

INTERACTIVE  
DISPLAYS

Interactive Displays Limited  
5 Thames Park  
Lester Way  
Wallingford  
Oxfordshire OX10 9TJ  
United Kingdom

Tel: +44 (0) 1491 835984

Fax: +44 (0) 1491 836020

Federal Communications Commission  
Equipment Approval Services  
7435 Oakland Mills Road  
COLUMBIA MD 21046

19<sup>th</sup> February 1999

For the attention of Joe Dichoso – jdichoso@fcc.gov – FCC Application Processing Branch

RE: FCC ID N5B RP-FP-PL  
Interactive Displays Limited  
Correspondence Ref No: 5323  
Reply to your email 12/23/1998.

Dear Mr Dichoso

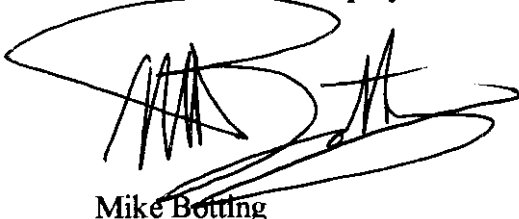
In response to the above email:

|             |                                                                                                                                                                                                                                                                                                                           |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Item 1:     | Photo's of the controller box, with and without the cover lid, and of the circuit board on both sides within this controller box. Please note this is the only circuit within the equipment. The touchscreen has no circuit-board and consists of passive resistance membranes, busbars and electrical circuit wire only. |
| Item 2 & 3: | The touchscreen and controller have been re-tested with peripherals as registered to comply with ANSI C63.4 and the Report No: B0604706/2 dated January 1999 is herewith re-submitted. This includes the line conducted test data and photo's of the configuration.                                                       |

We have uploaded the above via your internet email address for advance advise. The package including photographs and report is being sent by courier by air today.

We trust this will now enable early approval of our application.

Yours sincerely  
**for Interactive Displays Limited**



Mike Botting  
Design & Production Engineer

Enc.

FCC LABORATORY  
087  
Mar 1 5 08 PM '99

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**REPORT ON**

FCC Emissions Testing of a Displaymate Touchscreen

Report No B0604706/2

January 1999

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**REPORT ON** FCC Emissions Testing of a Displaymate Touchscreen  
Report No BO604706/2  
January 1999

**PREPARED FOR** Interactive Displays Limited  
5 Thames Park  
Lesterway  
Wallingford  
Oxfordshire  
OX10 9TS

**APPROVED BY** Jensen Adams  
**J J ADAMS**  
Manager, Civil EMC Test - Birmingham

**DATED** 23<sup>rd</sup> January 1999

**DISTRIBUTION** Mitsubishi Electric 1 Copy  
TÜV Product Service 1 Copy

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Total No of Pages 17

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**1    STATUS PAGE**

|                                      |                                                                                                                                                       |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| OBJECTIVE                            | To undertake measurements to determine the Equipment Under Test's (EUT's) compliance with the specifications.                                         |
| MANUFACTURING DESCRIPTION            | Displaymate Touchscreen                                                                                                                               |
| MANUFACTURER                         | Interactive Displays Ltd                                                                                                                              |
| MANUFACTURERS MODEL NUMBER           | RP96                                                                                                                                                  |
| SERIAL NUMBER                        | Screen (DAV0014) Controller (97242)                                                                                                                   |
| TEST SPECIFICATION NUMBER            | FCC Part 15 Subpart B; 1 <sup>st</sup> January 1997                                                                                                   |
| REGISTRATION NUMBER                  | BO604706/2                                                                                                                                            |
| QUANTITY OF ITEMS TESTED             | One                                                                                                                                                   |
| SECURITY CLASSIFICATION OF EUT       | Unclassified                                                                                                                                          |
| DISPOSAL<br>REFERENCE NUMBER<br>DATE | Service Receipt Note<br>747<br>21 <sup>st</sup> January 1999                                                                                          |
| ORDER NUMBER                         | 1507                                                                                                                                                  |
| START OF TEST<br>FINISH OF TEST      | 21 <sup>st</sup> January 1999<br>21 <sup>st</sup> January 1999                                                                                        |
| TEST ENGINEERS                       | J J Adams<br>J J Laydon<br>M A N Terry                                                                                                                |
| RELATED DOCUMENTS                    | ANSI C63.4 1988. Methods of Measurements of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 10kHz to 1GHz. |

## 2 **BRIEF SUMMARY OF RESULTS**

Table 2 below shows a brief summary of the results obtained.

| Specification and Section Number | Test                                                 | EUT Modification State | Result     |
|----------------------------------|------------------------------------------------------|------------------------|------------|
| FCC Part 15 Subpart B            | Radiated Emissions<br>30MHz - 2000MHz Enclosure Port | 0                      | Pass in MU |
| FCC Part 15 Subpart B            | Conducted Emissions<br>450kHz to 30MHz               | 0                      | Pass in MU |

Table 2

MU = Measurement taken is within the measurement uncertainty of the measurement system.

