

FCC PART 15 CLASS B EMI MEASUREMENT AND TEST REPORT

FOR

Finecom Co., Ltd.
Fine Bldg. 673-5 Dungchon-Dong,
Kangseo-Ku, Seoul 157-030,
KOREA

MODEL: FLM-520

Issued Date: December 4, 2000
Report No.: THRU-F2k1204B

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| This Report Concerns: <input checked="" type="checkbox"/> Original Report | Equipment Type: TFT-LCD Monitor FLM-520 |
| Test Date: December 1, 2000 | |
| Tested By:  K. M. Choi - Test Engineer | |
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Note: This report may not be duplicated except in full without prior written consent of Thru Lab. & Engineering.

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1 - General Information

1.1 Test Facility

The open area test site used by Thru Lab. & Engineering to collect radiated and conducted emissions measurement data is located in the 389 JeArm-Rhi, HyangNam-Myun, HwaSung-Gun, KyungKi-Do, Korea.

Test sites at Thru Lab. & Engineering has been fully described in reports submitted to the Federal Communication Commission and the details of the reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules. The test facility also complies with the radiated and AC line conducted test site criterion in ANSI C63.4-1992.

The Federal Communications Commission has the reports on file and is listed under Registration Number 92583. Thru Lab. & Engineering is a Test Facility. The scope of the accreditation covers the FCC Method - 47 CFR Part 15 or 18 of the Commission's Rules.

1.2 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-1992, 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.

All radiated and conducted emissions measurements were performed at Thru Lab. & Engineering. The radiated testing was performed at an antenna-to-EUT distance of 10 meters for Class A devices and 3 meters for Class B devices.

1.3 Test Equipment List

| Description | Model Number | Serial Number | Manufacturer | Cal. Due Date |
|----------------------|-----------------|---------------|-----------------|---------------|
| EMI Test Receiver | ESVS 10 | 830489/001 | Rohde & Schwarz | 2001.05.17. |
| Spectrum Analyzer | R3261C | 71720189 | Advantest | 2001.10.04. |
| Biconical Antenna | 94455-1 | 0977 | Eaton | 2001.05.17. |
| Log Periodic Antenna | 3146 | 2051 | EMCO | 2001.05.17. |
| Dipole Antenna Set | TDA25/TDS25.1/2 | 176/200/200 | Electro Metrics | 2001.10.4. |
| LISN | KNW-242 | 8-923-2 | Kyoritsu | None |
| LISN | 8012-50-R-24 | 8379121 | Solar | None |
| Plotter | 7475A | 2210A 02802 | Hewlett Packard | None |
| Signal Generator | SMS | 8721651100 | Rohde & Schwarz | None |

1.4 Product Description for Equipment Under Test (EUT)

Finecom Co., Ltd.'s FLM-520 or the "EUT" as referred to in this report is a display device which transforms analogue signals of graphic inputs (video signals of VGA, SVGA and XGA) into digital signals and displays them on LCD panel. The user can select OSD Menu items by using external keypad to adjust Brightness, Contrast, Color, Position and etc for best working condition. Digital/NTSC/PAL is optionally supported.

Main Features of EUT are:

- Resolution: 1024×768
- Pixel Pitch: 0.297x0.297 mm
- Display Color 262,144 Colors
- Input Video Signal: VGA compatible analog RGB
- Horizontal Frequency: 31~60 KHz
- Vertical Frequency: 56~75 Hz
- Compatibility: IBM VGA, SVGA, XGA
- OSD Control: Brightness, Contrast, Color, Position, Phase
- Speaker: 1.5 watt x 2 speakers
- Power Source: 12V AC-DC adapter (Input 100~240V AC, 50~60Hz)
- Power consumption: 40 watts maximum

1.5 Equipment Under Test (EUT)

| Description | Model Number | Serial Number | Manufacturer | Remarks |
|-----------------|--------------|---------------|-------------------|------------|
| TFT-LCD Monitor | FLM-520 | 280770005 | Finecom Co., Ltd. | 15" |
| Power Supply | PW160 | none | Ault Inc. | AC Adaptor |

1.6 Support Equipment

| Description | Model Number | Serial Number | Manufacturer | Remarks |
|-----------------|--------------|---------------|---------------------|---------|
| Host Computer | ART586C | TRL0080730 | Art Computer | ATX |
| TFT-LCD Monitor | FLM-520 | 280770005 | Finecom Co., Ltd. | EUT |
| Keyboard | BTC-5560 | K71200885 | BTC Korea | PS/2 |
| Mouse | Mouse 2.0 | 02873445 | Microsoft Corp. | PS/2 |
| Printer | C2605 | 3221S66649 | Hewlett Packard | 300dpi |
| Modem | SM1200A1 | 71000230 | Samsung Electronics | 1200bps |
| Zip Drive | Z100USB | PSBL35F137 | Iomega Corp. | USB |

1.7 Host System Configuration

| Description | Model Number | Serial Number | Manufacturer | Remarks |
|---------------|--------------|---------------|-----------------------|--------------|
| Power Supply | ST-250GL | S008016533 | Seventeam Electronics | 250W |
| Motherboard | Richmond AGP | LA700937 | Sambo Computer | ATX |
| Video Adapter | Delphino 128 | DP128A03282 | Dooin Electronics | AGP |
| Hard Drive | PLS-31084A | JQXG917701 | Samsung Electronics | 1.08GB |
| Floppy Drive | SFD-321D/T | J2YD611113 | Samsung Electronics | 3.5" |
| CD-ROM Drive | SCR-831 | 63PH400104 | Samsung Electronics | 8X |
| CPU | Pentium MMX | None | Intel Corp. | 233MHz |
| Memory | SDRAM | None | Samsung Electronics | 64MB |
| Host Chassis | ART586C | TRL0080730 | Art Computer | Middle Tower |

1.8 External I/O Cabling

| Description | Length(m) | Port/From | To/Port | Remarks |
|----------------|-----------|---------------|--------------------|----------|
| Video Cable | 1.2 | VGA/Host | Monitor/Dsub | Shielded |
| Keyboard Cable | 1.8 | Keyboard/Host | Keyboard | Shielded |
| Mouse Cable | 2.0 | Mouse/Host | Mouse | Shielded |
| Printer Cable | 1.5 | Parallel/Host | Printer/Centronics | Shielded |
| Modem Cable | 2.0 | Serial/Host | Modem/RS232 | Shielded |
| USB Cable | 1.0 | USB/Host | Zip Drive/USB | Shielded |

2 - System Test Configuration

2.1 Justification

The system was configured for testing in a typical fashion (as normally used by a typical user). Worst case conducted and radiated emissions are presented in section 3.5 and section 4.6 of this report.

