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

SYSTEM	GATEWAY 2000, INC.	LOW PROFIL MINI-TOWER	N/A	N/A	SHIELDED POWER	8428
MONITOR (EUT)	**KOREA DATA SYSTEMS CO. LTD.**	**KD-1910T**	**N/A**	**EVOKD-1910T**	**SHIELDED I/O, FERRITE BOTH ENDS; UNSHIELDED POWER**	**9748**
PRINTER	EPSON	P880A	3BR1810257	BKMP880A	SHIELDED I/O, UNSHIELDED POWER	6714
KEYBOARD	MAXI SWITCH, INC.	2196003-XX-XXX	51433202	D7J2196003-XX	SHIELDED I/O	8439
MOUSE	MICROSOFT CORPORATION	INTELLIMOUSE 1.1A	01504632	C3KKMP5	SHIELDED I/O	8449
MODEM	US ROBOTICS	0413	839032B86P9WB	DoC	SHIELDED I/O, UNSHIELDED POWER	900409

Internal Components

FLOPPY DRIVE	PANASONIC	JU-256A216P	00275670	N/A	INTERNAL RIBBON	8431
HARD DRIVE	QUANTUM	FIREBALL EX (10 GB)	371222216222	N/A	INTERNAL RIBBON	9545
POWER SUPPLY	ASTEC	ATX202-3515	2580191351	N/A	SHIELDED POWER	8429
CD-ROM DRIVE	TOSHIBA	XM-6102B	786F301391	CJ6AT97-027	INTERNAL RIBBON	8430
VIDEO CARD	ACCELGRAPHICS	225-0128-01	011156B2	N/A	SHIELDED I/O	8436
MOTHERBOARD	INTEL	ASTORIA	ISAL73901219	N/A	INTERNAL RIBBON	8433
CPU	INTEL	PENTIUM II 300 MHZ	R7410431-236	N/A	N/A	8435

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 ten meters.

1.6 TEST FACILITY

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of Rhein Tech Laboratories, Inc. 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report dated June 24, 1996, submitted to and approved by the Federal Communication Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 1992).

Testing performed at 10 meters follows the test methodology of EN55022 (CISPR22). The Federal Communication Commission accepts 10 meter data in order to meet Class B Compliance.

3.0 SYSTEM TEST CONFIGURATION

3.1 JUSTIFICATION

The system was configured for testing in a typical fashion (as a customer would normally use it). Worst case conducted and radiated emissions are presented in 1280 x 1024 @ 85 Hz, and 1600 x 1200 @ 75 Hz mode.

The EUT was tested with the serial, parallel, mouse, and keyboard port attached to external peripherals. The monitor was investigated as powered from the wall outlet since there is no auxiliary power outlet. CPU Speed: 300 MHz.

3.2 EUT EXERCISE SOFTWARE

The EUT exercise program used during radiated and conducted testing has been designed to exercise the various system components in a manner similar to a typical use. The software, contained on the hard disk drive, sequentially exercises each system component. 1) an H prints on the monitor, 2) an H prints on the printer 3) an H is sent to serial ports, 4) a file is read from the floppy diskette, 5) a file is read from the hard drive and any other hard drive present, 6) a file is read from the CD-ROM drive. In cases that implement the use of Universal Serial Bus (USB) ports, a looped batch program is initiated to render a continuous flow of data through the USB ports. The complete cycle takes less than one second and is repeated continually. Systems that utilize network cards are connected to a server and are configured to transmit and receive packets of data continuously. As the keyboard and mouse are strictly input devices, no data was transmitted to them during test. They are, however, continuously scanned for data input activity.

3.3 SPECIAL ACCESSORIES

The end user is advised that he/she should use the same type of cables as those mentioned in Table 1 of this test report.

3.4 CONFORMANCE 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 to the equipment during testing 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: September 29, 1998

Typed/Printed Name: Bruno Clavier

Position: Quality Manager
(NVLAP Signatory)

NVLAP *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:

BLOCK DIAGRAM OF KD-1910T 19" MONITOR

Please see following pages.

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 average limit with the instrument set to the quasi-peak mode, then measurements are made in the average mode.

The conducted test was performed with the EUT exercise program loaded, and the emissions were scanned between 150 kHz to 30 MHz on the NEUTRAL SIDE and HOT SIDE, herein referred to as L1 and L2, respectively.

