APPLICATION FOR FCC CERTIFICATION

CLASS B TRANSMITTER DEVICE

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

MODEL: PrestoPad RFID Mousepad Transmitter (Serial & Game Ports)

FCC ID: OCMPRESTOPADSER01

April 29, 1999

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:** _____ ***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: Daniel W. Baltzell
Administrative Writer: Dixie L. Shetter

Rhein Tech Laboratories, Inc.

Document Number: 990215
*Reference: QRTL*99-092

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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 RFID Mousepad Transmitter (Serial & Game Ports), FCC ID:OCMPRESTOPADSER01. 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.

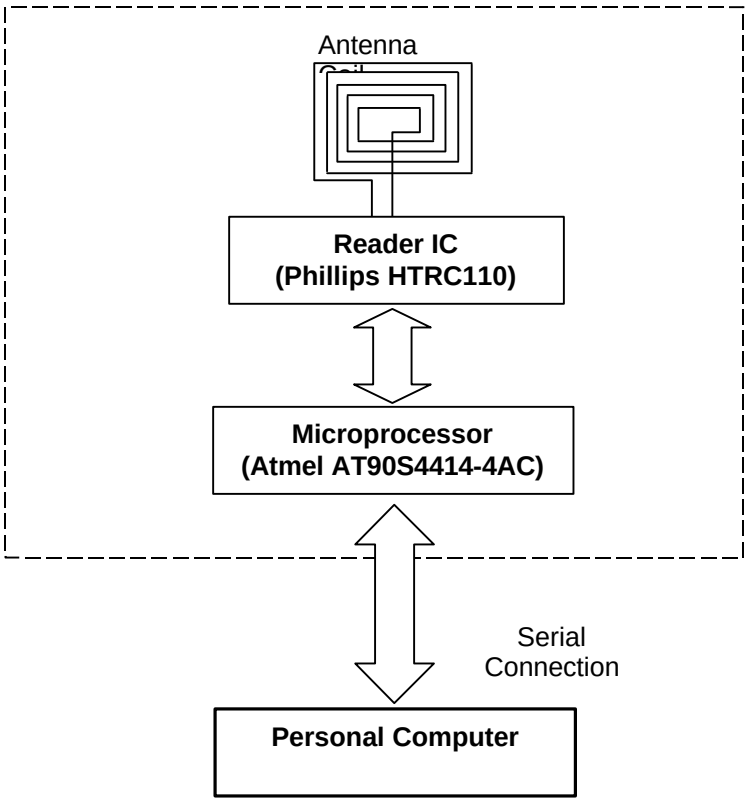
1.1 RELATED SUBMITTAL(S)/GRANT(S)

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

1.2 PRODUCT DESCRIPTION

The device, called PrestoPad™ 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 contl 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 transponde couples with the RF field and sufficient potential is generated in the tag to allow communication of the tag's serial number and/or oher information from the tag to the device. The device microprocessor then encapulates this information for transmission via the serial connection (either RS-232 or Midi) 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

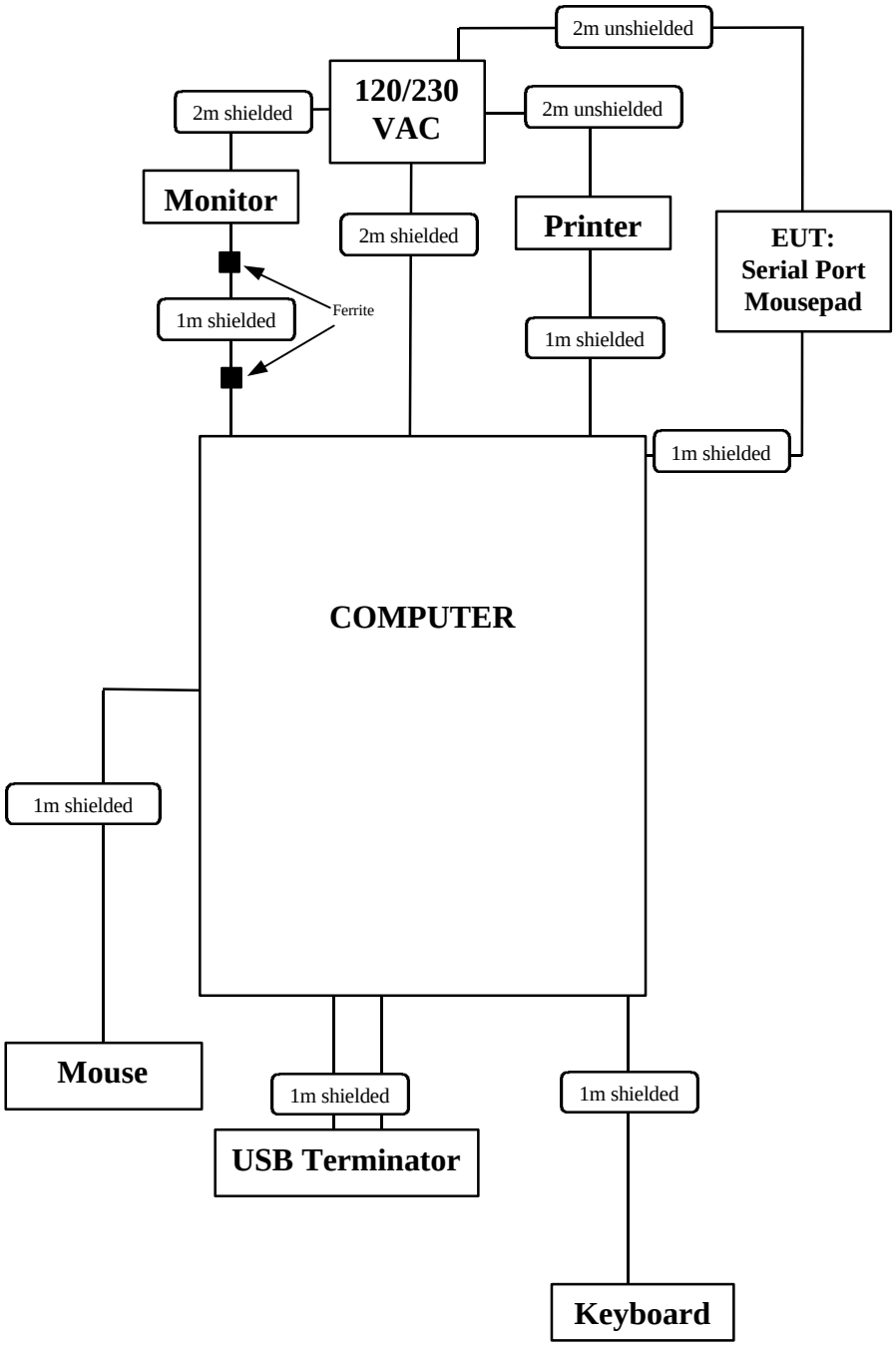
PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
SERIAL PORT MOUSE PAD 1 (EUT)	**PRESTO TECHNOLOGIES, INC.**	**DB-9 MOUSEPAD**	**0001-00100018**	**OCMPRESTOPADSER1**	**SHIELDED I/O, UNSHIELDED POWER**	**010556**
GAME PORT MOUSEPAD 2 (EUT)	**PRESTO TECHNOLOGIES, INC.**	**MIDI PORT MOUSEPAD**	**N/A**	**OCMPRESTOPADSER1**	**SHIELDED I/O**	**010555**
TRANSPONDER	PRESTO TECHNOLOGIES, INC.	N/A	N/A	N/A	N/A	010531
TERMINATION	GATEWAY 2000, INC.	USB HIGH/LOW SPEED	N/A	N/A	SHIELDED I/O	006834
MOUSE	MICROSOFT	INTELLIMOUSE 1.1A	00332324	C3KKMP5	SHIELDED I/O	900589
KEYBOARD	MAXI SWITCH	2196003-XX-XXX	50432753	D7J2196003-XX	SHIELDED I/O	008443
PRINTER	HEWLETT PACKARD	C3941A	JPPJ-072076	B94C3941A	SHIELDED I/O, UNSHIELDED POWER	010272
MONITOR	MAG TECHNOLOGIES, INC.	E5005 (EV500)	SAM588000020	DOC	SHIELDED I/O, FERRITE ON BOTH ENDS, SHIELDED POWER	009752
SYSTEM	GATEWAY 2000, INC.	BATC	N/A	DOC	SHIELDED I/O, SHIELDED POWER	010008
AUDIO DEVICE	*RADIO SHACK*	*SCP-59*	*N/A*	*N/A*	*SHIELDED I/O*	*900691*
MICROPHONE	*TELEX*	*700358*	*N/A*	*N/A*	*SHIELDED I/O*	*009579*
SPEAKER	*ALTEC LANSING*	*GCS100*	*FMW0030780*	*N/A*	*SHIELDED I/O*	*009163*
SPEAKER	*ALTEC LANSING*	*GCS100*	*FMW0030780*	*N/A*	*SHIELDED I/O, UNSHIELDED POWER*	*009162*
MODEM	*US ROBOTICS*	*0413*	*839032B86P9WB*	*DOC*	*SHIELDED I/O, UNSHIELDED POWER*	*900409*