The test was performed with a AGP video adapter for the final qualification test. The Video Input connector (VGA/DB15) provided by the EUT, Video port (VGA/DB15), PS/2 Keyboard/Mouse ports (miniDIN), Parallel port (LPT/DB25), Serial port (COM/DB9) and USB port provided by the host computer were also tested.

2.2 EUT Exercise

The EUT exercising program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The test software, GWBASIC contained on a floppy diskette, is starting on the XGA (1024x768@60Hz) display mode running Windows 98 operating system. Once exercising program software loaded, the program sequentially exercises each system component.

The sequence used is as follows:

- (1) Lines of "H"s are printed on the monitor.
- (2) The printer outputs "H"s.
- (3) A signal was sent to the COM port and USB port.

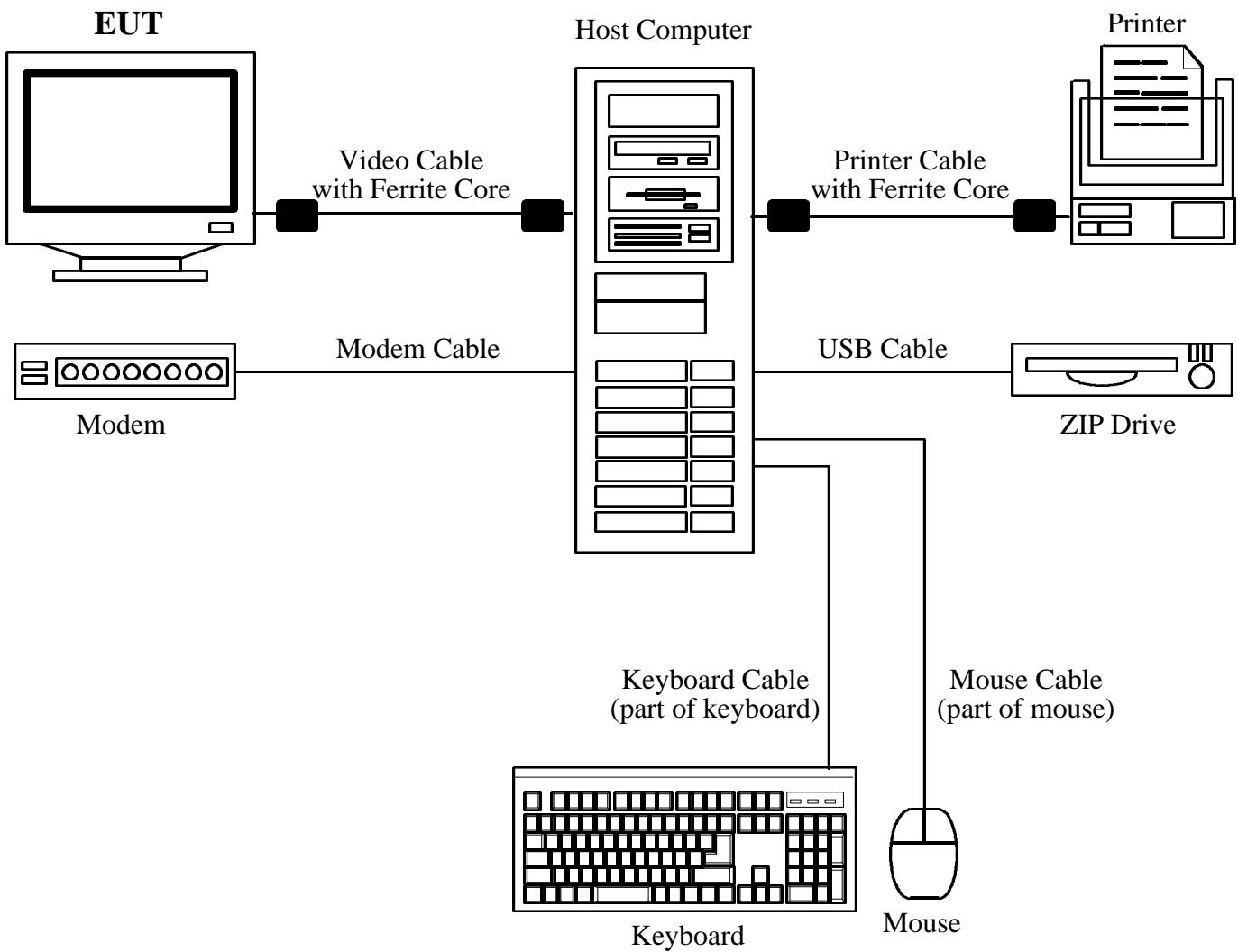
2.3 Special Accessories

As shown in section 2.5, all interface cables used for compliance testing are shielded as normally supplied or by use respective component manufacturers. The Printer, Modem and Monitor featured shielded metal connectors.