## 3 **EUT MODIFICATION CHRONOLOGY**

Table 3 below details modifications necessary in order for the EUT to pass the relevant tests applied.

| Modification State | Description of Modification still fitted to EUT | Modification Fitted By | Date Modification Fitted |
|--------------------|-------------------------------------------------|------------------------|--------------------------|
| 0                  | As Supplied by Manufacturer                     | Not Applicable         | Not Applicable           |

Table 3

## **4 SYSTEM CONFIGURATION DURING EMC TESTING**

### **4.1 Emissions Testing**

The Displaymate - Touchscreen Display with all associated cabling was set-up simulating a typical user installation within the test area, then retested in accordance with the specification.

The EUT was supported by a metal frame and placed on a 0.8m high table above the ground plane. The communication cable from the Touchscreen Display was connected via the "controller" to a Personal Computer, operating under Windows 95, and powered with a 110VAC 60Hz supply voltage.

The Personal Computer was running the "Displays" software which continuously monitored the Touchscreen for activation's. A motor operated "mechanical finger" was positioned in front of the Touchscreen. The finger touched the display every  $\frac{3}{4}$  seconds, monitored by the Personal Computer.

### **4.2 Drive Equipment/External Peripherals used during testing**

| ITEM              | MANUFACTURER    | MODEL                        | SERIAL NUMBER |
|-------------------|-----------------|------------------------------|---------------|
| Personal Computer | Hewlett Packard | Pavillion System 3240 DS3344 | NL81340108    |
| Keyboard          | Hewlett Packard | FDA - 104EB                  | FDKB 7248382  |
| Mouse             | Hewlett Packard | P/N 518Z - 8864 M/N M - S 3A | LZB 74760209  |
| Monitor           | Hewlett Packard | D5258A                       | DK 73272094   |

Table 4.2

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## **5 RADIATED EMISSIONS 30MHz to 1000MHz**

### **5.1 Enclosure Port - Test Procedure**

A preliminary profile of the Radiated Emissions was obtained by placing the Equipment Under Test (EUT) in a Characterisation Chamber; measurements were taken at a 3m distance. Measurements of emissions from the EUT were obtained with the Measurement Antenna in Horizontal and Vertical Polarisations. The characterisation produced a list of the highest emissions and their associated antenna polarisation.

The EUT was then transferred to the Open Field Site and placed on a remotely controlled turntable. Using the information from the preliminary profiling of the EUT, a search was made of the frequency spectrum from 30MHz to 1000MHz. The list of the highest emissions was then confirmed or updated under Open Site conditions. These emissions were then formally measured using a Quasi-Peak Detector and measurement bandwidth of 120kHz which meets the CISPR requirements for frequencies below 1000MHz. The readings were maximised by adjusting the antenna height, polarisation and turntable azimuth, in accordance with the specification. The details of these highest emissions were then recorded in the Job Log Book. Details of the highest emissions are presented in Table 5.2.

The emissions have been measured at 3m.

The Radiated Emissions measurements were made using a Rohde and Schwarz ESVP Test Receiver, and a Hewlett Packard Spectrum Analyser above 1000MHz.

The climatic conditions recorded at the time of this test were:-

Temperature - 17.4°C    Relative Humidity - 59.0%rh    Atmospheric Pressure - 1008HPa

The test was performed in accordance with FCC Part 15 Subpart B.

## 5.2 Enclosure Port - Test Results

Equipment Designation : Unintentional Radiator.

The EUT met the Class B requirements of FCC Part 15 Subpart B Paragraph 15.109 (a) for Radiated Emissions, configured at modification state 0, for the test applied.

The emissions have been measured at 3m.