(Note: The components italicized were used during testing of the game port configuration only.)

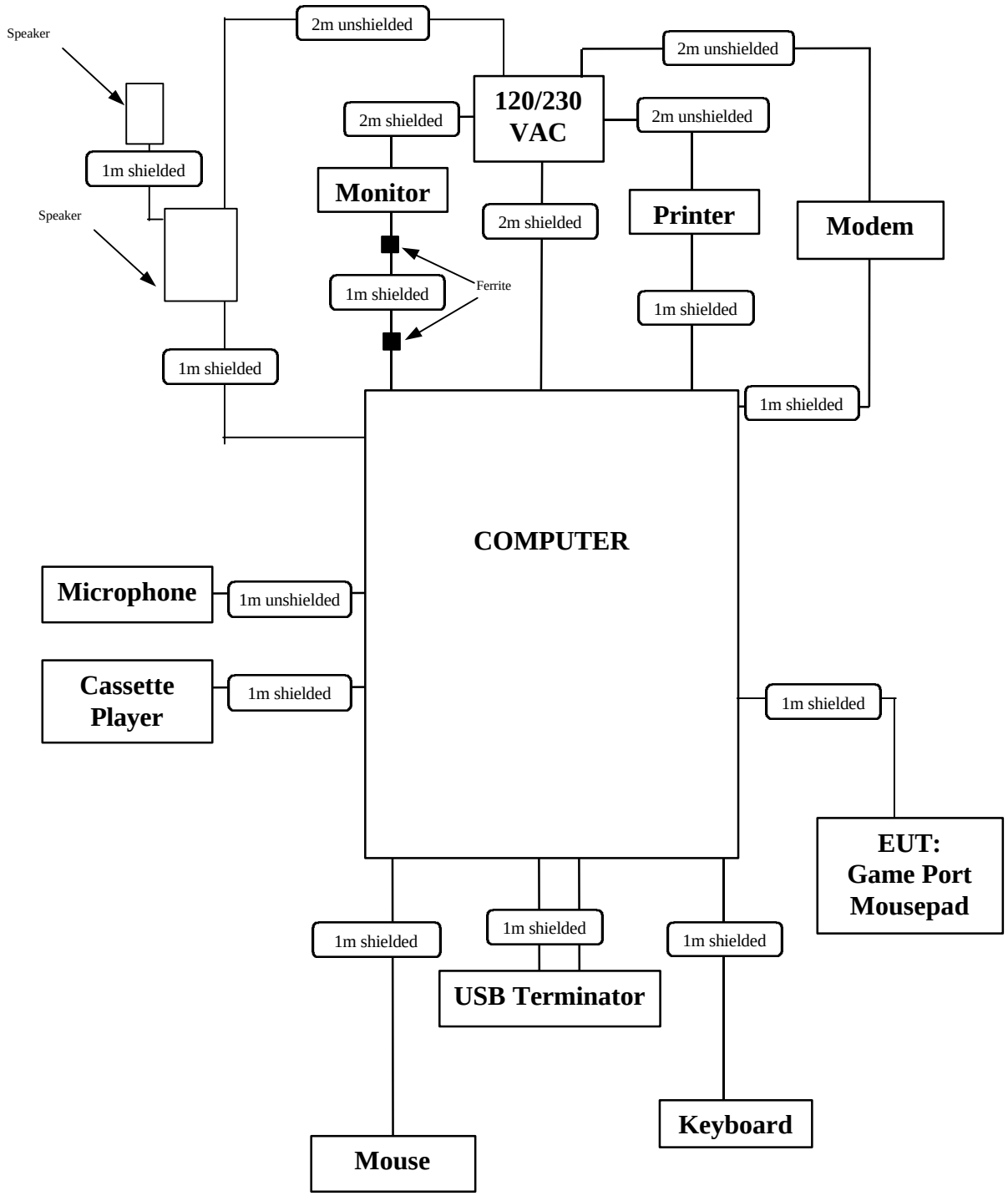
Internal Components

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
CPU	INTEL	PENTIUM 166 MHZ	FV80502166	N/A	N/A	900511
MOTHERBOARD	INTEL	HITMAN	AA-666761-204	N/A	INTERNAL I/O, INTERNAL POWER	900533
SOUND CARD	CREATIVE LABS	CT4170	T4170830011041	DOC	SHIELDED I/O	009667
VIDEO CARD	STB SYSTEMS, INC.	VIRGE GX	210-0262-001-A0	N/A	SHIELDED I/O	007043
POWER SUPPLY	ASTEC	ATX147-3515	2418040920	N/A	SHIELDED POWER	007517
HARD DRIVE	QUANTUM	FIREBALL ST	162OATST16A2F1	N/A	INTERNAL I/O, INTERNAL POWER	900582
FLOPPY DRIVE	PANASONIC	JU256A216P	00571657	N/A	INTERNAL I/O, INTERNAL POWER	900530

1.4 CONFIGURATION OF TESTED SYSTEM (SERIAL PORT)



1.5 CONFIGURATION OF TESTED SYSTEM (GAME PORT)



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 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.