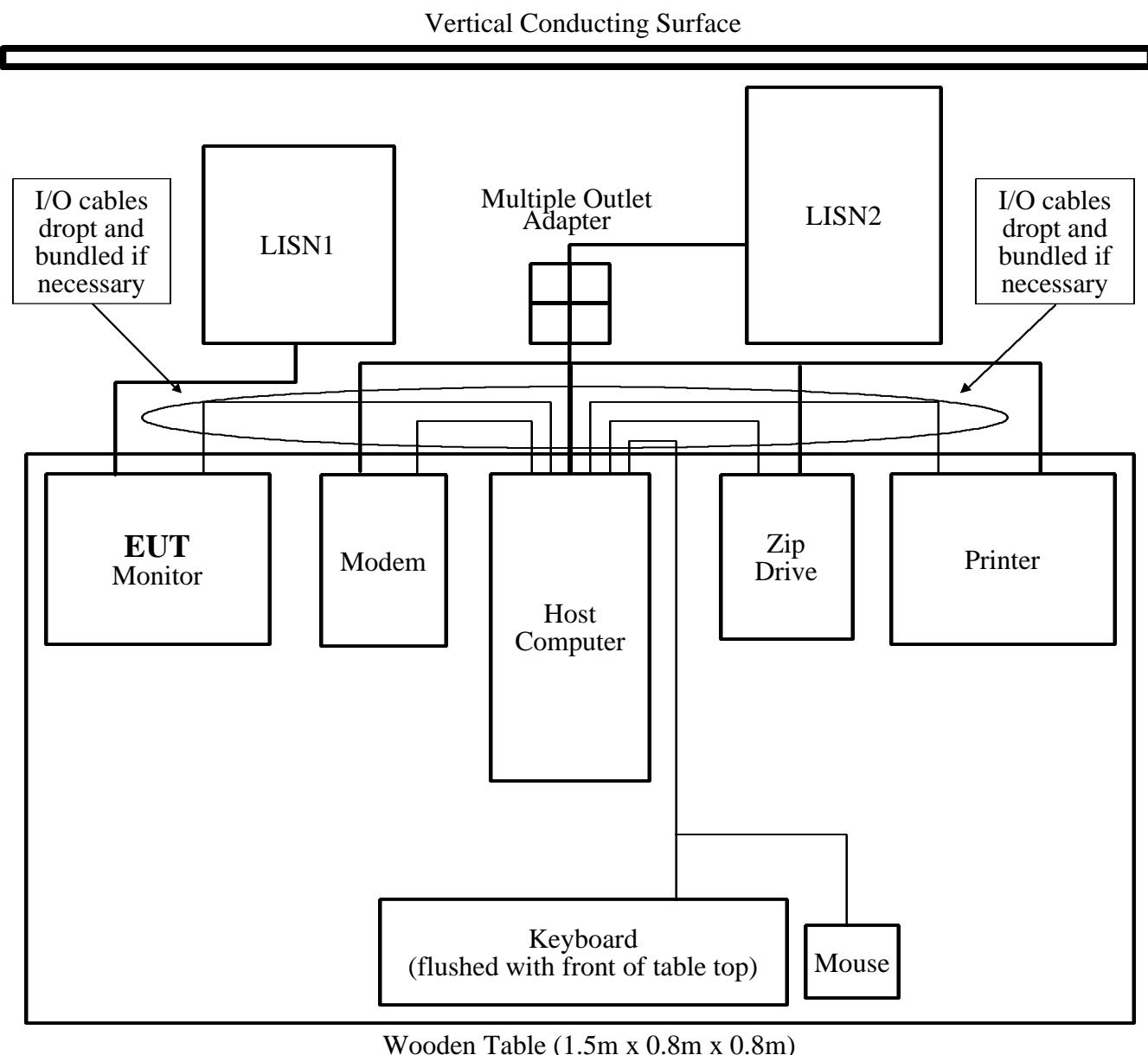
2.4 Schematics/Block Diagram

The EUT schematic or block diagram is presented in Appendix B as reference.

2.5 Configuration of Test System



2.6 Conducted Emissions Test Setup Block Diagram



3 - Conducted Emissions Test

3.1 EUT Setup

The measurement was performed in the screen room of test site, using the setup in accordance with ANSI C63.4-1992 conducted emissions measurement procedure.

The host computer was placed on the center and back edge of the test table. The EUT (TFT-LCD Monitor) and the modem were placed on one side of the host computer with the printer and zip drive on the other side. The rear of the EUT (TFT-LCD Monitor) and all support equipments were flushed with the rear and sides of the tabletop. The keyboard was placed in front of the host computer, flushed with the front of the tabletop. The mouse was placed flushed with the back of the keyboard.

Spacing between the peripherals was approximately 10 centimeters.

3.2 Test Equipment Setup

The spectrum analyzer was configured during the conduction test in as follows:

| | |
|-----------------------|--------|
| Start Frequency | 450kHz |
| Stop Frequency | 30MHz |
| Sweep Speed | Auto |
| IF Bandwidth | 100kHz |
| Video Bandwidth | 100kHz |

3.3 Test Procedure

During the conducted emissions test, the EUT power cord was connected to the auxiliary outlet of the LISN1, and host computer power cord and all other peripherals power cords were connected to the multiple outlet adapter of the LISN2.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance using all installation combination.

All data was recorded in the peak detection mode. Quasi-peak readings were only performed when an emissions was found to be marginal (less than -4dBuV). Quasi-peak readings are distinguished with a "QP".

The conducted emissions test was performed with EUT exercise program loaded, and the emissions were scanned between 0.45MHz to 30MHz on the LINE side and NEUTRAL side, herein referred to as L and N, respectively. The final test data for this test configuration is recorded in the table listed under section 3.5 of this report.

3.4 Summary of Test Results

According to the data in section 3.5, the EUT complied with the FCC Part 15 Class B standards, and had the worst margin reading of:

-8.9dB at 11.265MHz in the Neutral side with the Ault Inc., Model PW160 power supply.

3.5 Conducted Emissions Test Data

| Line Conducted Emissions | | | | FCC Part15 Class B | | |
|--------------------------|------------------|----------------------|--------------------|--------------------|--------|-------------|
| Frequency (MHz) | Amplitude (dBuV) | Detector Qp/Ave/Peak | Phase Line/Neutral | Limit | | Margin (dB) |
| | | | | (dBuV/m) | (uV/m) | |
| 0.598 | 31.5 | QP | N | 48.0 | 250 | -16.5 |
| 1.762 | 30.2 | QP | N | 48.0 | 250 | -17.8 |
| 4.260 | 31.9 | QP | L | 48.0 | 250 | -16.1 |
| 9.803 | 35.7 | QP | L | 48.0 | 250 | -12.3 |
| 10.750 | 38.8 | QP | L | 48.0 | 250 | -9.2 |
| 11.265 | 39.1 | QP | N | 48.0 | 250 | -8.9 |

3.6 Plot of Conducted Emissions Test Data

Plot(s) of conducted emissions test data for the Ault Inc., Model PW160 power supply is presented in Appendix A of this report as reference.

4 - Radiated Emissions Test

4.1 EUT Setup

The radiated emissions tests were performed in the open area test site, using the setup in accordance with ANSI C63.4-1992 radiated emissions measurement procedure.

The host computer was placed on the center of the test table. The EUT (TFT-LCD Monitor) and the modem were placed on one side of the host computer with the printer and zip drive on the other side. The keyboard was placed in front of the host computer, flushed with the front of the tabletop. The mouse was placed flushed with the front of the keyboard.

Spacing between the peripherals was approximately 10 centimeters.

