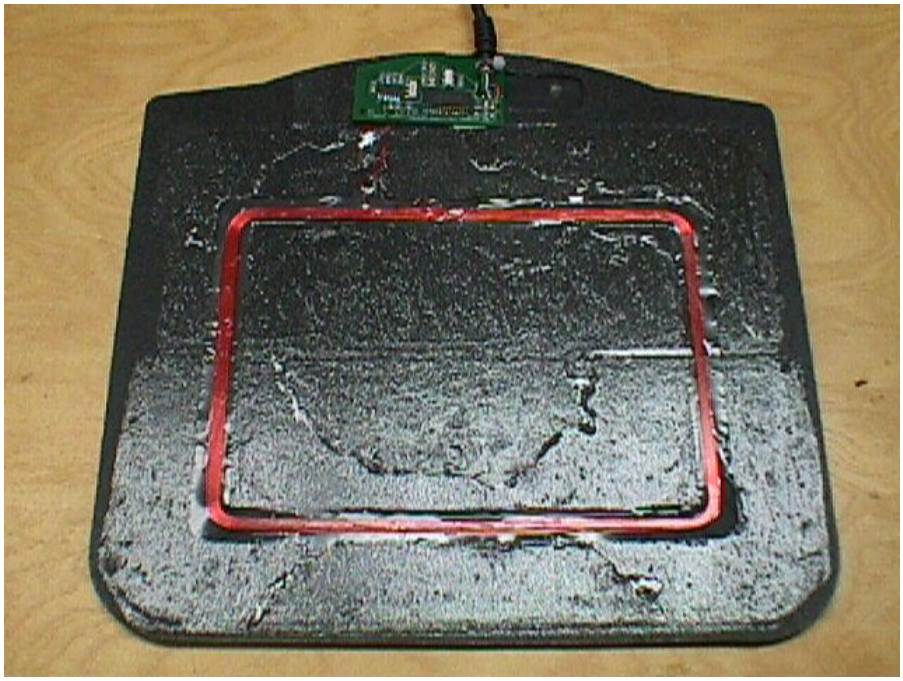


**FIGURE 6:** Mousepad, Antenna

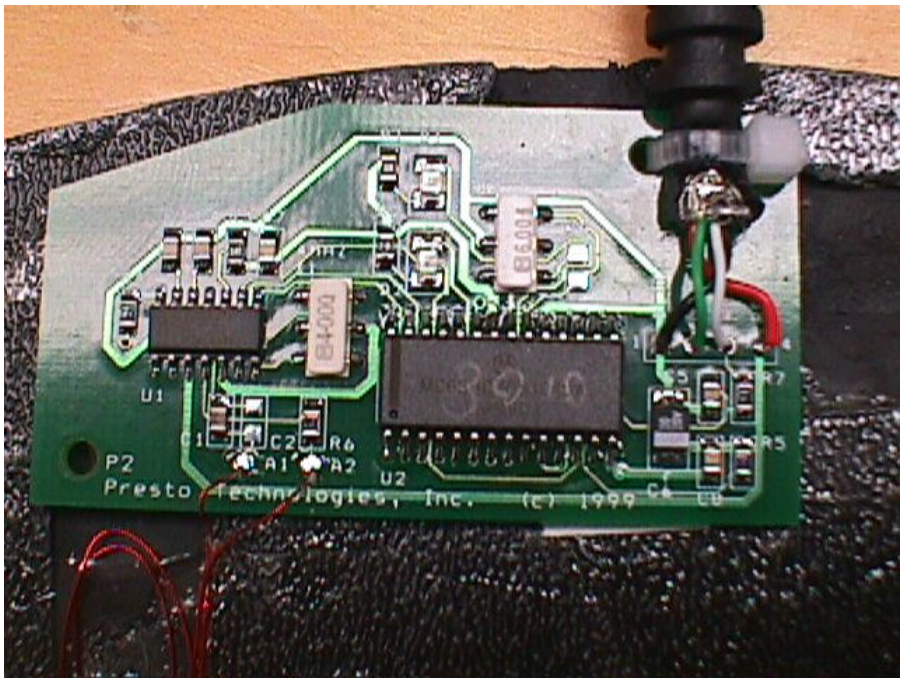



**FIGURE 7:** Mousepad, Processor Board, Component Side

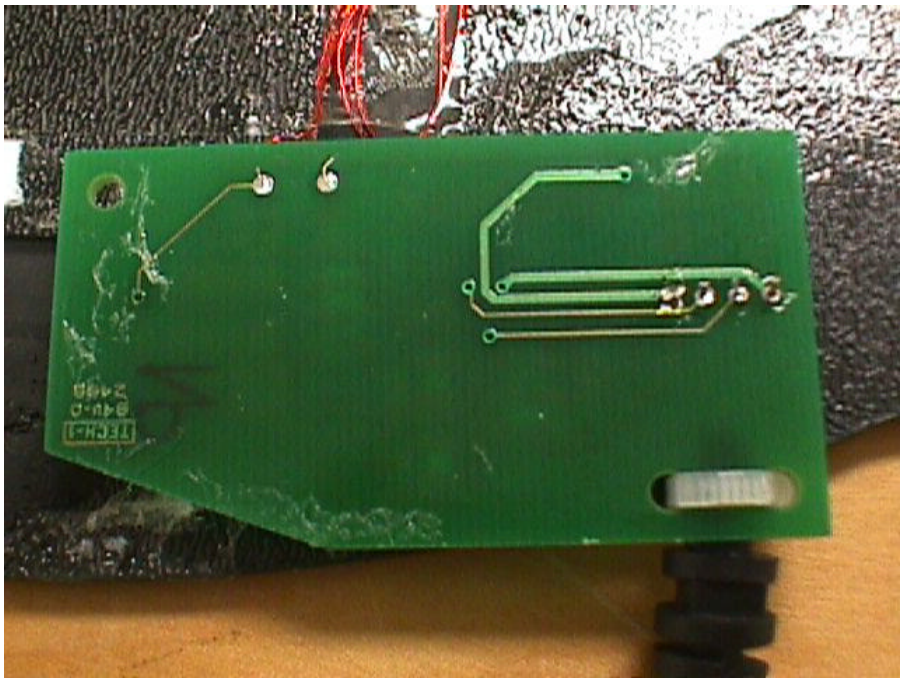


**FIGURE 8:** Mousepad, Processor Board, Solder Side

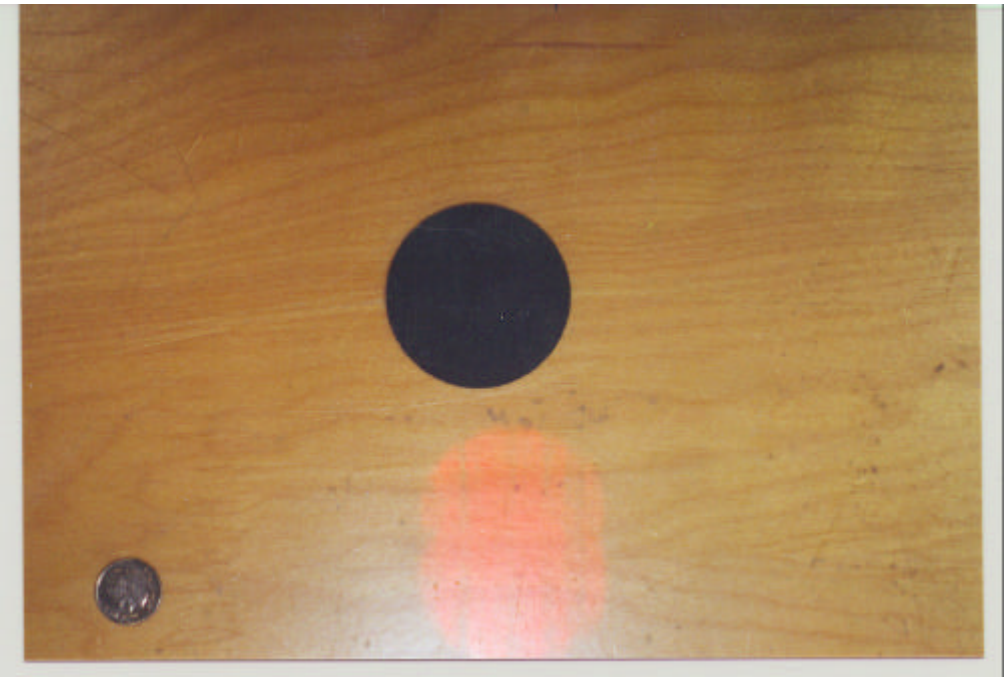