1.7 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).

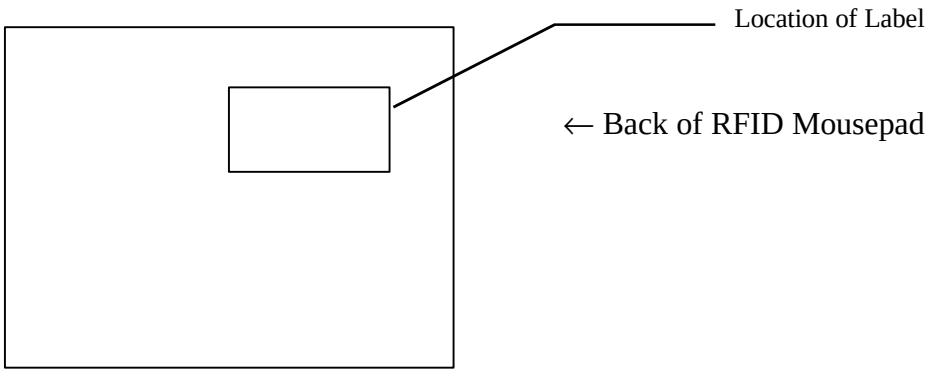
2.0 PRODUCT LABELING

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: OCMPRESTOPADSER01

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 poewer 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: El188601, 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 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. 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: May 26, 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.

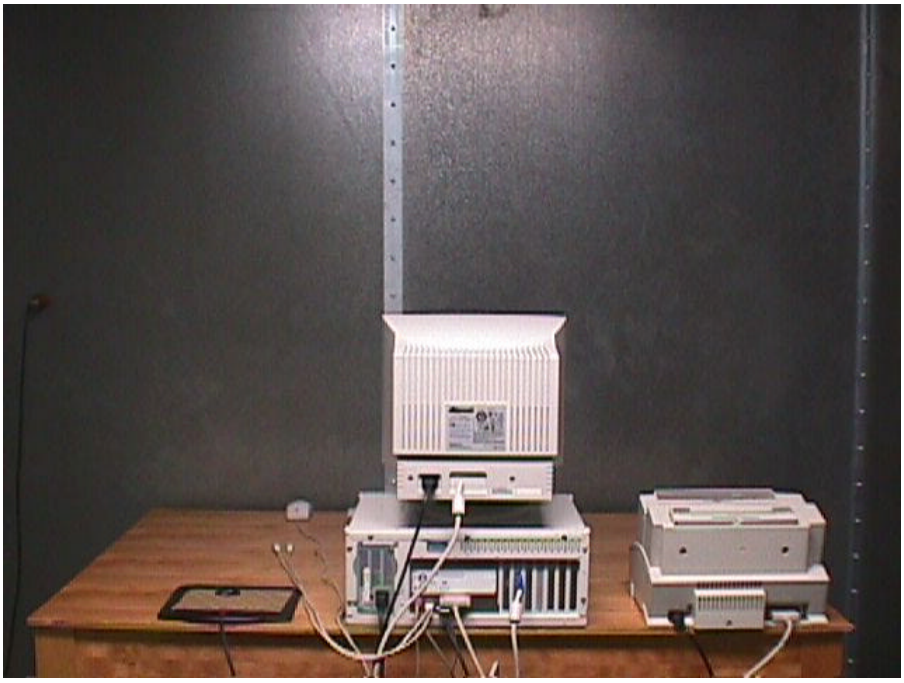
APPENDIX A:

SCHEMATICS OF PRESTOPAD RFID

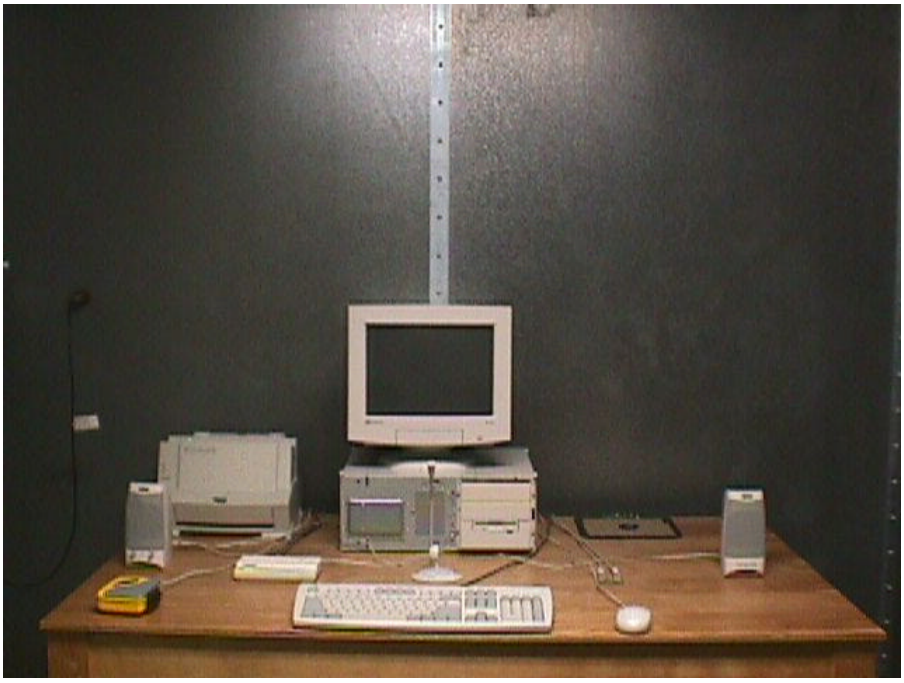
MOUSEPAD TRANSMITTER

4.0 MEASUREMENT PHOTOS

4.1 CONDUCTED MEASUREMENT PHOTOS (SERIAL PORT CONFIGURATION)

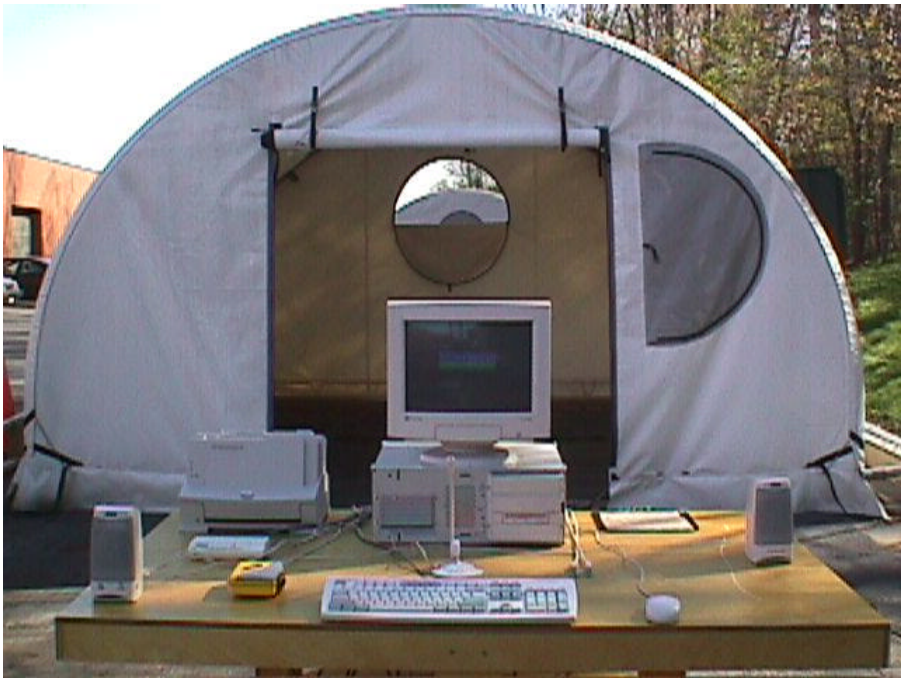


4.2 CONDUCTED MEASUREMENT PHOTOS (GAME PORT CONFIGURATION)



4.3 RADIATED MEASUREMENT PHOTOS (SERIAL PORT CONFIGURATION)

4.4 RADIATED MEASUREMENT PHOTOS (GAME PORT CONFIGURATION)



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-SERIAL PORT (SYSTEM TO LISN)

L1

EMISSION FREQUENCY (MHz)	TEST DETECTOR	ANALYZER READING (dBuV)	SITE CORRECTION FACTOR (dB)	EMISSION LEVEL (dBuV)	FCC LIMIT (dBuV)	FCC MARGIN (dBuV)
0.868	Pk	28.2	0.9	29.1	48.0	-18.9
11.531	Pk	27.4	2.6	30.0	48.0	-18.0
15.970	Pk	31.0	3.0	34.0	48.0	-14.0
23.957	Pk	28.3	3.5	31.8	48.0	-16.2
27.323	Pk	29.1	3.5	32.6	48.0	-15.4
29.830	Pk	33.0	3.5	36.5	48.0	-11.5

L2

EMISSION FREQUENCY (MHz)	TEST DETECTOR	ANALYZER READING (dBuV)	SITE CORRECTION FACTOR (dB)	EMISSION LEVEL (dBuV)	FCC LIMIT (dBuV)	FCC MARGIN (dBuV)
0.866	Pk	30.4	0.8	31.2	48.0	-16.8
11.783	Pk	27.3	2.7	30.0	48.0	-18.0
15.975	Pk	31.3	3.2	34.5	48.0	-13.5
23.952	Pk	27.6	3.5	31.1	48.0	-16.9
27.324	Pk	29.2	3.4	32.6	48.0	-15.4
29.830	Pk	32.1	3.6	35.7	48.0	-12.3

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

TEST PERSONNEL:

Signature**:** _____ **D**ate**:** 4/26/99

Typed/Printed Name: Daniel W. Baltzell

TABLE 3: CONDUCTED EMISSIONS-GAME PORT (MOUSE AC TO LISN)

L1

EMISSION FREQUENCY (MHz)	TEST DETECTOR	ANALYZER READING (dBuV)	SITE CORRECTION FACTOR (dB)	EMISSION LEVEL (dBuV)	FCC LIMIT (dBuV)	FCC MARGIN (dBuV)
0.563	Pk	37.8	0.9	38.7	48.0	-9.3
1.825	Pk	39.3	1.3	40.6	48.0	-7.4
12.351	Pk	27.7	2.7	30.4	48.0	-17.6
26.576	Pk	29.3	3.5	32.8	48.0	-15.2
27.578	Pk	32.3	3.4	35.7	48.0	-12.3
28.079	Pk	31.5	3.4	34.9	48.0	-13.1

L2

EMISSION FREQUENCY (MHz)	TEST DETECTOR	ANALYZER READING (dBuV)	SITE CORRECTION FACTOR (dB)	EMISSION LEVEL (dBuV)	FCC LIMIT (dBuV)	FCC MARGIN (dBuV)
0.561	Pk	37.2	0.7	37.9	48.0	-10.1
1.824	Pk	38.7	1.2	39.9	48.0	-8.1
24.067	Pk	27.1	3.5	30.6	48.0	-17.4
25.823	Pk	30.6	3.5	34.1	48.0	-13.9
27.076	Pk	30.2	3.4	33.6	48.0	-14.4
28.080	Pk	31.4	3.5	34.9	48.0	-13.1

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

TEST PERSONNEL:

Signature**:** _____ **D**ate**:** 4/26/99

Typed/Printed Name: Daniel W. Baltzell

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 4: RADIATED EMISSIONS; SPURIOUS NOISE-SERIAL PORT CONFIGURATION

(Temperature: 80°F, Humidity: 2%)

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)
48.129	V	54.3	-20.8	33.5	40.0	-6.5
84.476	V	54.1	-21.8	32.3	40.0	-7.7
96.132	V	59.8	-18.2	41.6	43.5	-1.9
110.310	V	53.1	-16.1	37.0	43.5	-6.5
112.441	V	58.9	-16.1	42.8	43.5	-0.7
120.462	V	51.7	-15.2	36.5	43.5	-7.0
224.501	V	49.5	-17.2	32.3	46.0	-13.7

TABLE 5: RADIATED EMISSIONS; SPURIOUS NOISE-GAME PORT CONFIGURATION

(Temperature: 67°F, Humidity: 2%)

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)
48.008	V	55.6	-20.7	34.9	40.0	-5.1
83.481	V	55.7	-22.0	33.7	40.0	-6.3
96.147	V	60.0	-18.2	41.8	43.5	-1.7
112.447	V	56.2	-16.1	40.1	43.5	-3.4
120.462	V	50.3	-15.2	35.1	43.5	-8.4
128.857	V	53.7	-15.4	38.3	43.5	-5.2
171.810	V	56.1	-17.3	38.8	43.5	-4.7
224.622	V	49.8	-17.2	32.6	46.0	-13.4

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

WORST CASE EMISSION DATA

TEST PERSONNEL:

Signature**:** _____ **D**ate**:** 4/27/99

Typed/Printed Name: Daniel W. Baltzell

TABLE 6: RADIATED EMISSIONS; FUNDAMENTAL AND HARMONICS; LOW FREQUENCY (SERIAL PORT CONFIGURATION)

(Temperature: 57°F, Humidity: 24%)

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)
0.126	V	93.3	-6.0	87.3	105.7	-18.3
0.251	V	50.3	-6.1	44.2	99.7	-55.4
0.376	V	56.4	-6.1	50.3	96.1	-45.8
0.501	V	37.8	-6.1	31.7	73.6	-41.9
0.626	V	54.0	-6.0	48.0	71.7	-23.7
0.751	V	42.2	-6.0	36.2	70.1	-33.9
0.877	V	30.6	-5.9	24.7	68.7	-44.7
1.002	V	33.4	-5.8	27.6	67.6	-40.0
1.127	V	35.5	-5.7	29.8	66.6	-39.7
1.253	V	28.7	-5.7	23.0	65.6	-46.5
1.378	V	30.1	-5.6	24.5	64.8	-45.0
24.816	V	29.3	-1.4	27.9	69.5	-41.6
25.568	V	28.6	-1.4	27.2	69.5	-42.3
26.821	V	31.2	-1.3	29.9	69.5	-39.6
27.323	V	32.3	-1.2	31.1	69.5	-38.4
28.076	V	34.3	-1.1	33.2	69.5	-36.3
29.079	V	40.5	-1.1	39.4	69.5	-30.1

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

Note: Measurements were made at 3 meter distance using a rod antenna. The results were then extrapolated using FCC 15.31f(2). The square of the inverse linear distance extrapolation factor.

