HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.

Product Compliance Division, EMC Team
SAN 136-1, AMI-RI , BUBAL-EUP, ICHEON-SI, KYOUNKI-DO, 467-701, KOREA
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CERTIFICATION

Manufacture;
IMAGEQUEST CO., LTD.

SAN 136-1, AMI-RI , BUBAL-EUP, ICHEON-SI, KYOUNKI-DO, 467-701,KOREA

IMAGEQUEST FRN : 0005-8664-39

Date of Issue: JANUARY 20, 2003

Test Report No.: HCT-F03-0101

Test Site: HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD.
HCT FRN : 0005-8664-21

FCC ID : PJIC17R07080

MODEL / TYPE : V780 / C17R07080

Rule Part(s):	**:Part 15 & 2; ET Docket 95-19**
Equipment Class:	**FCC Class B Peripheral Device (JBP)**
Standard(s):	**FCC Class B: 1998 (CISPR 22)**
EUT Type:	**17" CRT Monitor**
Max. Resolution(s):	**1280 X 1024 Non-interlaced (@80.0KHz/ 75Hz)**
Model(s):	**V780**
Port/Connector(s)	**15-pin D-sub VGA connector**

This equipment has been shown to be in compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-1992 (Grant Notes: #19, #28).

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Ki Soo Kim

Report prepared by : Ki-Soo Kim
Manager of EMC Tech. Part

TABLE OF CONTENTS

MEASUREMENT REPORT

1.1 Scope

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

Applicant Name:	**IMAGEQUEST**
Address:	**SAN 136-1, AMI-RI , BUBAL-EUP, ICHEON-SI, KYOUNKI-DO, 467-701,KOREA**

- **FCC ID : PJIC17R07080**
- Equipment Class: FCC Class B Peripheral Device (JBP)
- EUT Type: 17” CRT MONITOR
- Model(s): V780
- Max. Resolution: 1280 X 1024, 80KHz 75Hz
- Frequency Range: V-Sync: 56Hz – 85Hz , H-Sync: 30kHz – 70kHz
- Cable(s): Shielded D-Sub (with ferrite on both ends)
- Power Cord: Unshielded
- Rule Part(s): FCC Part 15 Subpart B
- Test Procedure(s): ANSI C63.4 (1992)
- Dates of Tests: December 30, 2002 ~ January 14, 2003
- Place of Tests: 254-1,MAEKOK-RI,HOBUP-MYUN,ICHON-SI,KYOUNGKI-DO,467-701,KOREA
- Test Report S/N: B.220211052.BEJ Analyzer HP 8566B (100Hz-22GHz) 04/17/02 2542A11898 Spectrum Analyzer

2.1 INTRODUCTION

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSIC63.4-1992) was used in determining radiated and conducted emissions emanating from **IMAGEQUEST CO., LTD. 17-inch CRT Monitor FCC ID: PJIC17R07080**

The open area test site and conducted measurement facility used to collect the radiated data are located at the 254-1, MAEKOK-RI, HOBUP-MYUN,ICHON-SI,KYOUNGKI-DO, 467-701,KOREA. The site is constructed in conformance with the requirements of ANSI C63.4and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated July 24,2000 (Confirmation Number: EA90661)

3.1 PRODUCT INFORMATION

3.2 Equipment Description

Equipment Under Test (EUT) is the **IMAGEQUEST CO., Ltd. (Model: V780) 17-inch CRT Monitor**

FCC ID: PJIC17R07080

Maximum Resolution(s): 1280 x 1024 Non-interlaced @80kHz/75Hz

Frequency Range(s): H-Sync: 30kHz – 87kHz
V-Sync: 50Hz – 150 Hz
Pixel Pitch: 0.27 mm

Power Supply: AC 100-240V 50/ 60Hz 1.5A

Power Cord: *Unshielded* AC power cord

Port(s)/Input Connector(s): 15-pin D-Sub type VGA connector

Cable(s): Shielded D-Sub (with ferrite on both ends)

Dimensions (WxHxD): 404 x 408 x 420 mm

Weight (Net): 13.7Kg unpacked

EMI Suppression Devices:

~ No modifications were made to the device.

