

## HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.

CORP QA OFFICE / INT'L STANDARD CERTIFICATION TEAM  
SAN 136-1, AMI-RI, BUBAL-EUP, ICHEON-SI, KYOUNKI-DO, 467-701, KOREA  
TEL : +82 31 639 8518 FAX : +82 31 639 8525 www.hctec.co.kr

# CERTIFICATION

Manufacture;  
BTC Korea CO., LTD.  
BTC B'D, 307 Yangjae-Dong, Seocho-Ku,  
Seoul, KOREA (137-130)

Date of Issue : JULY 11, 2001  
Test Report No. : HCT-F01-0701  
Test Site : HYUNDAI CALIBRATION & CERTIFICATION  
TECHNOLOGIES CO., LTD.

FCC ID :

**LAKNF-1800MA**

MODEL / TYPE :

**NF-1800MA**

FCC Rule Part(s):	Part 15 & 2; ET Docket 95-19
Classification:	FCC Class B Peripheral Device (JBP)
Standard(s):	FCC Class B: 1998 (CISPR 22)
Equipment(EUT) Type:	18" LCD Monitor
Max Resolution:	1280X1024 (@75KHz/ 80Hz)
Port/ Connector(s)	15-pin D-sub VGA connector

The device bearing the trade name and model specified above, has been shown to comply 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.(See Test Report if any modifications were made for compliance)

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.

HYUNDAI C-Tech certifies that no party to application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse of 1988,21 U.S.C.853(a).



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



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# 1. GENERAL INFORMATION

## 1.1 Product Description

The BTC Korea CO., LTD. Model NF-1800MA (referred to as the EUT in this report) is a 18" LCD Monitor HOR. Freq. 80KHz w/max. Resolution of 1280X1024 Non-Interlaced. Product specification information described herein was obtained from product data sheet or user's manual.

CHASSIS TYPE	PLASTIC
LIST OF EACH OSC. OR XTAL. FREQ.(FREQ. 1MHz)	12MHz / 14.318MHZ
POWER REQUIREMENT	100 - 240 VAC 60/50Hz 1.5A
NUMBER OF LAYERS	MAIN BOARD 4 LAYER OSD BOARD 2 LAYER POWER BOARD 1 LAYER INVERTER BOARD 2 LAYER LCD MODULE BOARD 2 LAYER
MAX. RESOLUTION	1280X1024 NON-INTERLACED(@80KHz/ 75 Hz)
H-SYNC FREQUENCY RANGE	63.980KHz 79.980KHz
V-SYNC FREQUENCY RANGE	60 Hz 75Hz
LCD SIZE	18" ( LCD Type : LG.PHILIPS LCD LM181E1)

## 1.2 Related Submittal(s) / Grant(s)

**ORIGINAL SUBMITTAL ONLY**

### 1.3 Tested System Details

The Model names for all equipment, plus descriptions used in the tested system (including inserted cards) are:

DEVICE TYPE	MANUFACTURER	MODEL NUMBER	FCC ID / DoC	CONNECTED TO
MONITOR (EUT)	BTC Korea CO., LTD.	NF-1800MA	LAKNF-1800MA	HOST
PC(HOST)	H/P	DTPC-17	DoC	N/A
KEY BOARD	H/P	SK-2501-2D-K	GYUR385K	HOST
PRINTER	H/P	HP895C	DoC	HOST
MODEM	3COM CORPORATION	56K FAX MODEM	DoC	HOST
VIDEO CARD	MATROX	MIL2P/4G	DoC	HOST
MOUSE	H/P	M-S34	DZL211029	HOST

### 1.4 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 10 meters.

### 1.5 Test Facility

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 C63.4 and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated July 24,2000(Confirmation Number: EA90661)

## 2.SYSTEM TEST CONFIGURATION

### 2.1 Justification

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the following components and I/O cards inside the E.U.T were used.

DEVICE TYPE	MANUFACTURE	MODEL/PART NUMBER
MAIN BOARD	COLLINS	LSPB8001001
POWER BOARD	LI SIN INTERNATIONAL	LSE9901B1260
OSD BOARD	COLLINS	LEPB10022002
INVERTOR BOARD	HANKOOK TECH	LEIN1811001
LCD BOARD	LG. PHILIPS	LM181E1

### 2.2 EUT exercise Software

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.