### Open Field Results

The levels of the six highest emissions measured in accordance with the specification are presented in Table 5.2 below.

| Frequency | Pol | Hgt | Azm | Uncorrected Level at 3m | Cable Loss | Antenna Factor | Field Strength at 3m |      | Margin | Specification Limit |       |
|-----------|-----|-----|-----|-------------------------|------------|----------------|----------------------|------|--------|---------------------|-------|
| MHz       | H/V | cm  | deg | dBµV                    | dB         | dB             | dBµV/m               | µV/m | dB     | dBµV/m              | µV/m  |
| 40.158    | V   | 100 | 247 | 16.8                    | 0.7        | 18.4           | 35.9                 | 62.4 | 4.1    | 40.0                | 100.0 |
| 50.011    | V   | 100 | 275 | 16.9                    | 1.0        | 15.4           | 33.3                 | 46.2 | 6.7    | 40.0                | 100.0 |
| 53.300    | V   | 100 | 259 | 16.5                    | 1.0        | 14.4           | 31.9                 | 39.3 | 8.1    | 40.0                | 100.0 |
| 73.682    | V   | 100 | 306 | 25.6                    | 1.0        | 6.1            | 32.7                 | 43.1 | 7.3    | 40.0                | 100.0 |
| 78.223    | V   | 100 | 290 | 26.2                    | 1.1        | 6.3            | 33.6                 | 47.8 | 5.5    | 40.0                | 100.0 |
| 82.334    | V   | 100 | 309 | 26.5                    | 1.1        | 6.9            | 34.5                 | 53.1 | 6.4    | 40.0                | 100.0 |

Table 5.2

The margin between the specification requirements and all other emissions was 8.8dB or more below the specification limit.

Note: Abbreviations for table 5.2

H Horizontal Polarisation  
Pol Polarisation  
deg degree

V Vertical Polarisation  
Hgt Height  
Azm Azimuth

Procedure Test Performed in accordance with ANSI C63.4.

Performed by M A N Terry, EMC Engineer  
J J Adams, EMC Engineer

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## **6     CONDUCTED EMISSIONS 0.45MHz to 30MHz**

### **6.1   AC Power Port - Test Procedure**

All Conducted Emission Measurements were undertaken within the Characterisation Chamber. Conducted Emissions measurements were undertaken on the Live and Neutral Lines.

The emissions were formally measured using a Quasi-Peak Detector which meets the CISPR requirements. The details of the highest emissions were then recorded in the Job Log Book. Details of the highest emissions for the Live and Neutral Lines are presented in Tables 6.2.1 and 6.2.2 respectively.

The Conducted Emissions measurements were made using a Rohde & Schwarz ESH-3 Test Receiver and ESH3 - Z5 LISN.

The climatic conditions recorded at the time of this test were:-

Temperature - 17.4°C    Relative Humidity - 59.0%rh    Atmospheric Pressure - 1008HPa

The test was performed in accordance with FCC Part 15 Subpart B.

## 6.2 AC Power Port - Test Results

### 6.2.1 Live Line

Equipment Designation : Unintentional Radiator - Live Line

The measured EUT emissions were below the Class B requirements of FCC Part 15 Subpart B Paragraph 15.107 (a) for Conducted Emissions on the Live Line. However a number of emissions detected were below the specification limit by a margin less than the measurement uncertainty of the measurement system.

#### Conducted Emissions Live Line

A search was made of the frequency spectrum from 450kHz to 30MHz. The levels of the eight highest emissions were measured in accordance with the specification and are presented in Table 6.2.1 below.

| Frequency | Uncorrected Quasi-Peak Level |      | LISN Factor | Pulse Limiter | Cable Loss | Quasi-Peak Level |       | Margin | Quasi-Peak Specification Limit |       |
|-----------|------------------------------|------|-------------|---------------|------------|------------------|-------|--------|--------------------------------|-------|
| MHz       | dBµV                         | µV   | dB          | dB            | dB         | dBµV             | µV    | dB     | dBµV                           | µV    |
| 5.532     | 36.8                         | 69.1 | 0.3         | 9.8           | 0.2        | 47.1             | 226.5 | 0.9    | 48.0                           | 250.0 |
| 5.550     | 37.1                         | 71.6 | 0.3         | 9.8           | 0.2        | 47.4             | 234.4 | 0.6    | 48.0                           | 250.0 |
| 5.568     | 37.1                         | 71.6 | 0.3         | 9.8           | 0.2        | 47.4             | 234.4 | 0.6    | 48.0                           | 250.0 |
| 5.595     | 37.1                         | 71.6 | 0.3         | 9.8           | 0.2        | 47.4             | 234.4 | 0.6    | 48.0                           | 250.0 |
| 5.613     | 37.0                         | 70.8 | 0.3         | 9.8           | 0.2        | 47.3             | 231.7 | 0.7    | 48.0                           | 250.0 |
| 5.631     | 36.9                         | 69.9 | 0.3         | 9.8           | 0.2        | 47.2             | 229.0 | 0.8    | 48.0                           | 250.0 |
| 5.649     | 36.8                         | 69.1 | 0.3         | 9.8           | 0.2        | 47.1             | 226.5 | 0.9    | 48.0                           | 250.0 |
| 5.676     | 36.4                         | 66.1 | 0.3         | 9.8           | 0.2        | 46.7             | 216.3 | 1.3    | 48.0                           | 250.0 |