TEST PERSONNEL:

Signature**:** _____ **D**ate**:** 4/29/99

Typed/Printed Name: Daniel W. Baltzell

TABLE 7: RADIATED EMISSIONS; FUNDAMENTAL AND HARMONICS; LOW FREQUENCY (GAME PORT CONFIGURATION)

(Temperature: 57°F, Humidity: 24%)

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 (Avg)	V	94.7	-6.0	88.7	105.7	-17.0
0.250 (Avg)	V	53.3	-6.1	47.2	99.7	-52.5
0.376 (Avg)	V	52.7	-6.1	46.6	96.1	-47.9
0.501	V	43.2	-6.1	37.1	73.6	-26.5
0.626	V	69.3	-6.0	63.3	71.7	-8.4
0.751	V	54.6	-6.0	48.6	70.1	-21.5
0.877	V	43.4	-5.9	37.5	68.7	-31.2
1.002	V	41.3	-5.8	35.5	67.6	-32.1
1.127	V	57.7	-5.7	52.0	66.6	-14.6
1.253	V	41.4	-5.7	35.7	65.6	-29.9
1.378	V	42.9	-5.6	37.3	64.8	-27.5
24.318	V	30.7	-1.4	29.3	69.5	-40.2
25.822	V	34.1	-1.3	32.8	69.5	-36.7
26.825	V	35.5	-1.3	34.2	69.5	-35.3
27.828	V	40.5	-1.2	39.3	69.5	-30.2
28.830	V	43.2	-1.1	42.1	69.5	-27.4
29.582	V	48.0	-1.0	47.0	69.5	-22.5

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

Note: Measurements were made at 3 meter distance using a rod antenna. The results were then extrapolated using FCC 15.31f(2). The square of the inverse linear distance extrapolation factor.

TEST PERSONNEL:

Signature**:** _____ **D**ate**:** 4/29/99

Typed/Printed Name: Daniel W. Baltzell

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: RFID Mousepad Transmitter, Front (Game Port Configuration)

FIGURE 4: RFID Mousepad Transmitter, Back (Game Port Configuration)

FIGURE 5: PrestoPad Mousepad Transmitter, Front (Serial Port Configuration)

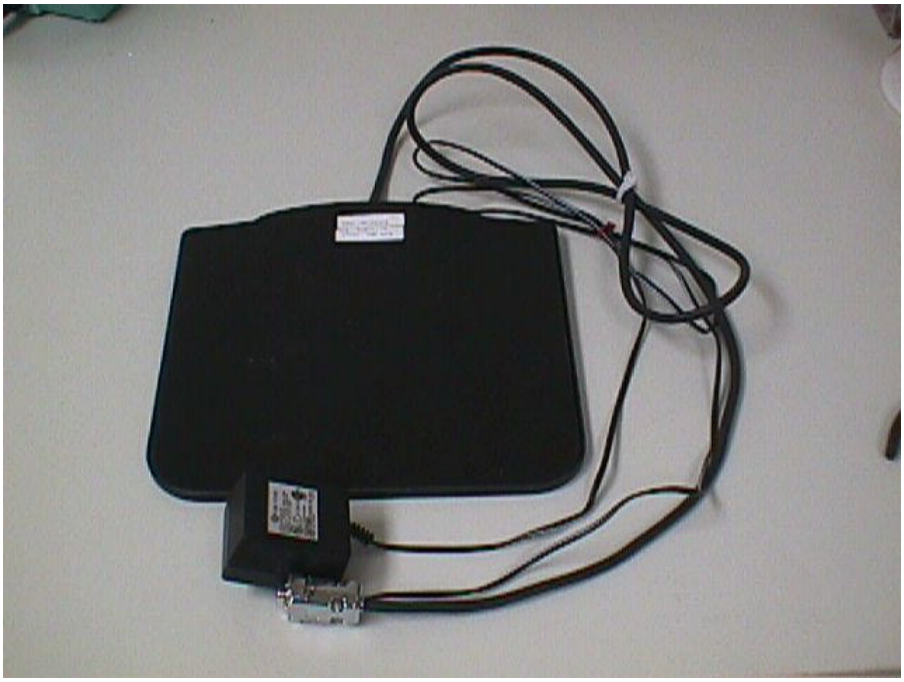


FIGURE 6: PrestoPad Mousepad, Back (Serial Port Configuration)