4.1 Description of Tests(Conducted)

4.2 Powerline Conducted RFI (150kHz- 30MHz)

The power line conducted RFI measurements were performed according to CISPR 22.
The EUT was placed on a non-conducting 1.0 by 1.5 meter table which is 0.8 meters in height and 0.40 meters away from the vertical wall of the shielded enclosure. Power to the EUT is provided through a Rohde & Schwarz 50 Ω / 50 uH Line Impedance Stabilization Network (LISN) and the support equipment through a separate Solar 50 Ω / 50 uH Line- Conducted Test Facility LISN. Sufficient time for the EUT, support equipment, and test equipment were allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME. The spectrum was scanned from 150kHz to 30 MHz. Each maximum EME was remeasured using an EMI receiver. The detector function of the receiver was set to CISPR quasi- peak and average mode with the bandwidth set to 9 kHz. Each emission was maximized consistent with the typical applications by varying the configuration of the test sample. Interface cables were connected to the available interface ports of the test unit. The effect of varying the position of cables was investigated to find the configuration that produces maximum Diagram emission. Excess cable lengths were bundled at the centre with 30- 40cm. in length. The worst-case configuration is noted in the test report and the photographs are attached. Each EME reported was calibrated using the Rohde & Schwarz SMX signal generator and are listed on Table 1. RFI Conducted FCC Class B

RFI CONDUCTED	FCC CLASS B Limits dB(uV/m)	CISPR 22 CLASS B Limits dB(uV/m)	
Freq. Range	FCC Class B Quasi-Peak	CISPR 22 Quasi-Peak	CISPR 22 Average
150kHz - 0.5MHz	48*	66-56**	56-46**
0.5MHz - 5MHz	48	56	46
5MHz - 30MHz	48	60	50
*FCC Class B limits starts from 450kHz **Limits decreases linearly with the logarithm of frequency			

Table 1. CISPR 22 CLASS B RFI Conducted Limits

4.3 Description of Tests (Radiated)

Radiated Emissions

Preliminary measurements were made indoors at 1 meter using broadband antennas, broadband amplifier, and spectrum analyzer to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The spectrum was scanned from 30 to 300 MHz using biconical antenna, 300 to 1000 MHz using log- periodic antenna, and above 1 GHz using linearly polarized horn antennas. Final measurements were made outdoors at 10-meter test range using Dipole antennas and EMI receiver. For frequencies above 1 GHz, horn antennas were used. Sufficient time for the EUT, support equipment, and test equipment were allowed in order for them to warm up to their normal operating condition. The EMI receiver detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 120 kHz. The EUT, support equipment, and interconnecting cables were arranged to the configuration that produces the maximum EME emission found during preliminary scan. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission. Horizontal and vertical antenna polarizations were checked. Each emission was maximized by: varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and/ or support equipment, and powering the monitor the computer aux AC outlet, if applicable; and changing the polarity of the antenna, whichever determined the worst-case emission.

ITE Radiated Limits			
Frequency (MHz)	**FCC Limit @ 3m. Quasi-Peak dB[μV/m]**	**FCC Limit @ 10m.* Quasi – Peak dB [μV/m]**	**CISPR Limit @ 10m. Quasi-Peak dB [μV/m]**
30-88	**40.0**	**29.5**	**30.0**
88-216	**43.5**	**33.0**	**30.0**
216-230	**46.0**	**35.6**	**30.0**
230-960	**46.0**	**35.6**	**37.0**
960-1000	**54.0**	**43.5**	**37.0**
> 1000	**54.0**	**43.5**	**No Specified Limit**
*** Limit extrapolated 20 dB/decade**			

Table 2. Radiated Class B limits @ 10-meters

5.1 Support Equipment Used

DEVICE TYPE	MANUFACTURER	MODEL NUMBER	FCC ID / DoC	CONNECTED TO
MONITOR (EUT)	IMAGEQUEST CO., LTD.	V780	PJIC17R07080	HOST
PC(HOST)	H/P	DTPC-17	DoC	N/A
VIDEO CARD	DIAMOND	3D3000	DoC	HOST
KEY BOARD	H/P	5181	DoC	HOST
MOUSE	MICROSOFT	Intellimouse optical USB and PS/2 compatible	DoC	HOST
PRINTER	H/P	C6410A	DoC	HOST
MODEM	3COM	56K FAX MODEM	DoC	HOST