Table 6.2.1

Note: \* Measurement not performed; see text above.

The margin between the specification requirements and all other emissions was 3.2dB or more below the specified Quasi-Peak limit when measured with a Quasi-Peak detector.

Procedure Test performed in accordance with ANSI C63.4.

Performed by M A N Terry, EMC Engineer.  
J J Laydon, EMC Engineer.

## **MANDATORY REQUIREMENT**

### **6.2.2 Neutral Line**

Equipment Designation : Unintentional Radiator. Neutral Line

The measured EUT emissions were below the Class B requirements of FCC Part 15 Subpart B Paragraph 15.107 (a) for Conducted Emissions on the Neutral Line. However a number of emissions detected were below the specification limit by a margin less than the measurement uncertainty of the measurement system.

#### **Conducted Emissions Neutral Line**

A search was made of the frequency spectrum from 450kHz to 30MHz. The levels of the nine highest emissions were measured in accordance with the specification and are presented in Table 6.2.2 below.

| Frequency<br>MHz | Uncorrected Quasi-Peak<br>Level |      | LISN<br>Factor<br>dB | Pulse<br>Limiter<br>dB | Cable<br>Loss<br>dB | Quasi-Peak<br>Level |       | Margin<br>dB | Quasi-Peak<br>Specification<br>Limit |       |
|------------------|---------------------------------|------|----------------------|------------------------|---------------------|---------------------|-------|--------------|--------------------------------------|-------|
|                  | dBµV                            | µV   |                      |                        |                     | dBµV                | µV    |              | dBµV                                 | µV    |
| 5.433            | 36.1                            | 63.8 | 0.3                  | 9.8                    | 0.2                 | 46.4                | 208.9 | 1.6          | 48.0                                 | 250.0 |
| 5.487            | 37.1                            | 71.6 | 0.3                  | 9.8                    | 0.2                 | 47.4                | 234.4 | 0.6          | 48.0                                 | 250.0 |
| 5.514            | 37.4                            | 74.1 | 0.3                  | 9.8                    | 0.2                 | 47.7                | 242.6 | 0.3          | 48.0                                 | 250.0 |
| 5.550            | 37.6                            | 75.8 | 0.3                  | 9.8                    | 0.2                 | 47.9                | 248.3 | 0.1          | 48.0                                 | 250.0 |
| 5.568            | 37.6                            | 75.8 | 0.3                  | 9.8                    | 0.2                 | 47.9                | 248.3 | 0.1          | 48.0                                 | 250.0 |
| 5.595            | 37.5                            | 74.9 | 0.3                  | 9.8                    | 0.2                 | 47.8                | 245.4 | 0.2          | 48.0                                 | 250.0 |
| 5.622            | 37.4                            | 74.1 | 0.3                  | 9.8                    | 0.2                 | 47.7                | 242.6 | 0.3          | 48.0                                 | 250.0 |
| 5.640            | 37.3                            | 73.2 | 0.3                  | 9.8                    | 0.2                 | 47.6                | 239.8 | 0.4          | 48.0                                 | 250.0 |
| 5.658            | 37.1                            | 71.6 | 0.3                  | 9.8                    | 0.2                 | 47.4                | 234.4 | 0.6          | 48.0                                 | 250.0 |

**Table 6.2.2**

Note: \* Measurement not performed; see text above.

The margin between the specification requirements and all other emissions was 3.4dB or more below the specified Quasi-Peak limit when measured with a Quasi-Peak detector.