## 2.3 Cable Description

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

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

## 2.4 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	Y	PC END	N	N/A
MODEM	N	N/A	Y	BOTH END
MOUSE	N	N/A	N	N/A

## **2.5 Equipment Modifications**

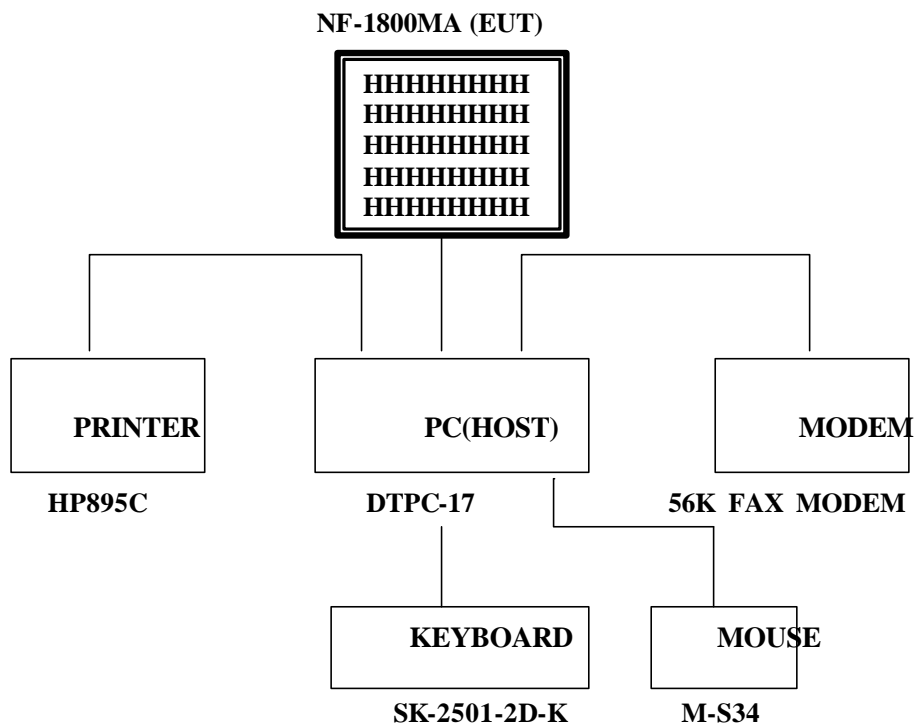
N/A

## 2.6 Configuration of Test system

**Line Conducted Test** : EUT was connected to LISN, all other supporting equipment were connected to another LISN.  
Preliminary Power line Conducted Emission tests were performed by using the procedure in ANSI C63.4/1992 7.2.3 to determine the worse operating conditions.

**Radiated Emission Test** : Preliminary Radiated Emissions tests were conducted using the procedure in ANSI C63.4/1992 8.3.1.1 to determine the worse operating condition. Final Radiated Emission tests were conducted at 10 meter open area test site.

### [Configuration of Tested System]



### 3. PRELIMINARY TESTS

#### 3.1 AC Power line Conducted Emission Tests

During Preliminary Tests, the following operating mode were investigated

Processor Speed (MHz)	Video Resolution (w/max)	The worst operating condition
Pentium 350 MHz	1280X1024 Non-Interlaced (80KHz/75Hz)	X
Pentium 350 MHz	1024 x 768 Non-Interlaced (60KHz/75Hz)	
Pentium 350 MHz	800 x 600 Non-Interlaced (53.7 KHz/85Hz)	
Pentium 350 MHz	640 x 480 Non-Interlaced (31.5KHz/60Hz)	

#### 4.2 Radiated Emission Tests

Processor Speed (MHz)	Video Resolution (w/max)	The worst operating condition
Pentium 350 MHz	1280X1024 Non-Interlaced (80KHz/75Hz)	X
Pentium 350 MHz	1024 x 768 Non-Interlaced (60KHz/75Hz)	
Pentium 350 MHz	800 x 600 Non-Interlaced (53.7 KHz/85Hz)	
Pentium 350 MHz	640 x 480 Non-Interlaced (31.5 KHz/60Hz)	

**NOTE:**

The monitor(EUT) has video interface port(VGA 15 pin D-sub) to support various kinds of graphics adapters. So the test were performed with each video interface port. The final measurement was performed with VGA 15 pin D-sub video interface port that produce the worst case emission.

Tested by Keun- Ho Park / Engineer

Date : JULY 3, 2001

## 4. FINAL CONDUCTED AND RADIATED EMISSION TESTS SUMMARY

### 4.1 Conducted Emission Test

The following table shows the highest levels of conducted emissions on both polarization of hot and neutral line.