4.2 Test Equipment Setup

During the radiated emissions test, the EMI test receiver was set with the following configurations:

| | | |
|-----------------|-------|--------|
| Start Frequency | | Manual |
| Stop Frequency | | Manual |
| IF Bandwidth | | 120kHz |
| Sweep Time | | 10msec |
| Sweep Speed | | Auto |

4.3 Test Procedure

For the radiated emissions test, the EUT and all support equipments power cords was connected to the AC floor outlet.

Maximizing procedure was performed on the six (6) highest emissions to verify that the EUT complied with all installation combination.

The radiated emissions test was performed with EUT exercise program loaded, and the emissions were scanned between 30MHz to 1000MHz. At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from 1 to 4 meters in order to determine the maximum emission levels. Measurements were taken using both HORIZONTAL and VERTICAL antenna polarization. The final test data for this test configuration is recorded in the table listed under section 4.6 of this report.

4.4 Corrected Amplitude and Margin Calculation

The Corrected Amplitude is calculated by adding the antenna and cable Correction Factor from the Indicated Amplitude reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Indicated Amplitude} + \text{Antenna Correction Factor} + \text{Cable Correction Factor}$$

The Margin column of the data table in section 4.6 indicates the degree of compliance with the applicable limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Applicable Limit}$$

4.5 Summary of Test Results

According to the data in section 4.6, the EUT complied with the FCC Part 15 Class B standards, and had the worst margin of:

-3.5dB at 800.00MHz in the Horizontal polarization at an antenna-to-EUT distance of 3 meters.

4.6 Radiated Emissions Test Result Data

| Indicated | | Antenna | | Table | Correction Factor | | Corrected Amplitude | FCC Part15 Class B | | |
|-------------|----------------|--------------|------------|--------------|-------------------|------------|---------------------|--------------------|-------------|--------|
| Freq. (MHz) | Ampl. (dBuV/m) | Polar. (H/V) | Height (m) | Angle (deg.) | Ant. (dB) | Cable (dB) | (dBuV/m) | Limit (dBuV/m) | Margin (dB) | (uV/m) |
| 40.56 | 17.1 | V | 1.2 | 80 | 13.1 | 0.6 | 30.8 | 40.0 | 100 | -9.2 |
| 41.93 | 13.0 | V | 1.4 | 100 | 12.7 | 0.6 | 26.3 | 40.0 | 100 | -13.7 |
| 53.46 | 22.9 | V | 1.4 | 90 | 9.4 | 0.8 | 33.1 | 40.0 | 100 | -6.9 |
| 57.27 | 20.4 | V | 1.5 | 90 | 7.8 | 0.8 | 29.0 | 40.0 | 100 | -11.0 |
| 64.53 | 27.7 | V | 1.4 | 80 | 5.7 | 0.9 | 34.3 | 40.0 | 100 | -5.7 |
| 72.51 | 23.3 | H | 2.5 | 80 | 5.3 | 1.0 | 29.6 | 40.0 | 100 | -10.4 |
| 108.16 | 17.9 | H | 1.9 | 90 | 10.6 | 1.3 | 29.8 | 43.5 | 150 | -13.7 |
| 129.93 | 24.6 | H | 1.4 | 290 | 13.0 | 1.6 | 39.2 | 43.5 | 150 | -4.3 |
| 149.99 | 21.7 | V | 1.0 | 300 | 16.2 | 1.7 | 39.6 | 43.5 | 150 | -3.9 |
| 195.43 | 7.4 | H | 1.7 | 340 | 15.7 | 2.0 | 25.1 | 43.5 | 150 | -18.4 |
| 199.99 | 13.9 | H | 1.6 | 230 | 16.0 | 2.1 | 32.0 | 43.5 | 150 | -11.5 |
| 211.97 | 14.0 | H | 1.4 | 350 | 11.2 | 2.2 | 27.4 | 43.5 | 150 | -16.1 |
| 300.00 | 16.2 | H | 2.1 | 280 | 15.4 | 2.9 | 34.5 | 46.0 | 200 | -11.5 |
| 400.00 | 23.5 | V | 1.0 | 340 | 14.7 | 3.3 | 41.5 | 46.0 | 200 | -4.5 |
| 500.00 | 18.3 | V | 1.0 | 360 | 18.3 | 3.7 | 40.3 | 46.0 | 200 | -5.7 |
| 550.00 | 12.6 | H | 1.9 | 350 | 17.4 | 3.8 | 33.8 | 46.0 | 200 | -12.2 |
| 600.00 | 15.3 | H | 2.3 | 330 | 18.8 | 4.1 | 38.2 | 46.0 | 200 | -7.8 |
| 800.00 | 15.9 | H | 2.2 | 340 | 21.9 | 4.7 | 42.5 | 46.0 | 200 | -3.5 |