5.2 Cable Description

	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (M)
MONITOR(EUT)	N	Y	1.8(P), 1.5(D)
PC(HOST)	N	N/A	1.8(P)
PRINTER	N	Y	2.0(P),1.8(D)
KEY BOARD	N/A	Y	1.8(D)
MODEM	N	Y	1.5(P),1.0(D)
MOUSE	N/A	Y	1.8(D)

The marked "(D)" means the Data Cable and "(P)" means the Power Cable.

5.3 Noise Suppression Parts on Cable. (I/O CABLE)

	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
MONITOR(EUT)	Y	BOTH END	Y	BOTH END
PRINTER	N	N/A	Y	BOTH END
KEY BOARD	N	N/A	Y	PC END
MODEM	N	N/A	Y	BOTH END
MOUSE	N	N/A	Y	PC END

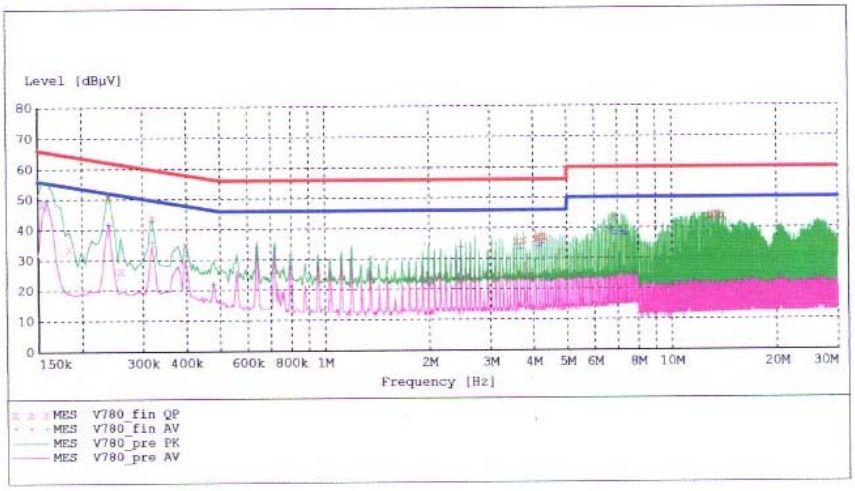
6.1 LINE-CONDUCTED TEST DATA

HYUNDAI C-TECH.
EMC Testing Laboratory

EUT:	V780
Manufacturer:	IMAGEQUEST
Operating Condition:	1280 X 1204 75Hz
Test Site:	SHIELD ROOM
Operator:	KH-SEO
Test Specification:	CISPR 22 CLASS B
Comment:	N
Start of Test:	1/3/03 / 11:44:09AM

SCAN TABLE: "EN 55022 Voltage #1"
Short Description: EN 55022 Voltage

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	500.0 kHz	5.0 kHz	MaxPeak Average	10.0 ms	9 kHz	ESH2-Z2 (50 Ohms)
500.0 kHz	5.0 MHz	5.0 kHz	MaxPeak Average	10.0 ms	9 kHz	ESH2-Z2 (50 Ohms)



MEASUREMENT RESULT: "V780_fin QP"
1/3/03 11:48AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.155000	48.50	10.1	66	17.3	1	---
0.185000	33.60	10.0	64	30.6	1	---
0.240000	50.80	10.0	62	11.3	1	---
0.260000	26.50	10.0	61	34.9	1	---
0.320000	44.00	10.0	60	15.7	1	---
0.400000	34.80	10.1	58	23.0	1	---
3.595000	35.70	10.4	56	20.3	1	---
3.755000	36.20	10.4	56	19.8	1	---
4.075000	36.60	10.4	56	19.4	1	---
4.155000	36.90	10.4	56	19.1	1	---
4.235000	37.40	10.4	56	18.6	1	---
4.315000	37.10	10.4	56	18.9	1	---
6.870000	43.70	10.6	60	16.3	1	---
12.860000	43.80	10.9	60	16.2	1	---

