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

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 emissions and radiated emissions are presented in 1600 X 1200 @ 85 Hz mode.

The EUT was tested with the serial port, parallel port, mouse port, 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: 300MHz.

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. The modifications listed on the following page 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: August 27, 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.

Statement of Manufacturer's Representative

Company Name : Korea Data Systems Co.,Ltd
Representative's Name : H.R.Lee
Product(Model Number) : 21" CRT Monitor(KD-2100K)
Intended FCC ID : EVOKD-2100K
Date Tested : Aug 21, 1998

I hereby warrant that the test sample is representative of the product to be Marketed. That the test system configuration is representative of the product's Intended use and that the following modifications were made to the KD-2100K In order to comply with the standards described in the attached report.

1. Added ferrite core on W405 wire ass'y.
2. Removed GND plate between top shield case and CRT neck cover.
3. Added GND wire between side shield case and CRT neck cover.
4. Added "X" capacitor 0.47 uF 250Vac (same as C801 position).

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Hwa Ryong Lee/ Manager of R&D

5.0 CONDUCTED EMISSION DATA

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement reange. If the conducted emissions exceed the limit with the instrument set to the quasi-peak mode, then measurements are made in the averaged mode. If the quasi-peak measuremet 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 with the EUT exercise program loaded, and the emissions were scanned between 450 kHz to 30 MHz on the NEUTRAL SIDE and HOT SIDE, herein referred to as L1 and L2, respectively.

TABLE 2: CONDUCTED EMISSIONS: 1600 X 1200 @ 85HZ D-SUB CONNECTOR

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)
0.578	Pk	31.6	0.3	31.9	48.0	-16.1
3.958	Pk	30.5	1.3	31.8	48.0	-16.2
10.239	Pk	31.3	2.1	33.4	48.0	-14.6
16.580	Pk	38.7	3.7	42.4	48.0	-5.6
20.720	Pk	33.3	3.2	36.5	48.0	-11.5
24.860	Pk	39.0	3.8	42.8	48.0	-5.2

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)
0.517	Pk	30.1	0.3	30.4	48.0	-17.6
2.347	Pk	31.0	1.4	32.4	48.0	-15.6
4.320	Pk	33.0	1.6	34.6	48.0	-13.4
16.610	Pk	33.0	3.4	36.4	48.0	-11.6
20.690	Pk	27.3	3.3	30.6	48.0	-17.4
24.860	Pk	33.8	3.4	37.2	48.0	-10.8

[1]Pk = Peak; QP = Quasi-Peak; Av = Average

TEST PERSONNEL:

Signature: Elizabeth Szrajer   **Date:** 8/24/98

Typed/Printed Name: Elizabeth Szrajer

TABLE 3: CONDUCTED EMISSIONS: 1600 X 1200 @ 85HZ BNC CONNECTOR

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)
0.461	Pk	33.4	0.3	33.7	48.0	-14.3
2.255	Pk	31.4	1.0	32.4	48.0	-15.6
8.523	Pk	30.7	2.0	32.7	48.0	-15.3
14.148	Pk	32.1	3.0	35.1	48.0	-12.9
16.438	Pk	38.4	3.7	42.1	48.0	-5.9
24.625	Pk	39.4	3.7	43.1	48.0	-4.9

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)
0.507	Pk	32.5	0.3	32.8	48.0	-15.2
2.863	Pk	30.7	1.4	32.1	48.0	-15.9
9.273	Pk	31.2	2.0	33.2	48.0	-14.8
13.037	Pk	31.2	2.6	33.8	48.0	-14.2
16.432	Pk	38.8	3.3	42.1	48.0	-5.9
20.660	Pk	33.9	3.3	37.2	48.0	-10.8
24.638	Pk	39.3	3.3	42.6	48.0	-5.4

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

TEST PERSONNEL:

Signature: Elizabeth Szrajer **Date:** 8/24/98

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: 1600 X 1200 @ 85 HZ D-SUB CONNECTOR

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)
171.929	H	44.7	-24.9	19.8	30.0	-10.2
229.196	V	43.8	-17.2	26.6	30.0	-3.4
248.303	V	46.0	-20.3	25.7	37.0	-11.3
362.895	V	38.1	-16.3	21.8	37.0	-15.2
381.987	V	38.0	-14.9	23.1	37.0	-13.9
401.079	V	39.9	-14.9	25.0	37.0	-12.0
630.192	H	37.6	-9.4	28.2	37.0	-8.8

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

TEST PERSONNEL:

Signature: Elizabeth Szrajer **Date:** 8/22/98

Typed/Printed Name: Elizabeth Szrajer

TABLE 5: RADIATED EMISSIONS: 1600 X 1200 @ 85 HZ BNC CONNECTOR

(Temperature: 71°F, Humidity: 44%)

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)
171.920	V	43.0	-24.9	18.1	30	-11.9
229.166	V	45.2	-21.3	23.9	30	-6.1
248.312	V	51.5	-20.3	31.2	37	-5.8
267.417	H	39.0	-19.8	19.2	37	-17.8
286.509	H	48.8	-20.3	28.5	37	-8.5
305.601	H	41.9	-18.7	23.2	37	-13.8
343.785	H	41.1	-16.9	24.2	37	-12.8
553.807	V	40.2	-11.1	29.1	37	-7.9

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

TEST PERSONNEL:

Signature: Elizabeth Szrajer **Date:** 8/22/98

Typed/Printed Name: Elizabeth Szrajer

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	Front of Monitor
FIGURE 4	Back of Monitor
FIGURE 5	Right Side of Chassis
FIGURE 6	Left Side of Chassis
FIGURE 7	Top of Chassis
FIGURE 8	Bottom of Chassis
FIGURE 9	Top View without Chassis
FIGURE 10	Bottom View without Chassis
FIGURE 11	Right Side View without Chassis
FIGURE 12	Left Side without Chassis
FIGURE 13	Back without Chassis
FIGURE 14	Inside of Chassis
FIGURE 15	Top Inside View of Circuitry
FIGURE 16	Component View of Left Side Circuitry
FIGURE 17	Solder View of Left Side Circuitry
FIGURE 18	Component View of Left Side Circuitry
FIGURE 19	Component View of Bottom Circuitry
FIGURE 20	Solder View of Bottom Circuitry
FIGURE 21	CRT Controller, Top View
FIGURE 22	CRT Controller Chassis, Back View

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 and three meter distances, 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 ten-meter, open-field test site. The EUT was placed on a nonconductive turntable approximately 0.8 meters above the ground plane. The spectrum was examined from 30 MHz to 1000 MHz using a Hewlett Packard 8566B spectrum analyzer, a Hewlett Packard 85650A quasi-peak adapter, and Antenna Research Bilog antenna. In order to gain sensitivity, a RTL PR-1040 preamplifier was connected in series between the antenna and the input of the spectrum analyzer.

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.