Humidity Level	: 37%	Temperature	: 27
Limit apply to	: CISPR 22		
Type of Tests	: CLASS B		
Date	: JULY 5, 2000		
Result	: PASSED BY -7.2 dB		
EUT	: 18" LCD MONITOR		

Operating Condition : 1280X1024 Non-Interlaced (Hf : 80 KHz, Vf : 75Hz)

Detector : CISPR Quasi-Peak (6 dB Bandwidth : 9 KHz)  
CISPR Average(6 dB Bandwidth : 9 KHz)

#### Line Conducted Emission Tabulated Data

Power Line Conducted Emissions			CISPR 22		
Frequency (MHz)	Amplitude (dBuV)	Conductor	Limit (dBuV)	Margin (dB)	Detector Mode
0.180	55.7	N	64.5	-8.8	Quasi-Peak
0.180	45.5	N	54.5	-9.0	Average
0.180	57.3	H	64.5	-7.2	Quasi-Peak
0.240	49.0	H	62.1	-13.1	Quasi-Peak

NOET:

1. All video modes and resolutions were investigated and the worst-case emissions are reported  
Other video modes & resolution were tested and found to be in compliance.

Measured by : Keun-Ho Park / Engineer

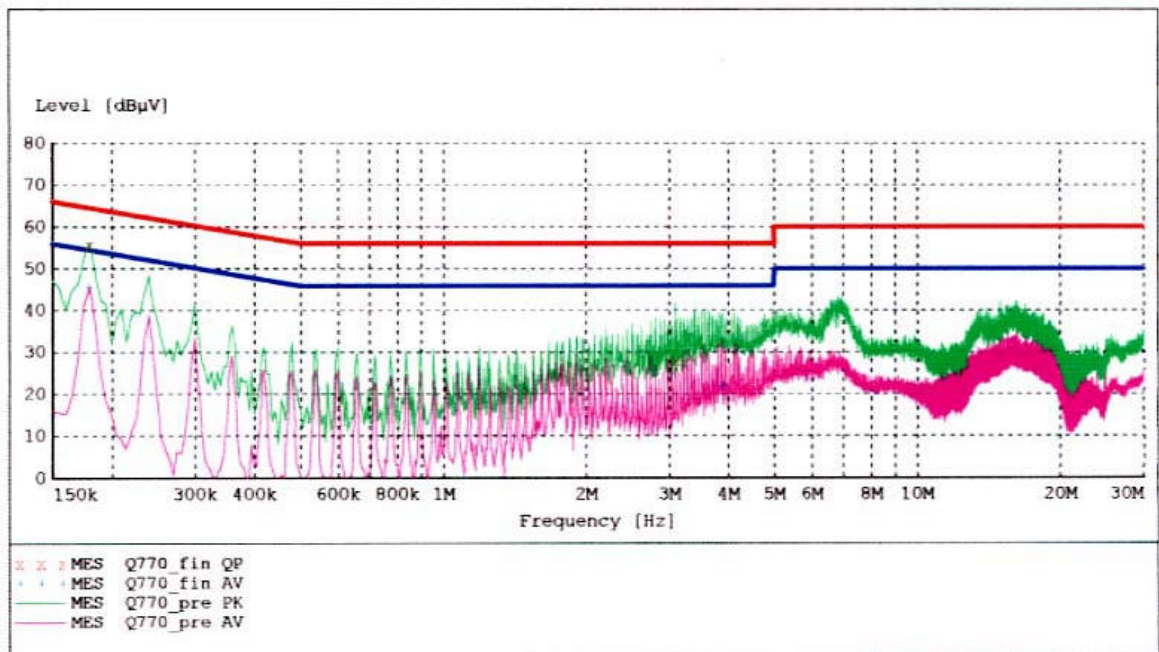
Date : JULY 5, 2000

**HYUNDAI C-TECH. CO., LTD.**  
**EMC TEST LAB.**

EUT: NF-1800MA  
 Manufacturer: BTC CO., LTD.  
 Operating Condition: 1280 X 1024 81K 75Hz  
 Test Site: Shield Room  
 Operator: Keun-Ho Park  
 Test Specification: CISPR 22 Class B  
 Comment: N