TABLE 2: CONDUCTED EMISSIONS: 1280 x 1024 @ 85 Hz

NEUTRAL SIDE (Line 1)

EMISSION FREQUENCY (MHz)	TEST DETECTOR (1)	ANALYZER READING (dBuV)	SITE CORRECTION FACTOR (dB)	EMISSION LEVEL (dBuV)	EN55022 / CISPR22 QUASI PEAK LIMIT (dBuV)	EN55022 / CISPR22 QUASI PEAK MARGIN (dBuV)	EN55022 / CISPR22 AVERAGE LIMIT (dBuV)	EN55022 / CISPR22 AVERAGE MARGIN (dBuV)
0.182	Pk	59.2	0.8	60.0	64.4	-4.4	54.4	5.6
0.182	Qp	59.0	0.8	59.8	64.4	-4.6	54.4	5.4
0.182	Av	50.0	0.8	50.8	64.4	-13.6	54.4	-3.6
0.274	Pk	47.4	0.7	48.1	61.0	-12.9	51.0	-2.9
0.274	Qp	47.4	0.7	48.1	61.0	-12.9	51.0	-2.9
0.274	Av	38.7	0.7	39.4	61.0	-21.6	51.0	-11.6
0.364	Pk	43.3	0.7	44.0	58.6	-14.6	48.6	-4.6
0.458	Pk	38.1	0.6	38.7	56.7	-18.0	46.7	-8.0
24.674	Pk	31.1	4.0	35.1	60.0	-24.9	50.0	-14.9
26.259	Pk	31.4	4.1	35.5	60.0	-24.5	50.0	-14.5

HOT SIDE (Line 2)

EMISSION FREQUENCY (MHz)	TEST DETECTOR (1)	ANALYZER READING (dBuV)	SITE CORRECTION FACTOR (dB)	EMISSION LEVEL (dBuV)	EN55022 / CISPR22 QUASI PEAK LIMIT (dBuV)	EN55022 / CISPR22 QUASI PEAK MARGIN (dBuV)	EN55022 / CISPR22 AVERAGE LIMIT (dBuV)	EN55022 / CISPR22 AVERAGE MARGIN (dBuV)
0.182	Pk	57.7	0.4	58.1	64.4	-6.3	54.4	3.7
0.182	Qp	57.5	0.4	57.9	64.4	-6.5	54.4	3.5
0.182	Av	48.7	0.4	49.1	64.3	-15.2	54.3	-5.2
0.274	Pk	47.0	0.5	47.5	61.0	-13.5	51.0	-3.5
0.274	Qp	46.5	0.5	47.0	61.0	-14.0	51.0	-4.0
0.274	Av	37.6	0.5	38.1	61.0	-22.9	51.0	-12.9
0.366	Pk	42.4	0.6	43.0	58.6	-15.6	48.6	-5.6
0.462	Pk	35.4	0.6	36.0	56.7	-20.7	46.7	-10.7
24.679	Pk	32.4	4.5	36.9	60.0	-23.1	50.0	-13.1
26.259	Pk	32.5	4.7	37.2	60.0	-22.8	50.0	-12.8

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

TEST PERSONNEL:

Signature: Elizabeth Szrajer Date: September 21, 1998

Typed/Printed Name: Elizabeth Szrajer

TABLE 3: CONDUCTED EMISSIONS: 1600 X 1200 @ 75 Hz

NEUTRAL SIDE (Line 1)

EMISSION FREQUENCY (MHz)	TEST DETECTOR (1)	ANALYZER READING (dBuV)	SITE CORRECTION FACTOR (dB)	EMISSION LEVEL (dBuV)	EN55022 / CISPR22 QUASI PEAK LIMIT (dBuV)	EN55022 / CISPR22 QUASI PEAK MARGIN (dBuV)	EN55022 / CISPR22 AVERAGE LIMIT (dBuV)	EN55022 / CISPR22 AVERAGE MARGIN (dBuV)
0.188	Pk	57.1	0.8	57.9	64.2	-6.3	54.2	3.7
0.188	Qp	57.1	0.8	57.9	64.1	-6.2	54.1	3.8
0.188	Av	48.3	0.8	49.1	64.1	-15.0	54.1	-5.0
0.281	Pk	46.5	0.7	47.2	60.8	-13.6	50.8	-3.6
0.281	Qp	46.4	0.7	47.1	60.8	-13.7	50.8	-3.7
0.281	Av	37.4	0.7	38.1	60.8	-22.7	50.8	-12.7
0.379	Pk	42.6	0.7	43.3	58.3	-15.0	48.3	-5.0
0.473	Pk	37.2	0.6	37.8	56.5	-18.7	46.5	-8.7
16.449	Pk	26.9	3.4	30.3	60.0	-29.7	50.0	-19.7
24.674	Pk	31.2	4.0	35.2	60.0	-24.8	50.0	-14.8

HOT SIDE (Line 2)

EMISSION FREQUENCY (MHz)	TEST DETECTOR (1)	ANALYZER READING (dBuV)	SITE CORRECTION FACTOR (dB)	EMISSION LEVEL (dBuV)	EN55022 / CISPR22 QUASI PEAK LIMIT (dBuV)	EN55022 / CISPR22 QUASI PEAK MARGIN (dBuV)	EN55022 / CISPR22 AVERAGE LIMIT (dBuV)	EN55022 / CISPR22 AVERAGE MARGIN (dBuV)
0.186	Pk	56.3	0.4	56.7	64.2	-7.5	54.2	2.5
0.186	Qp	55.6	0.4	56.0	64.2	-8.2	54.2	1.8
0.186	Av	47.4	0.4	47.8	64.2	-16.4	54.2	-6.4
0.283	Pk	45.9	0.5	46.4	60.7	-14.3	50.7	-4.3
0.378	Pk	42.0	0.6	42.6	58.3	-15.7	48.3	-5.7
0.467	Pk	36.9	0.6	37.5	56.6	-19.1	46.6	-9.1
16.442	Pk	28.1	3.8	31.9	60.0	-28.1	50.0	-18.1
24.673	Pk	31.9	4.5	36.4	60.0	-23.6	50.0	-13.6