**FIGURE 9:** Transponder, Side A

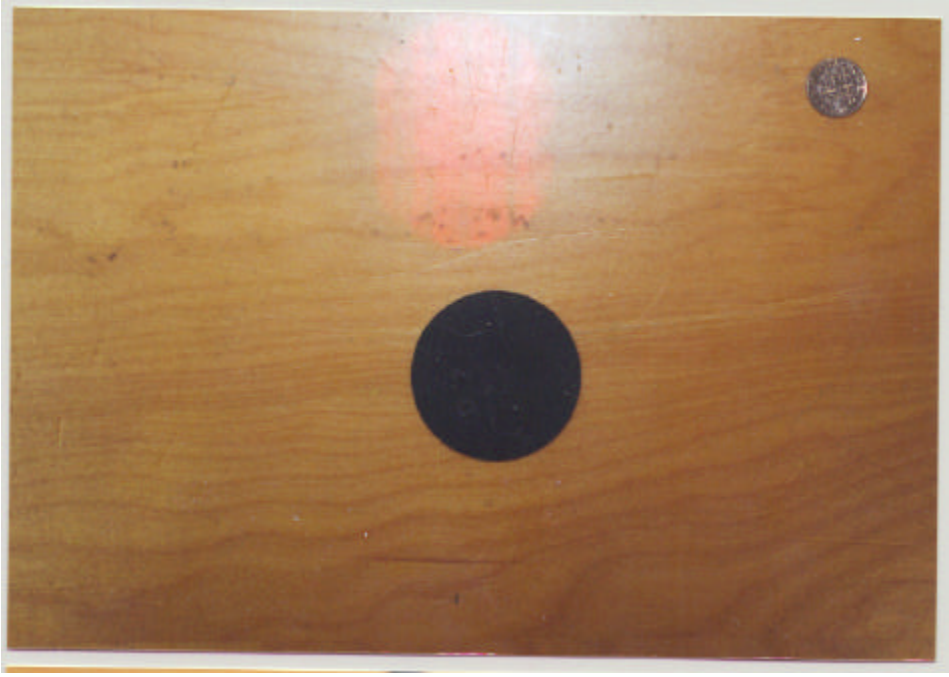


**FIGURE 10:** Transponder, Side B

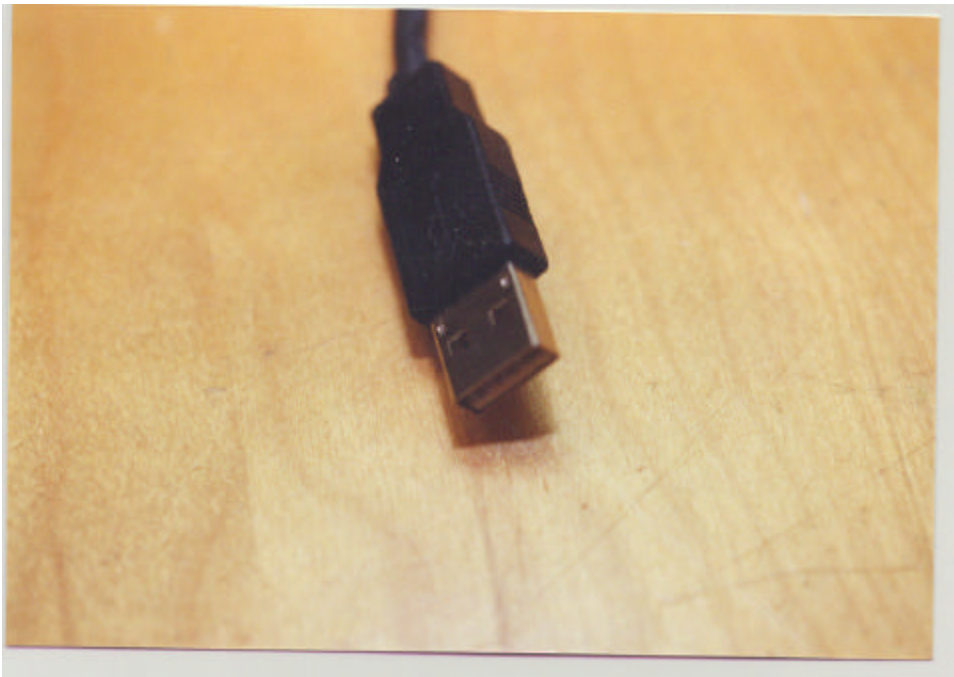


**FIGURE 11:** Mousepad, USB Connector

# 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.*

# APPENDIX D:

# USER'S MANUAL

# Preliminary User's Manual

1. You should have Windows 98 installed on your computer
2. Run HIDVIEW v 3.0
3. Removed and reinsert the USB Device
4. The Program should recognize available USB device
5. Run **"get data from device"**
6. Run **"continuous"**
7. Place transponder on mousepad