FIGURE 7: Top Side Mousepad Housing

FIGURE 8: Inductive Antenna

FIGURE 9: Mousepad Housing

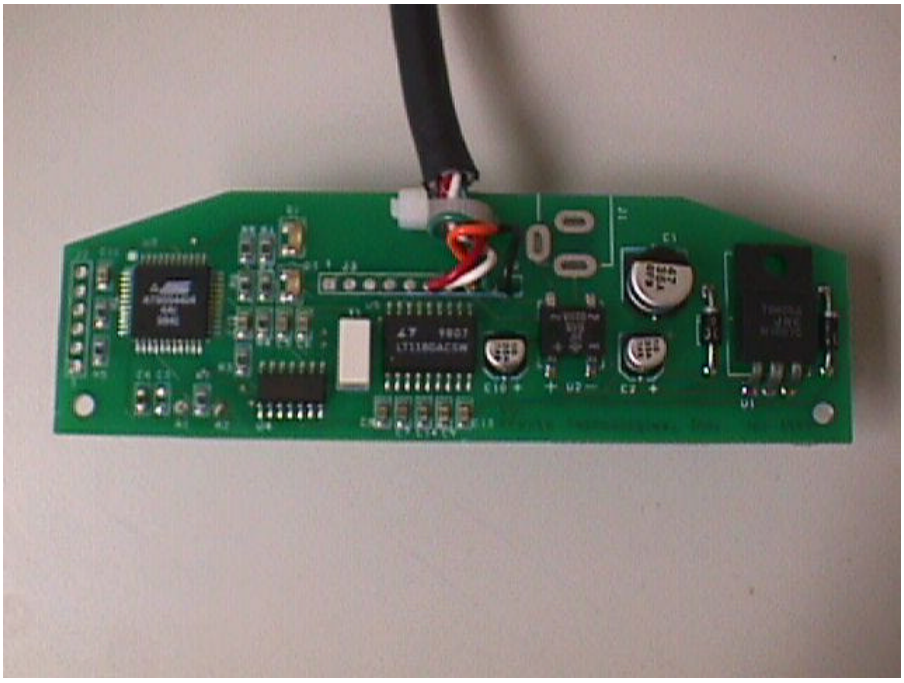


FIGURE 10: Component Side, Game Port Connection

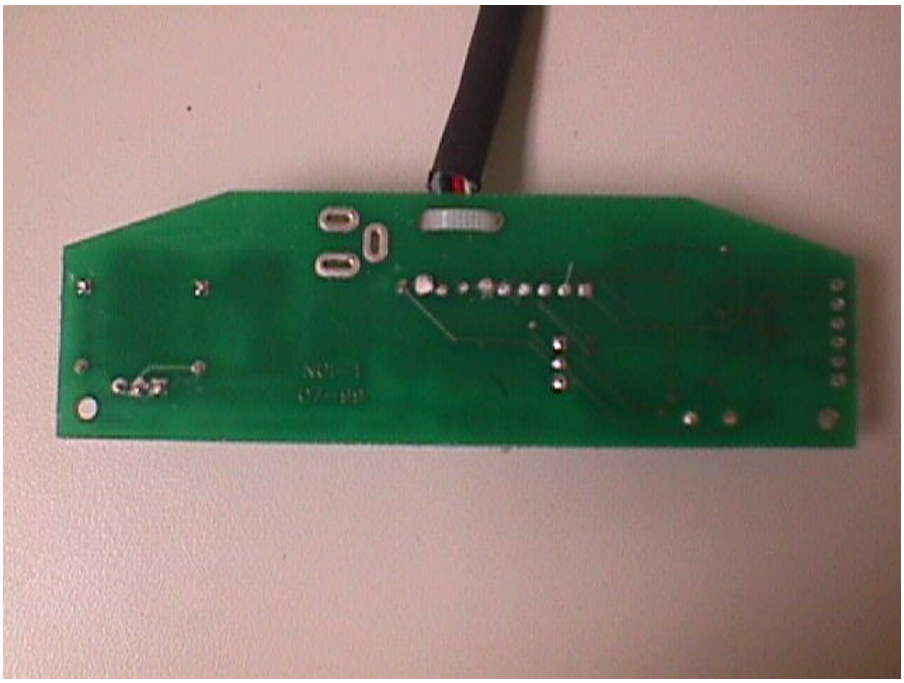


FIGURE 11: Solder Side, Game Port Connection

FIGURE 12: Game Port Connector

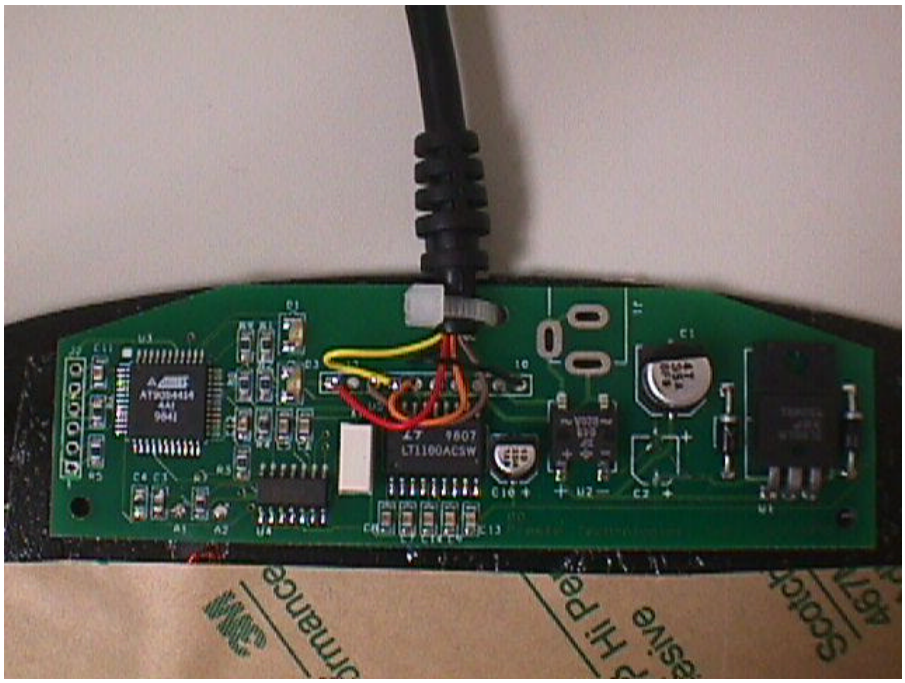


FIGURE 13: Component Side, Serial Connection

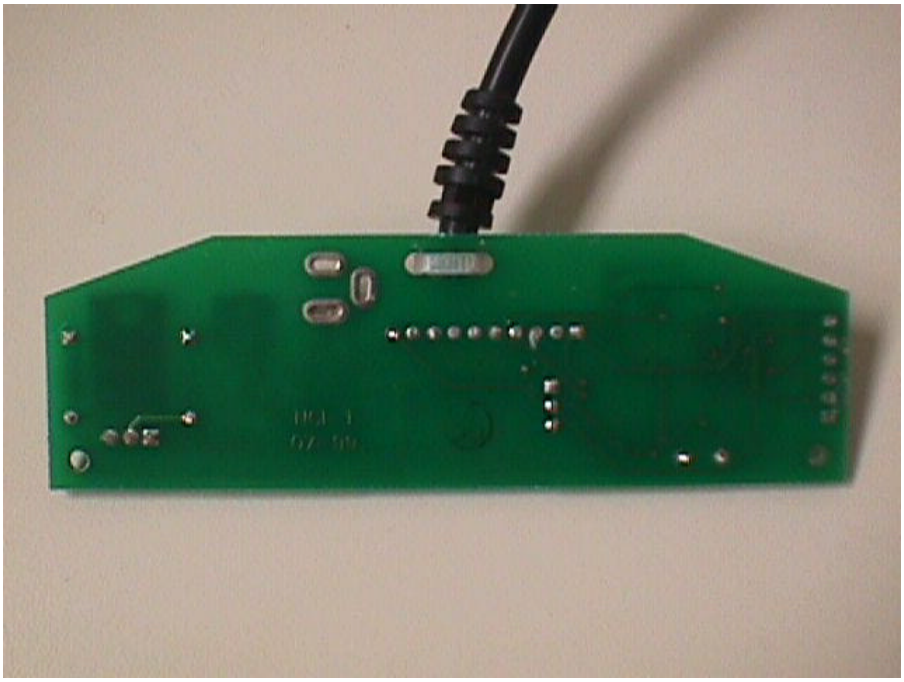


FIGURE 14: Solder Side, Serial Connection