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

TEST PERSONNEL:

Signature: Elizabeth Szrajer Date: September 21, 1998

Typed/Printed Name: Elizabeth Szrajer

6.0 RADIATED EMISSION DATA

The following data lists the significant 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: 1280 x 1024 @ 85 Hz

EMISSION FREQUENCY (MHz)	ANTENNA POLARITY (H/V)	ANALYZER READING (dBuV) *	SITE CORRECTION FACTOR (dB/m)	EMISSION LEVEL (dBuV/m)	EN55022 / CISPR22 LIMIT (dBuV/m)	EN55022 / CISPR22 MARGIN (dBuV/m)
170.740	V	46.6	-25.1	21.5	30.0	-8.5
183.865	V	50.7	-24.2	26.5	30.0	-3.5
196.990	V	49.4	-23.9	25.5	30.0	-4.5
210.115	V	46.6	-23.0	23.6	30.0	-6.4
223.240	V	43.9	-22.0	21.9	30.0	-8.1
275.765	H	45.7	-19.3	26.4	37.0	-10.6

TABLE 5: RADIATED EMISSIONS: 1600 x 1200 @ 75 Hz

EMISSION FREQUENCY (MHz)	ANTENNA POLARITY (H/V)	ANALYZER READING (dBuV) *	SITE CORRECTION FACTOR (dB/m)	EMISSION LEVEL (dBuV/m)	EN55022 / CISPR22 LIMIT (dBuV/m)	EN55022 / CISPR22 MARGIN (dBuV/m)
169.145	V	50.4	-25.3	25.1	30.0	-4.9
202.955	V	50.5	-23.8	26.7	30.0	-3.3
219.860	V	48.4	-22.1	26.3	30.0	-3.7
236.765	V	44.5	-20.8	23.7	37.0	-13.3
253.670	H	47.9	-20.4	27.5	37.0	-9.5
287.480	H	43.6	-20.3	23.3	37.0	-13.7

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

TEST PERSONNEL:

Signature: 

Date: September 22, 1998

Typed/Printed Name: Robert Thomson

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: MONITOR FRONT
FIGURE 4: MONITOR POSTERIOR
FIGURE 5: MONITOR LEFT SIDE
FIGURE 6: MONITOR RIGHT SIDE
FIGURE 7: MONITOR BOTTOM
FIGURE 8: MONITOR DORSAL
FIGURE 9: MONITOR BOTTOM CASE REMOVED
FIGURE 10: MONITOR LEFT SIDE, CASE REMOVED
FIGURE 11: MONITOR DORSAL CASE REMOVED
FIGURE 12: MONITOR RIGHT SIDE
FIGURE 13: MONITOR RIGHT SIDE, SHEILDING REMOVED
FIGURE 14: MONITOR DORSAL, SHEILDED REMOVED
FIGURE 15: MONITOR LEFT SIDE, SHEILDING REMOVED
FIGURE 16: NECK PCB COMPONENT SIDE
FIGURE 17: NECK PCB SOLDER SIDE
FIGURE 18: MONITOR TUBE FRONT SIDE
FIGURE 19: MONITOR TUBE POSTERIOR
FIGURE 20: MONITOR MAINBOARD COMPONENT SIDE
FIGURE 21: MONITOR MAINBOARD, SOLDER SIDE
FIGURE 22: MONITOR BEZEL, POSTERIOR
FIGURE 23: MONITOR SHEILDING/STUCTURAL INTERIOR
FIGURE 24: MONITOR CASE INTERIOR
FIGURE 25: MONITOR I/O INTERFACE SOLDER SIDE
FIGURE 26: POWER BUTTON PCB, SOLDER SIDE
FIGURE 27: POWER BUTTON PCB, COMPONENT SIDE
FIGURE 28: CONTROLLER PCB, SOLDER SIDE
FIGURE 29: CONTROLLER PCB, COMPONENT SIDE
FIGURE 30: NECK PCB, SOLDER SIDE WITH SHIELDING
FIGURE 31: I/O INTERFACE BOARD, COMPONENT SIDE
FIGURE 32: MISCELLANEOUS INTERNAL MONITOR CABLES

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	N/A	RTL
AMPLIFIER (S/A 2)	RHEIN TECH	RTL2	N/A	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
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		ACUCAL
LISN (ROOM 1/L2)	SOLAR	7225-1		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

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.

Before final measurements of radiated emissions were made on the open-field three/ten meter range; the EUT was scanned indoors at one and three meter distances. 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 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 three-meter, open-field test site. The EUT was placed on a nonconductive turntable 0.8 meters above the ground plane. The spectrum was examined from 30 MHz to 1000 MHz.

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.

1.4 CONFIGURATION OF TESTED SYSTEM