Page 1/2 1/3/03 11:53AM V780

MEASUREMENT RESULT: "V780_fin QP"
(continued)

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
13.100000	44.00	10.9	60	16.0	1	---
13.500000	44.40	10.9	60	15.6	1	---
13.740000	44.10	11.0	60	15.9	1	---
14.060000	43.70	11.0	60	16.3	1	---

MEASUREMENT RESULT: "V780_fin AV"
1/3/03 11:48AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.160000	49.60	10.1	56	5.9	1	---
0.240000	41.70	10.0	52	10.4	1	---
0.320000	35.90	10.0	50	13.8	1	---
0.380000	27.70	10.0	48	20.6	1	---
0.400000	31.60	10.1	48	16.3	1	---
0.480000	22.00	10.1	46	24.3	1	---
0.640000	33.90	10.1	46	12.1	1	---
0.720000	33.70	10.1	46	12.3	1	---
2.475000	34.20	10.3	46	11.8	1	---
3.675000	33.20	10.4	46	12.8	1	---
4.155000	34.00	10.4	46	12.0	1	---
4.235000	35.00	10.4	46	11.0	1	---
6.710000	39.80	10.6	50	10.2	1	---
6.790000	39.10	10.6	50	10.9	1	---
6.870000	37.70	10.6	50	12.3	1	---
7.190000	38.80	10.6	50	11.2	1	---
7.270000	38.60	10.6	50	11.4	1	---
7.350000	37.70	10.6	50	12.3	1	---

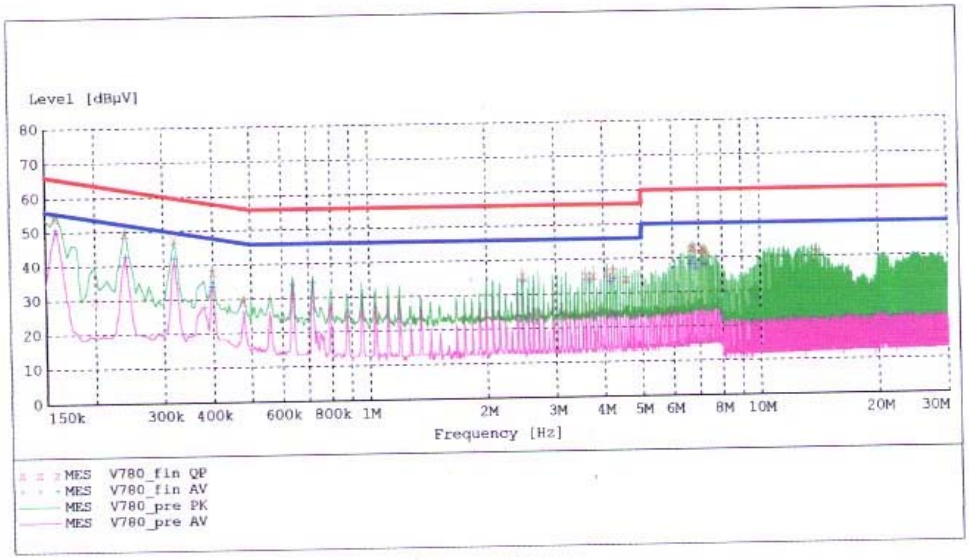
Page 2/2 1/3/03 11:53AM V780

HYUNDAI C-TECH.
EMC Testing Laboratory

EUT:	V780
Manufacturer:	IMAGEQUEST
Operating Condition:	1280 X 1204 75Hz
Test Site:	SHIELD ROOM
Operator:	KH-SEO
Test Specification:	CISPR 22 CLASS B
Comment:	H
Start of Test:	1/3/03 / 11:55:12AM

SCAN TABLE: "EN 55022 Voltage #1"
Short Description: EN 55022 Voltage

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	500.0 kHz	5.0 kHz	MaxPeak Average	10.0 ms	9 kHz	ESH2-Z2 (50 Ohms)
500.0 kHz	5.0 MHz	5.0 kHz	MaxPeak Average	10.0 ms	9 kHz	ESH2-Z2 (50 Ohms)