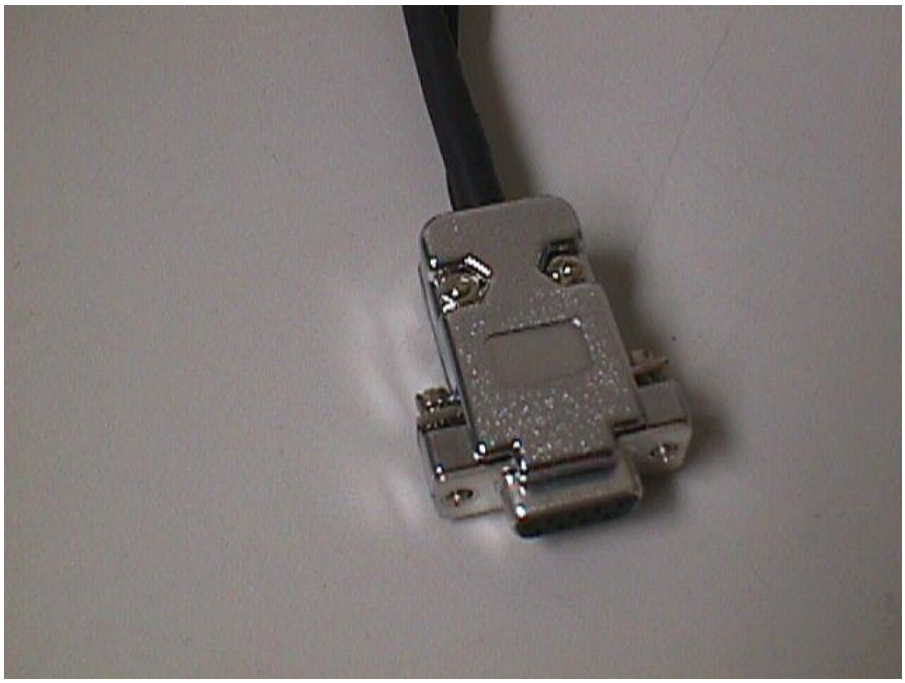


FIGURE 15: DB9 Serial Port Connector

FIGURE 16: Top Side AC/DC Wall Transformer

FIGURE 17: Bottom Side AC/DC Wall Transformer

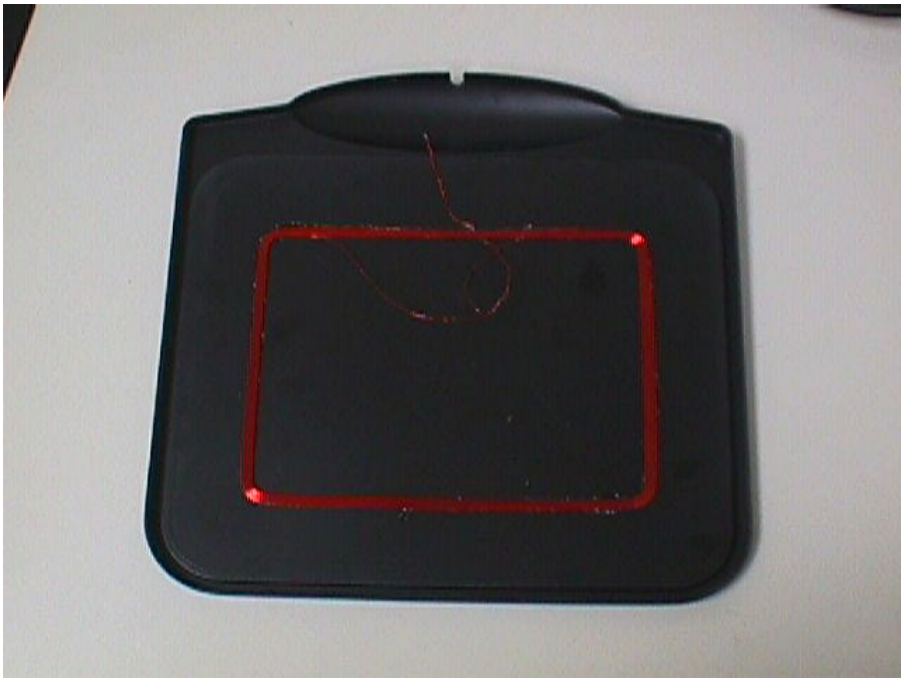


FIGURE 18: Inductive Antenna

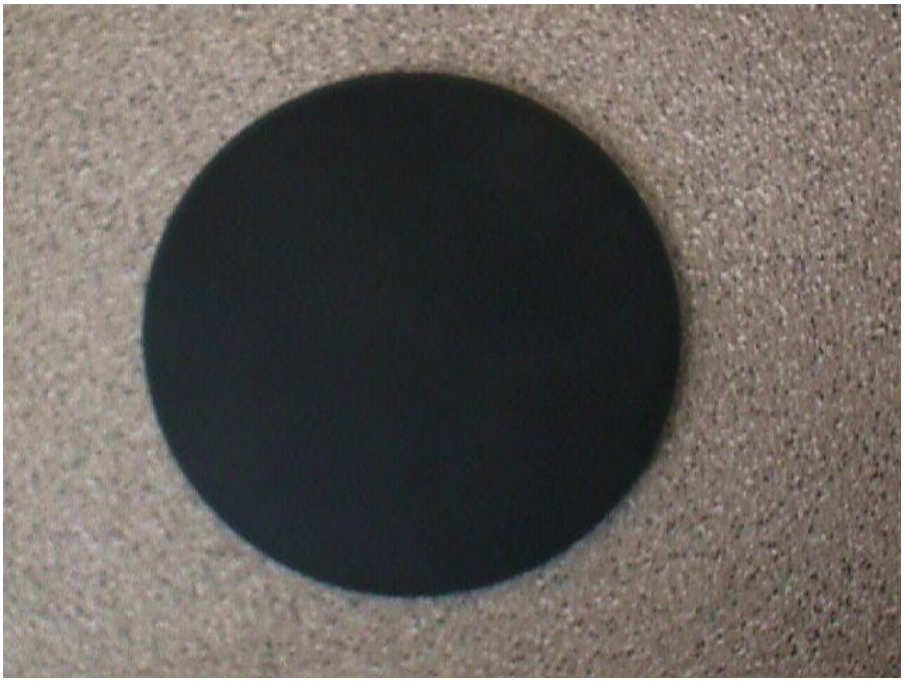


FIGURE 19: Transponder Side A

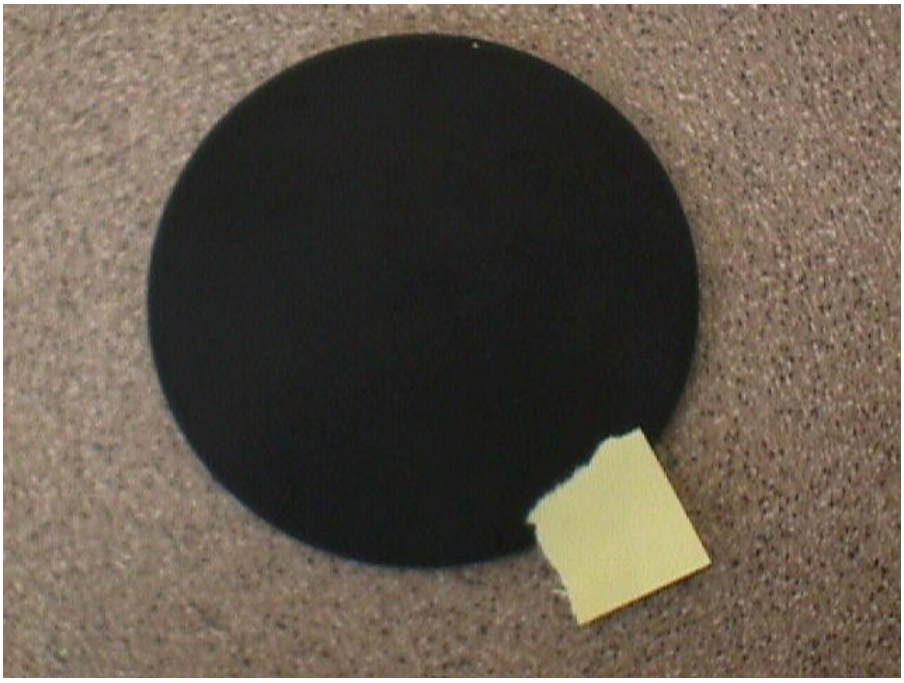


FIGURE 20: Transponder Side B

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:

Plots

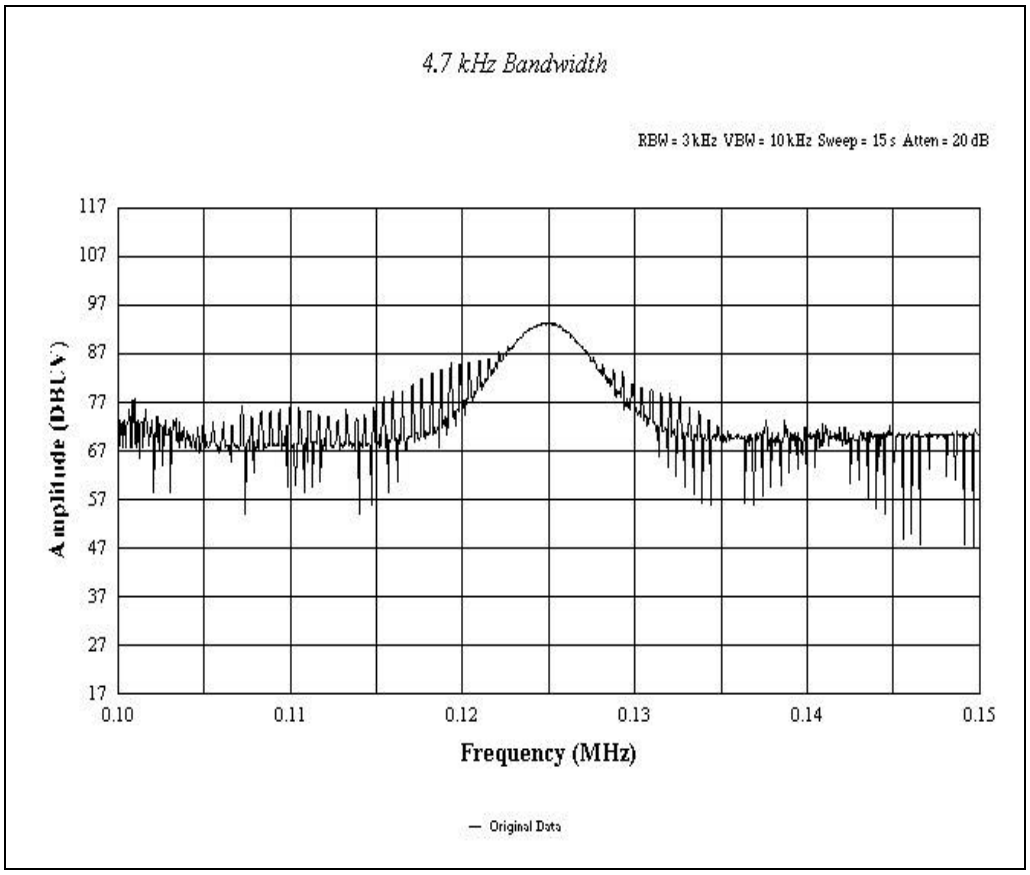


FIGURE 21: Serial Configuration occupied bandwidth Plot

4.85 kHz Bandwidth

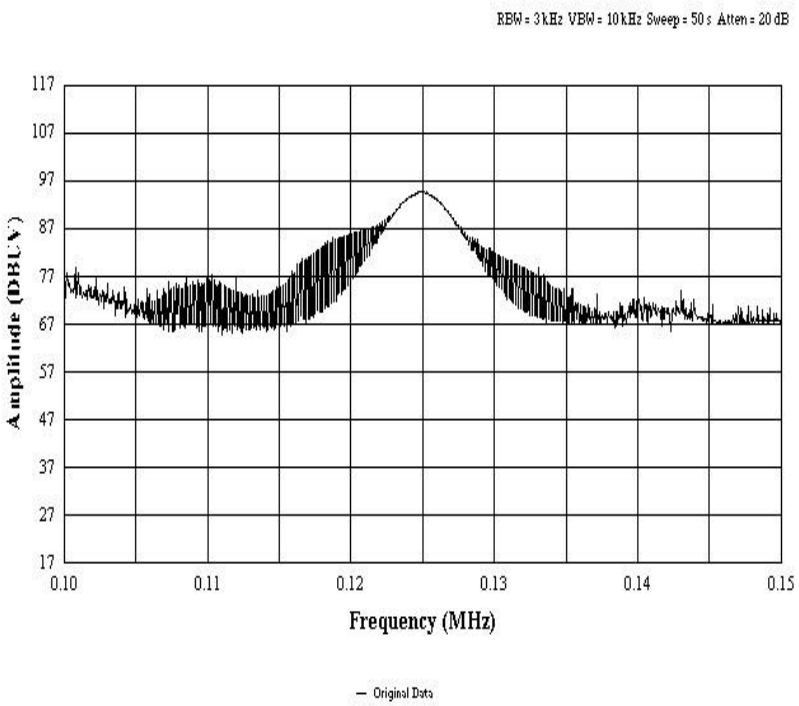


FIGURE 22: Game Port configuration occupied bandwidth Plot

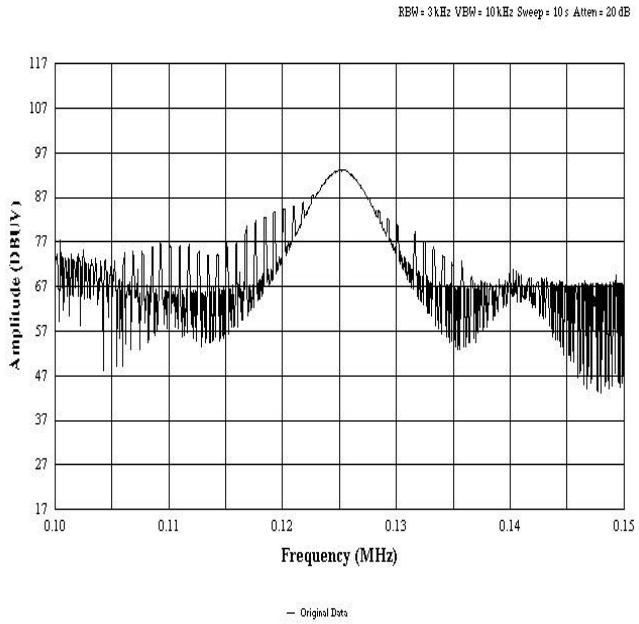


FIGURE 23: Game Port configuration fundamental Plot

APPENDIX E:

USER'S MANUAL