5 - Conducted and Radiated Setup Photographs

5.1 Conducted Emissions Photograph: Front View



5.2 Conducted Emissions Photograph: Side View



5.3 Radiated Emissions Photograph: Front View



5.4 Radiated Emissions Photograph: Rear View



6 - Photographs

6.1 EUT: Front View



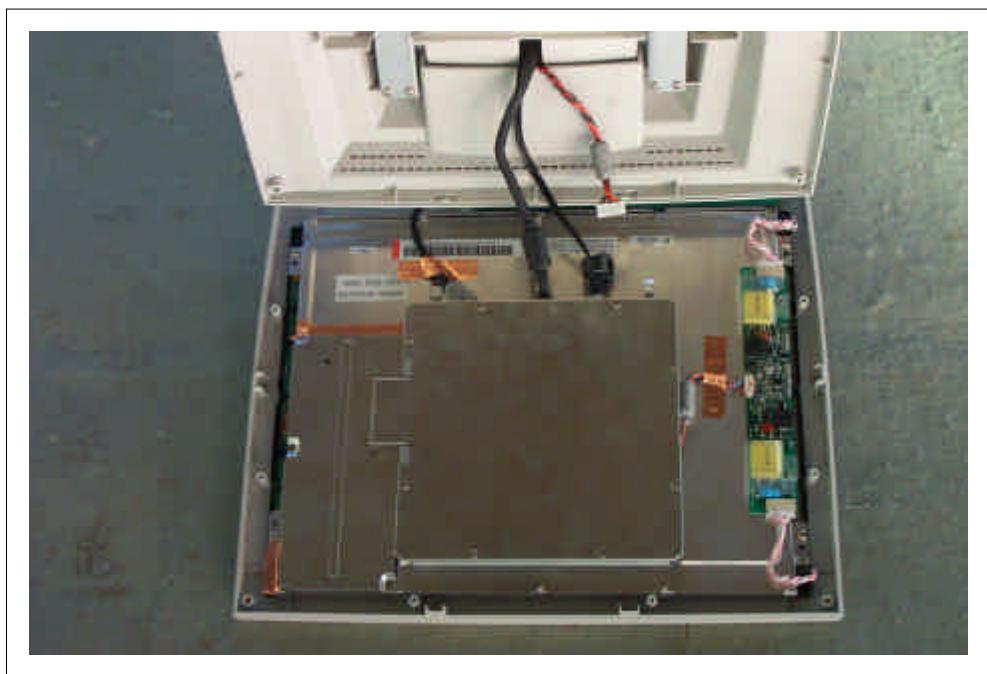
6.2 EUT: Rear View



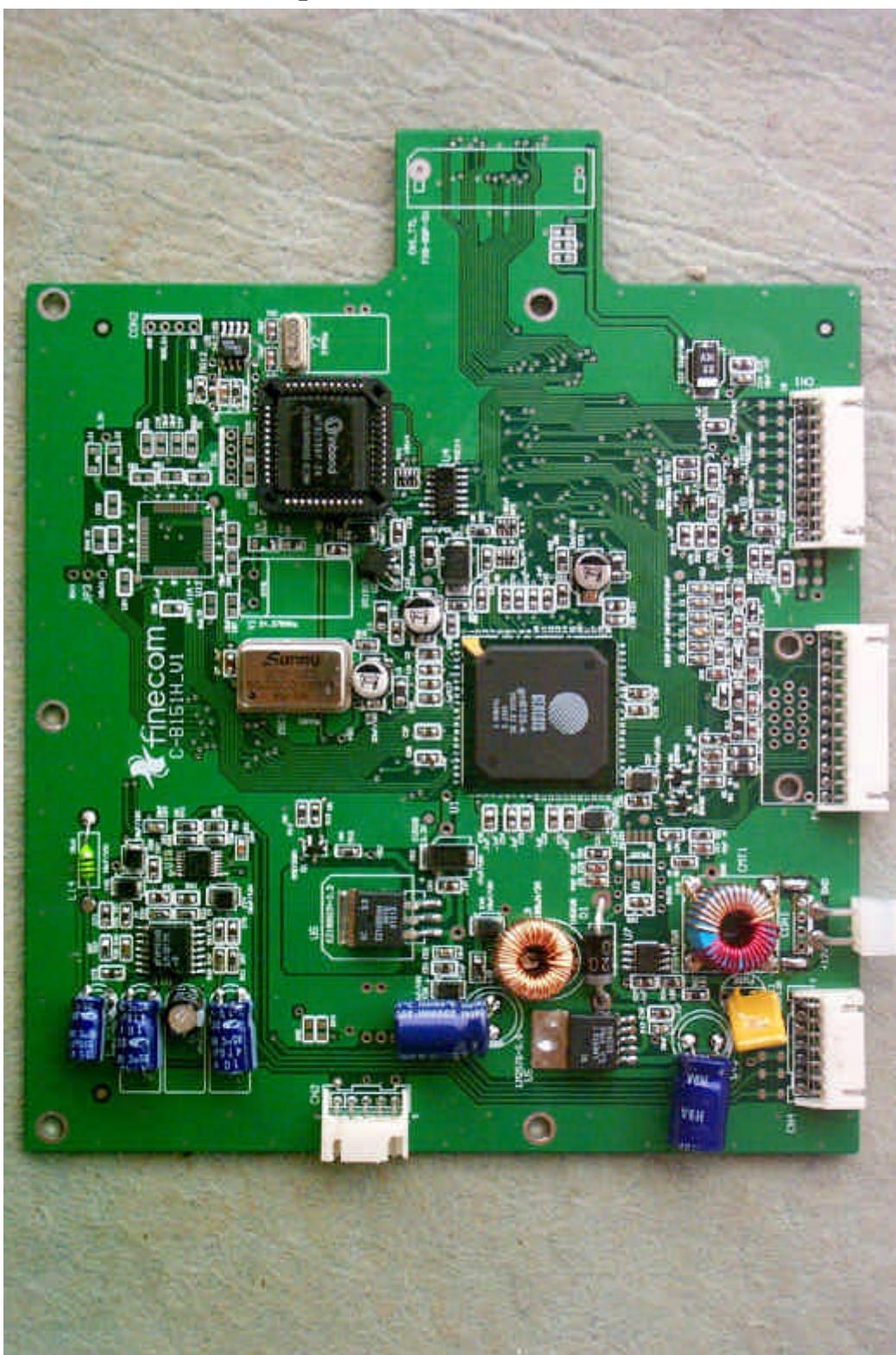
6.3 EUT: Label View



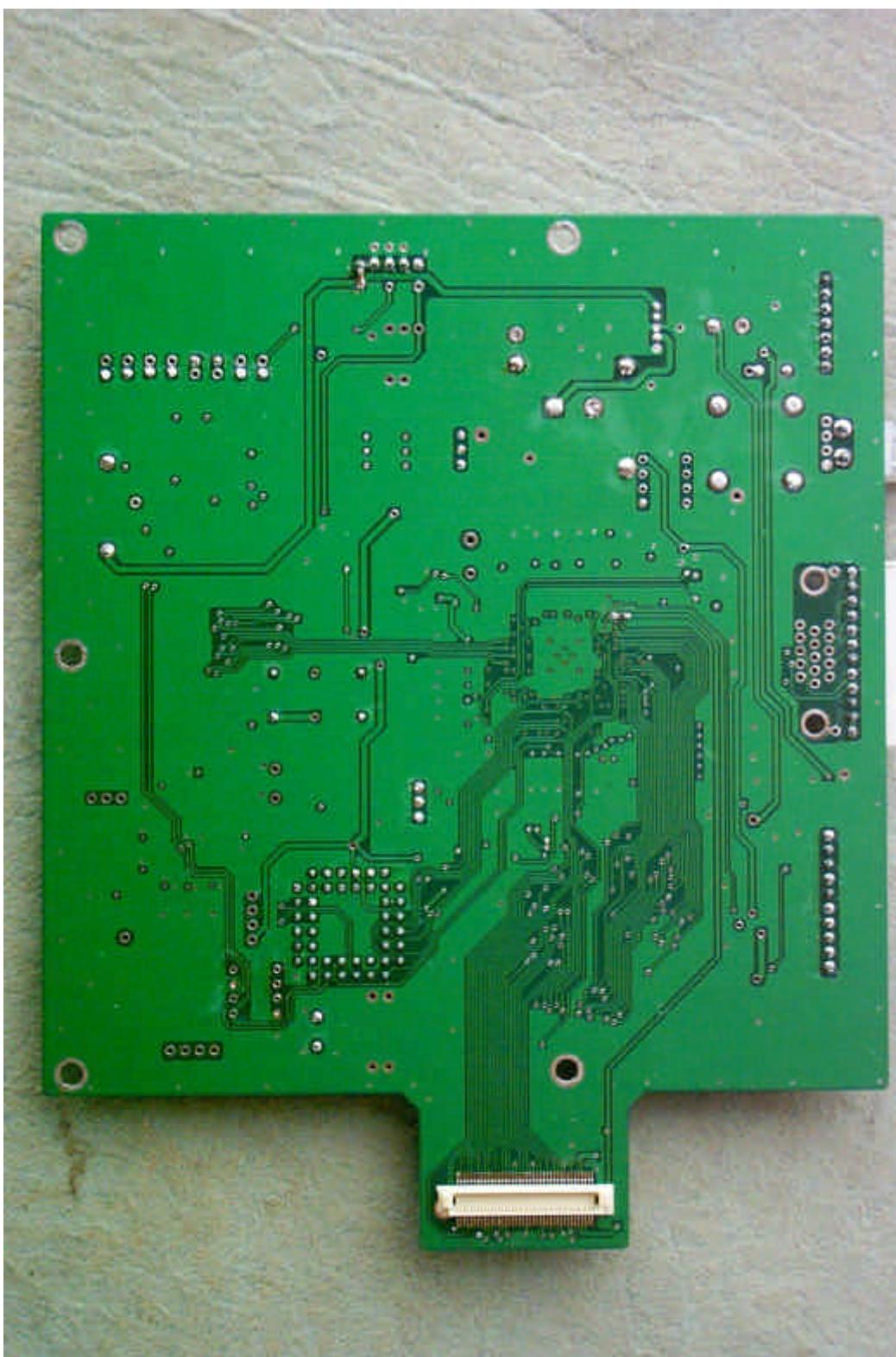
6.4 EUT: Internal View



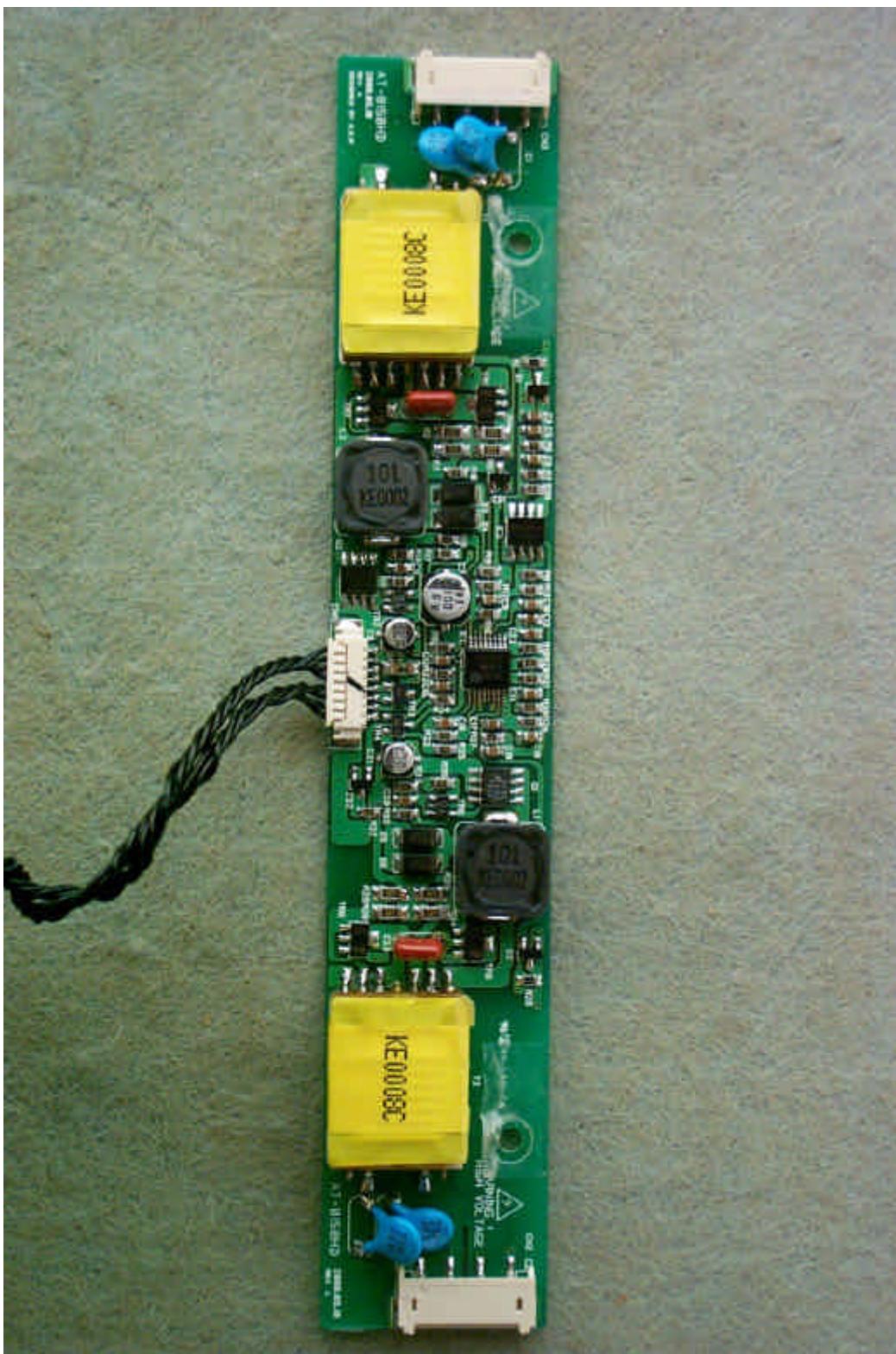
6.5 EUT: Control Board, Component View



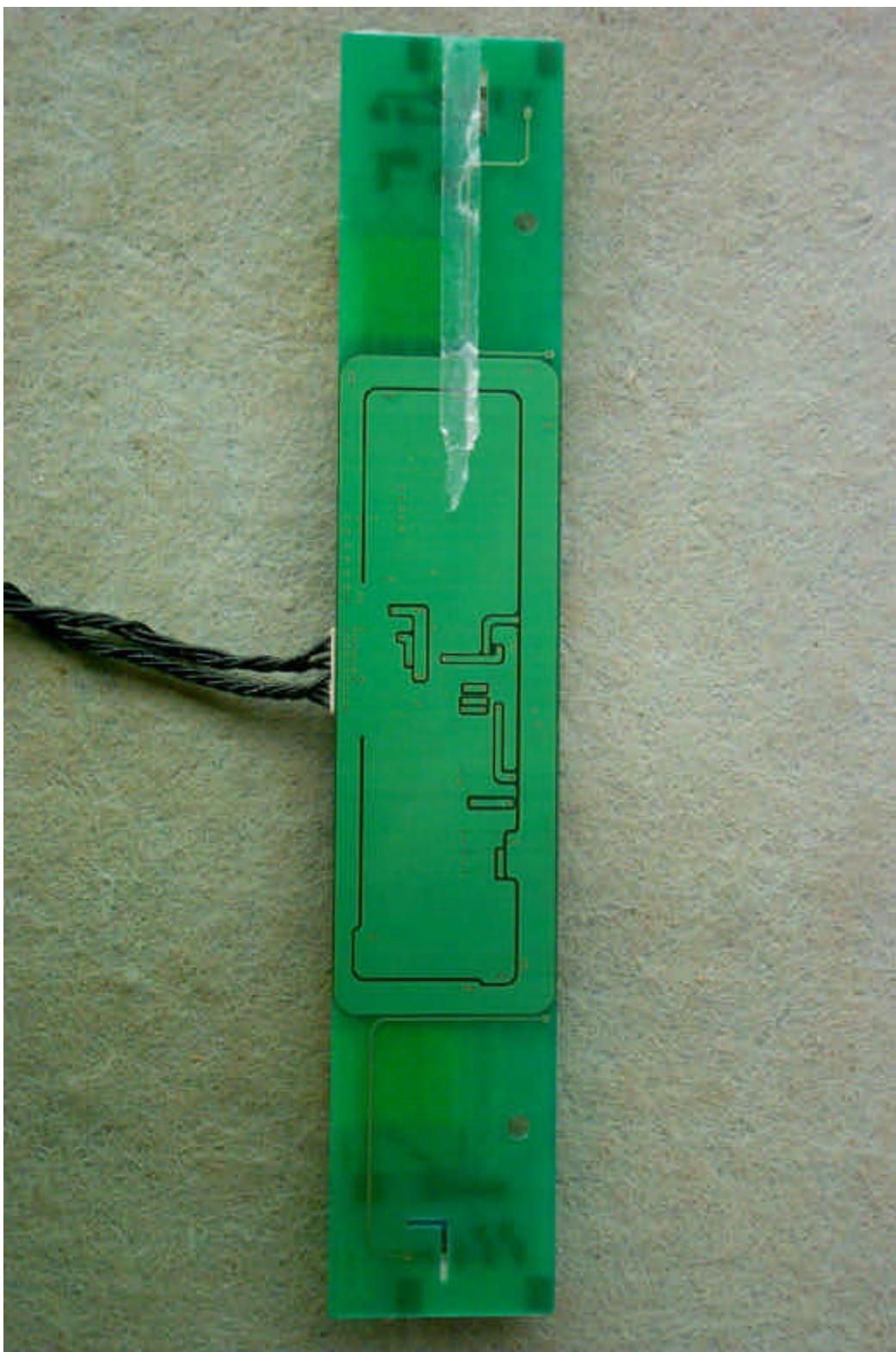
6.6 EUT: Control Board, Circuit View



6.7 EUT: Backlight Board, Component View



6.8 EUT: Backlight Board, Circuit View



7 - FCC Labelling/Statement Requirement

7.1 FCC Label

The device shall bear the following statement in a conspicuous location on the device:

FCCID: xxxFLM-520

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

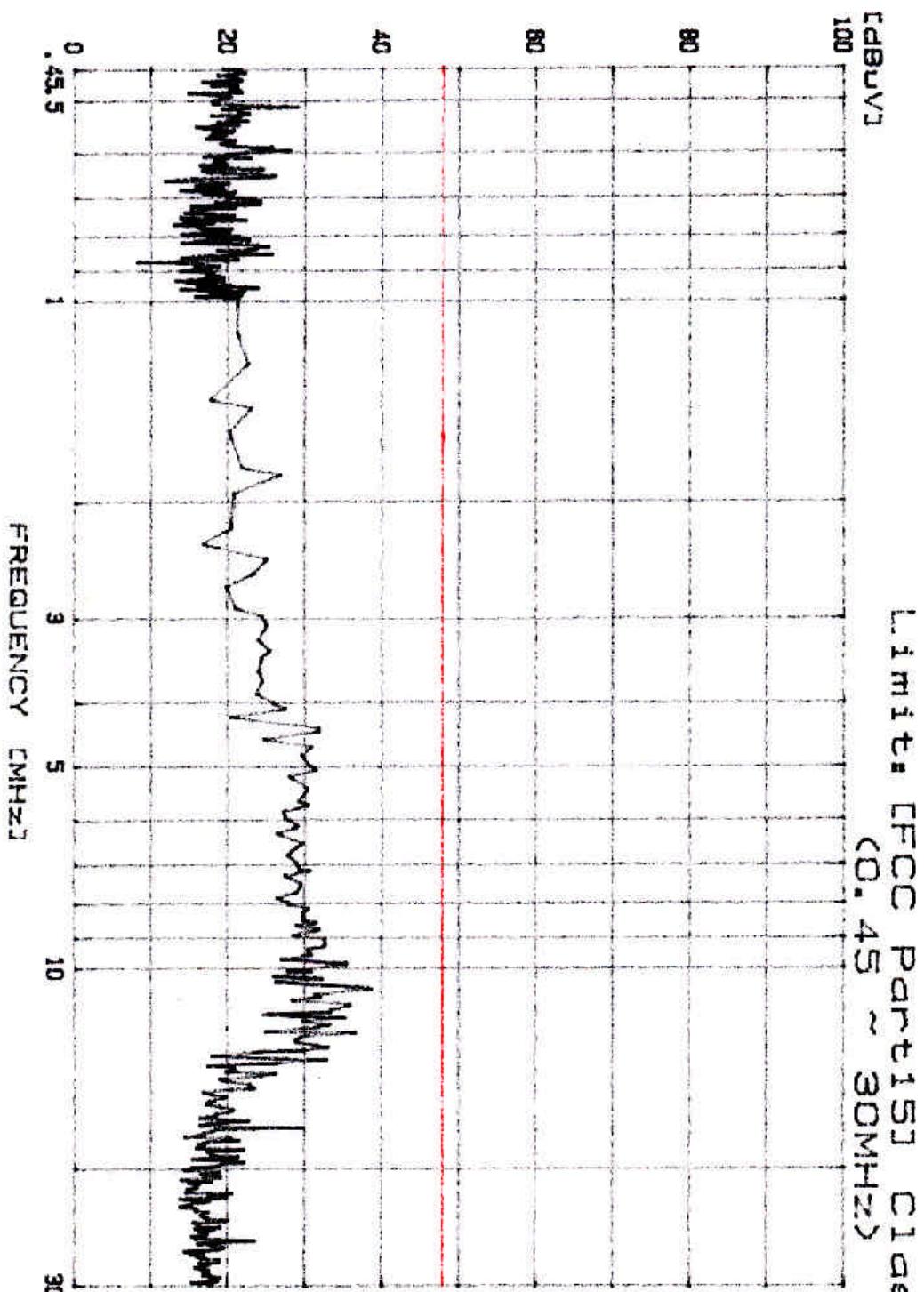
MADE IN KOREA

7.2 FCC Statement

When the device is so small or for such use that it is not practicable to place the statement specified FCC label on it, the information shall be placed in a prominent location in the instruction manual (user's manual) supplied to the user.

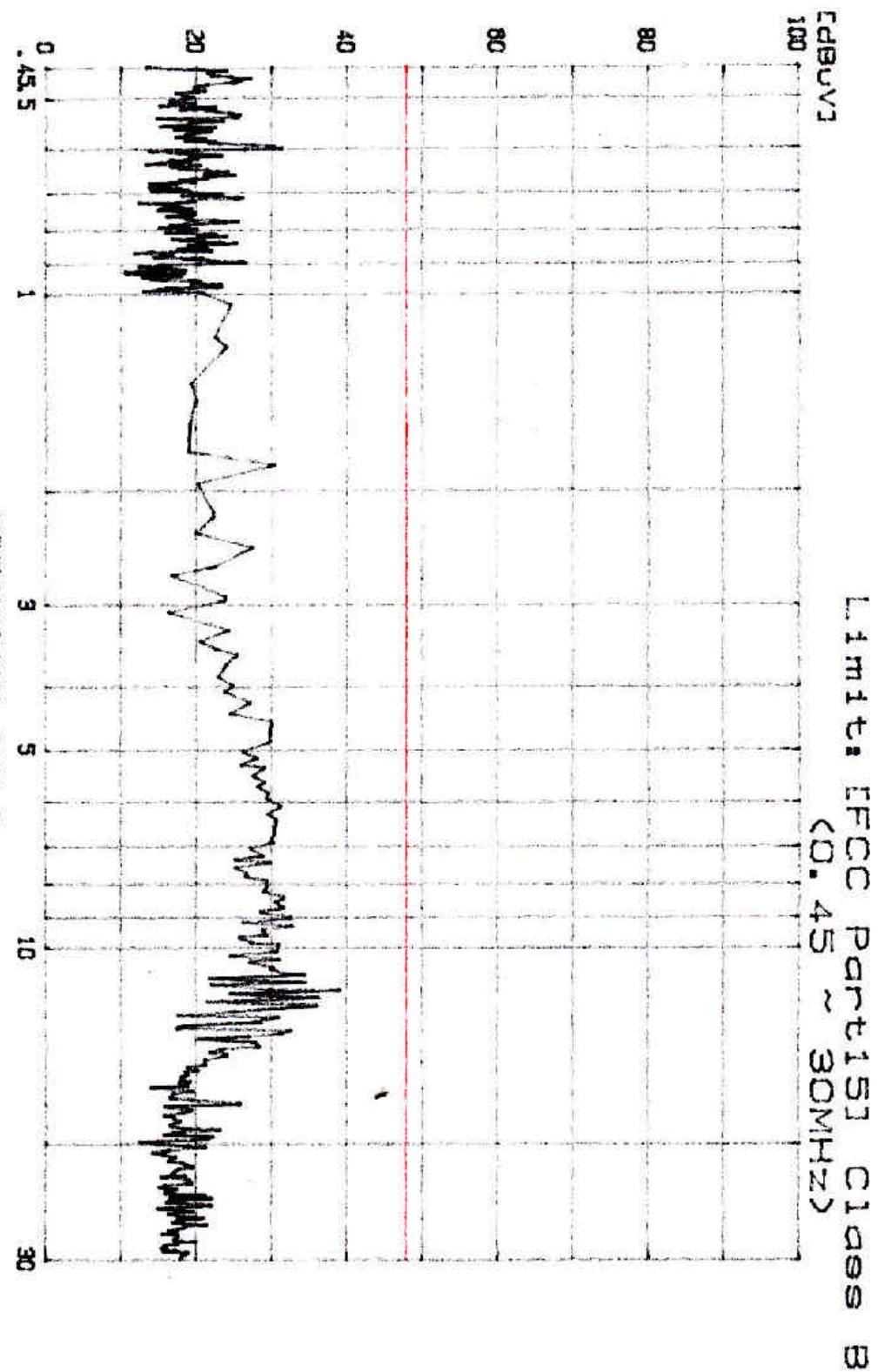


Appendix A - Plot of Conducted Emissions Test Data



December 1, 2000
FINECOM CO., LTD.
MODEL: FLM-520

December 1, 2000
TFT-LCD MONITOR
PHASE: LINE



December 1, 2000
FINECOM CO., LTD.
MODEL: FLM-520

TFT-LCD MONITOR
PHASE: NEUTRAL



Appendix B - EUT Schematics/Block Diagram



Appendix C - User's Manual