**SCAN TABLE: "EN 55022 Voltage"**

Short Description:		EN 55022 Voltage				
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
Frequency 150.0 kHz	2.0 MHz	5.0 kHz	MaxPeak	10.0 ms	9 kHz	CABLE LOSS (NEW)
			Average			
2.0 MHz	30.0 MHz	5.0 kHz	MaxPeak	10.0 ms	9 kHz	CABLE LOSS (NEW)
			Average			


**MEASUREMENT RESULT: "Q770\_fin QP"**

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.180000	55.70	0.5	65	8.8	1	---
3.105000	28.00	0.6	56	28.0	1	---

**MEASUREMENT RESULT: "Q770\_fin AV"**

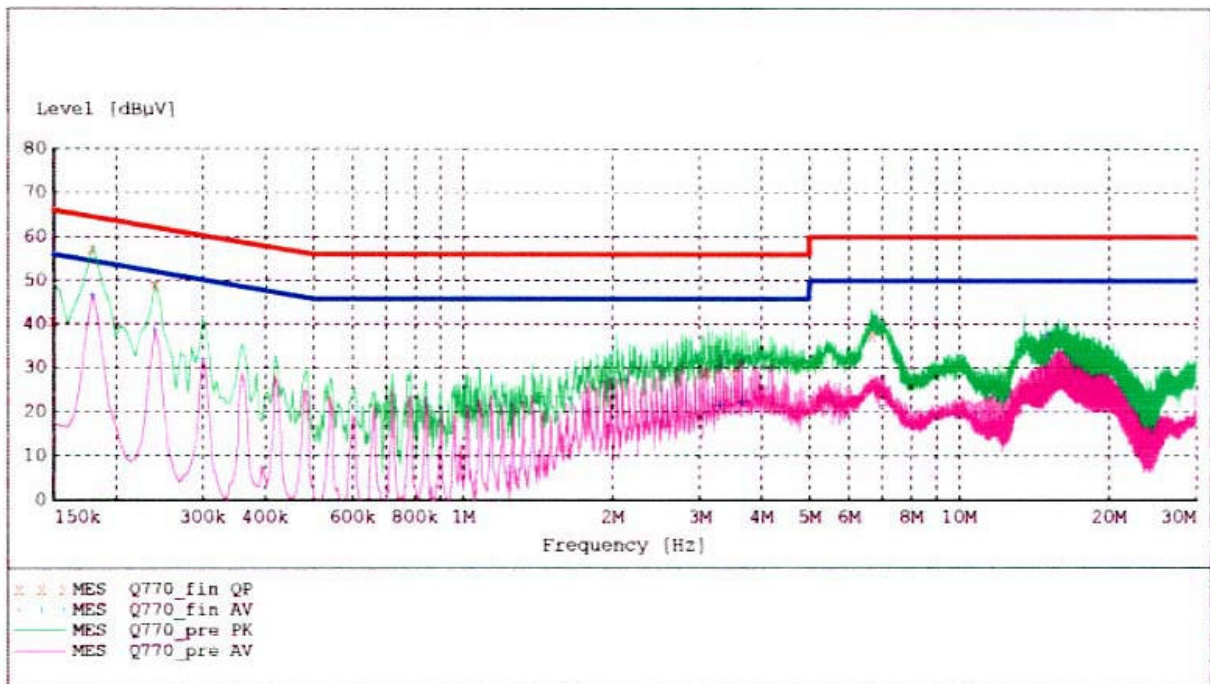
Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.180000	45.50	0.5	55	9.0	1	---
3.885000	22.10	0.7	46	23.9	1	---

**HYUNDAI C-TECH. CO., LTD.**  
**EMC TEST LAB.**

**EUT:** NF-1800MA  
**Manufacturer:** BTC CO., LTD.  
**Operating Condition:** 1280 X 1024 81K 75Hz  
**Test Site:** Shield Room  
**Operator:** Keun-Ho Park  
**Test Specification:** CISPR 22 Class B  
**Comment:** N

**SCAN TABLE: "EN 55022 Voltage"**

Short Description:			EN 55022 Voltage			
Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	2.0 MHz	5.0 kHz	MaxPeak	10.0 ms	9 kHz	CABLE LOSS (NEW)
			Average			
2.0 MHz	30.0 MHz	5.0 kHz	MaxPeak	10.0 ms	9 kHz	CABLE LOSS (NEW)
			Average			



**MEASUREMENT RESULT: "Q770\_fin QP"**

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.150000	40.80	0.5	66	25.2	1	---
0.180000	57.30	0.5	65	7.2	1	---
0.240000	49.00	0.5	62	13.1	1	---
3.125000	29.30	0.6	56	26.7	1	---
3.485000	28.80	0.7	56	27.2	1	---
6.700000	37.30	1.1	60	22.7	1	---

## 4.2 Radiated Emissions Tests

The following table shows the highest levels of Radiated Emissions on both polarization of horizontal and vertical.