MEASUREMENT RESULT: "V780_fin QP"
1/3/03 11:59AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.160000	54.10	10.1	66	11.4	1	---
0.200000	30.10	10.0	64	33.5	1	---
0.240000	49.40	10.0	62	12.7	1	---
0.320000	47.70	10.0	60	12.1	1	---
0.400000	37.70	10.1	58	20.2	1	---
0.480000	29.30	10.1	56	27.0	1	---
2.475000	35.50	10.3	56	20.5	1	---
3.595000	35.20	10.4	56	20.8	1	---
3.755000	35.20	10.4	56	20.8	1	---
4.075000	36.10	10.4	56	19.9	1	---
4.235000	36.50	10.4	56	19.5	1	---
4.555000	34.10	10.4	56	21.9	1	---
6.710000	42.80	10.6	60	17.2	1	---
6.790000	43.10	10.6	60	16.9	1	---

Page 1/2 1/3/03 12:00PM V780

MEASUREMENT RESULT: "V780_fin QP"
(continued)

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
7.110000	42.60	10.6	60	17.4	1	---
7.190000	42.40	10.6	60	17.6	1	---
7.270000	41.90	10.6	60	18.1	1	---
13.980000	41.10	11.0	60	18.9	1	---

MEASUREMENT RESULT: "V780_fin AV"
1/3/03 11:59AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.160000	50.80	10.1	56	4.7	1	---
0.240000	42.80	10.0	52	9.3	1	---
0.320000	42.10	10.0	50	7.6	1	---
0.380000	27.70	10.0	48	20.6	1	---
0.400000	33.70	10.1	48	14.2	1	---
0.480000	26.20	10.1	46	20.2	1	---
0.640000	34.20	10.1	46	11.8	1	---
0.720000	34.60	10.1	46	11.4	1	---
2.475000	33.80	10.3	46	12.2	1	---
3.675000	33.30	10.4	46	12.7	1	---
4.155000	33.50	10.4	46	12.5	1	---
4.235000	34.40	10.4	46	11.6	1	---
6.630000	38.20	10.6	50	11.8	1	---
6.710000	39.20	10.6	50	10.8	1	---
6.790000	38.30	10.6	50	11.7	1	---
6.870000	36.80	10.6	50	13.2	1	---
7.190000	38.30	10.6	50	11.7	1	---
7.270000	37.90	10.6	50	12.1	1	---

NOTES:

1. **All modes of operation were investigated and the worst-case emissions are reported.**
2. **The CISPR RFI conducted limits are listed on Table 1 (Page 4).**
3. **Line A = Phase Line B = Neutral**
4. **Deviations to the Specifications: None**

** Measurements using CISPR quasi-peak mode.

7.1 RADIATED TEST DATA

Frequency MHz	Reading dBuV	Ant. Factor dB	Cable Loss dB	ANT POL (H/V)	Total dBuV/m	Limit dBuV/m	Margin dB
95.4	11.57	9.44	2.2	V	23.2	30	-6.8
107.3	10.45	11.21	2.3	V	24.0	30	-6.0
149.5	6.00	14.91	2.7	V	23.6	30	-6.4
168.6	8.42	15.62	3.0	V	27.0	30	-3.0
180.5	6.52	15.88	3.0	H	25.4	30	-4.6
224.7	6.15	16.96	3.4	V	26.5	30	-3.5
334.5	12.42	16.38	4.2	V	33.0	37	-4.0
468.1	9.09	18.67	4.9	V	32.7	37	-4.3
501.1	7.76	19.13	5.1	V	32.0	37	-5.0
519.7	8.67	19.54	5.2	V	33.4	37	-3.6
689.9	3.54	22.51	6.0	V	32.1	37	-4.9
748.0	4.82	22.83	6.2	V	33.9	37	-3.1

Radiated Measurements at 10-meters.

1280 x 1024 Non-interlaced @ 75Hz

NOTES:

1. All modes of operation were investigated, and the worst-case emissions are reported.
2. The radiated limits are listed on Table 2 (Page 5).

** AFCL = Antenna Factor (Roberts dipole) and Cable Loss (30 ft. RG58C/U).

*** Measurements using CISPR quasi-peak mode. Above 1GHz, peak detector function mode is used using a resolution bandwidth of 1MHz and a video bandwidth of 1MHz. The peak level complies with the average limit. Peak mode is used with linearly polarized horn antenna and low-loss microwave cable.

8.1 Sample Calculations

$$dB\,\mu V = 20 \log_{10} (mV/m)$$

$$dB\,\mu V = dBm + 107$$

8.2 Example 1:

@ 20.3 MHz

Class B limit	= 250 μV = 47.96 dBμV
Reading	= - 67.8 dBm (calibrated level)
Convert to dbμV	= - 67.8 + 107 = 39.2 dBμV
$10^{(39.2/20)}$	= 91.2 μV
Margin	= 39.2 - 47.96 = - 8.76
	= 8.8 dB below limit

8.3 Example 2:

@ 66.7 MHz

Class B limit	= 100 μV/m = 47.96 dBμV/m
Reading	= - 76.0 dBm (calibrated level)
Convert to dbμV/m	= - 76.0 + 107 = 31.0 dBμV/m
Antenna Factor + Cable Loss	= 5.8 dB
Total	= 36.8 dBμV/m
Margin	= 36.8 - 40.0 = - 3.2
	= 3.2 dB below limit

9.1 Test Equipment

Type	Manufacture	Model Number	CAL Date
EMI Test Receiver	Rohde & Schwarz	ESH3	2002.07.16
EMI Test Receiver	Rohde & Schwarz	ESVP	2002.10.01
EMI Test Receiver	Rohde & Schwarz	ESI40	2002.11.16
EMI Test Receiver	Rohde & Schwarz	ESVS30	2002.07.16
LISN	EMCO	3816/2	2002.11.29
LISN	EMCO	3816/2	2002.08.22
Amplifier	Hewlett-Packard	8447E	2002.08.23
Absorbing Clamp	Rohde & Schwarz	MDS-21	2002.04.24
Dipole Antennas	Rohde & Schwarz	VHAP	2002.07.16
Dipole Antennas	Rohde & Schwarz	UHAP	2002.07.16
Biconical Antenna	Rohde & Schwarz	VHA9103	2002.07.12
Log-Periodic Antenna	Rohde & Schwarz	UHALP9107	2002.07.12
Antenna Position Tower	EMCO	1051-12	N/A
Turn Table	EMCO	1060-06	N/A
Power Analyzer	Voltech	PM 3300	2002.2.16
Reference Network	ImpedanceVoltech	IEC 555	N/A
AC Power Source	PACIFIC	Magnetic Module	N/A
AC Power Source	PACIFIC	360AMX	2002.11.25
Controller	HD GmbH	HD 100	N/A
EMI in Motion	HD GmbH	KMS 560	N/A

10.1 Test Software Used

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The software, contained on a 3-1/2 inch disc, was inserted into drive A and is auto starting on power-up. Once loaded, the program sequentially exercises each system component in turn. The sequence used is :(1) Display test, (2) RS 232 test (3) Key board test,(4) Printer test,(5) FDD test,(6) HDD test. The complete cycle takes about 20 seconds and is repeated continuously. As the keyboard and mouse are strictly input devices, no data is transmitted to them during test. They are however, continuously scanned for data input activity. The video resolution modes setup and change program was used during the radiated and conducted emission testing.

NOTE: This is a sample of the basic program used during the test. However, during testing, a different software program may be used; whichever determines the worst-case condition. In addition, the program used also depends on the number and type of devices being tested.

Actual program used is the “H” pattern in Notepad under Windows environment. All resolution modes (1280x1024, 1024x768, 800x600, 640x480, 720x400, Non-interlaced) were investigated and tested

11.1 Conclusion

The data collected shows that the IMAGEQUEST CO., LTD. 17-inch CRT Monitor **FCC ID: PJIC17R07080**

complies with §15.107 and §15.109 of the FCC Rules.