Humidity Level : 39 %                      Temperature : 29  
 Limit apply to : CISPR 22  
 Type of Tests : CLASS B  
 Date : JULY 6, 2001  
 Result : PASSED BY -3.6 dB

EUT : 18" LCD MONITOR  
 Operating Condition : 1280X1024 Non-Interlaced (Hf :80 kHz, Vf : 75 Hz)  
 Detector : CISPR Quasi-Peak (6 dB Bandwidth : 120 KHz)

Frequency MHz	Reading dBuV	Ant. Factor dB	Cable Loss dB	ANT POL (H/V)	Total dBuV/m	Limit dB	Margin dB
57.0	14.30	8.80	1.60	V	24.7	30.0	-5.3
134.2	8.52	14.28	2.50	V	25.3	30.0	-4.7
136.0	7.96	14.34	2.50	V	24.8	30.0	-5.2
167.8	6.01	14.89	2.70	V	23.6	30.0	-6.4
206.9	5.01	15.99	3.00	V	24.0	30.0	-6.0
229.1	5.91	17.19	3.30	V	26.4	30.0	-3.6
335.5	8.88	16.12	3.90	V	28.9	37.0	-8.1
391.5	10.67	16.53	4.20	V	31.4	37.0	-5.6
407.2	11.16	16.64	4.20	V	32.0	37.0	-5.0
418.2	8.65	16.85	4.20	V	29.7	37.0	-7.3
671.2	2.56	22.24	6.00	V	30.8	37.0	-6.2

### NOTE:

- 1.All video modes and resolutions were investigated and the worst-case emissions are reported.
- 2.Other video modes & resolution were tested and found to be in compliance.
3. The EUT was test up to 2GHz and no significant emission was found.

Measured by : Keun-Ho Park / Engineer

Date : JULY 6, 2001

## 5. Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor.

The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF$$

where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

Assume a receiver reading of 21.5 dBuV is obtained. The Antenna Factor of 7.4 and a Cable Factor of 1.1 is added. The 30 dBuV/m value was mathematically converted to its corresponding level in uV/m.

$$FS = 21.5 + 7.4 + 1.1 = 30 \text{ dBuV/m}$$

$$\text{Level in uV/m} = \text{Common Antilogarithm} [(30 \text{ dBuV/m})/20] = 31.6 \text{ uV/m}$$

## 6. LIST OF TEST EQUIPMENT

<b>TYPE</b>	<b>MANUFACTURE</b>	<b>MODEL</b>	<b>CAL. DATE</b>
EMI Test Receiver	Rohde & Schwarz	ESH3	2001.6.26
EMI Test Receiver	Rohde & Schwarz	ESVP	2001.2.14
EMI Test Receiver	Rohde & Schwarz	ESI40	2001.1.18
EMI Test Receiver	Rohde & Schwarz	ESVS30	2001.6.26
Spectrum Monitor	Rohde & Schwarz	EZM	N.A
Graphic Plotter	Rohde & Schwarz	DOP2	N.A
Printer	Rohde & Schwarz	PDN	N.A
Spectrum Analyzer	H.P	8591EM	2000.7.11
LISN	EMCO	3825/2	2000.10.13
LISN	Rohde & Schwarz	ESH2-Z5	2000.7.14
Amplifier	Hewlett-Packard	8447E	2001.3.6
Dipole Antennas	Rohde & Schwarz	VHAP	2001.6.28
Dipole Antennas	Rohde & Schwarz	UHAP	2001.6.28
Biconical Antenna	Rohde & Schwarz	BBA-9106	2001.6.28
Log-Periodic Antenna	Rohde & Schwarz	UHALP-9107	2001.6.26
Antenna Position Tower	EMCO	1051-12	N.A
Turn Table	EMCO	1060-06	N.A
Line Filter	KEENE	ULW 2X30-60	N.A
Power Analyzer	Voltech	PM 3300	2000.12.20
Reference Network Impedance	Voltech	IEC 555	N.A
AC Power Source	PACIFIC	Magnetic Module	N.A
AC Power Source	PACIFIC	360AMX	N.A