#### **Procedure**

Test performed in accordance with ANSI C63.4.

#### **Performed by**

M A N Terry, EMC Engineer.  
J J Laydon, EMC Engineer.

## 7 EMISSION TESTING INSTRUMENTATION

| Instrument                          | Manufacturer           | Type No     | EMC No   |
|-------------------------------------|------------------------|-------------|----------|
| Computer                            | Opus                   | PCV         | CV5      |
| Test Receiver                       | Rohde and Schwarz      | ESVP        | 1806     |
| Test Receiver                       | Rohde and Schwarz      | ESVP        | 1807     |
| Test Receiver                       | Rohde and Schwarz      | ESH3        | 1805     |
| Spectrum Monitor                    | Rohde and Schwarz      | EZM         | 1811     |
| Biconical Antenna                   | Emco                   | 3110        | 1847     |
| Log Periodic Antenna                | Emco                   | 3146        | 1850     |
| Turntable & Controller              | British Turntables     | RH253       | 1858     |
| Automatic Antenna Mast & Controller | Emco                   | 1050        | 1844/5   |
| Antenna Mast                        | Electrometrics         | AMU74A      | 1853     |
| Plotter                             | Hewlett Packard        | 7550A       | -        |
| Open Area Test Site                 | Assessment Services    | OATS 2      | 2280     |
| Thermohydrograph                    | Rotronic               | A1 Hygromer | 3162     |
| HPA Monitor                         | Diplex                 | -           | 1932     |
| 60Hz 110 VAC Power Supply           | California Instruments | 1251 WP     | SNL03874 |

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## 8 SYSTEM MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems, in accordance with the recommendations of NIS 81 Edition 1, May 1994 are :-

For Radiated Emissions, Quasi-Peak Measurements using the ESVP Test Receiver:-

|                                                                           |                         |
|---------------------------------------------------------------------------|-------------------------|
| Measurement Uncertainty when using the Bicon Antenna Amplitude is:        | $\pm 3.6\text{dB}$      |
| Measurement Uncertainty when using the Log Periodic Antenna Amplitude is: | $\pm 2.9\text{dB}$      |
| Measurement Uncertainty for Frequency is:                                 | 5ppm $\pm 500\text{Hz}$ |

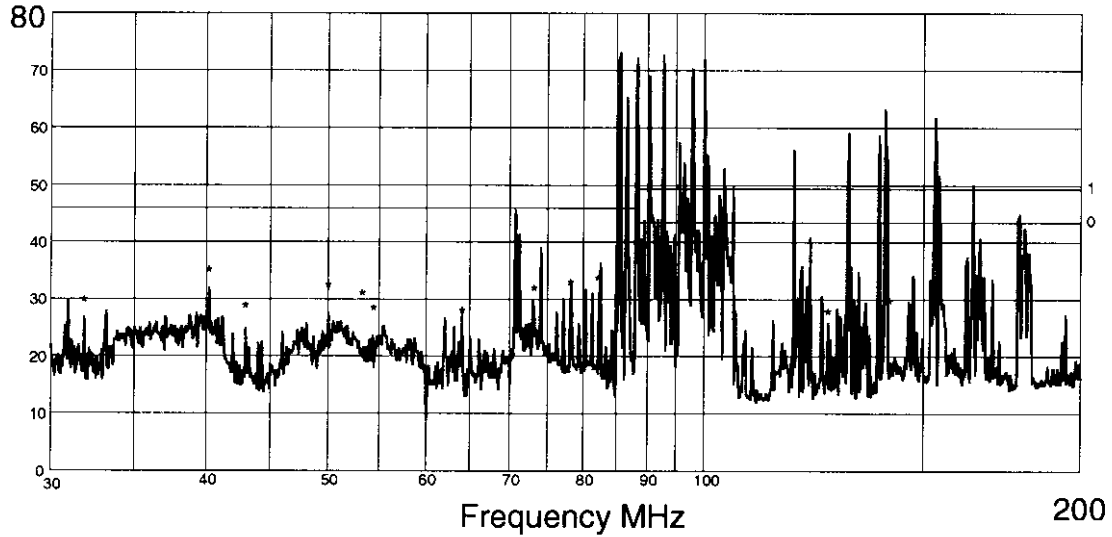
For Conducted Emissions, Quasi-Peak measurements using a Rohde & Schwarz ESH-3 Test Receiver:-

|           |                                  |
|-----------|----------------------------------|
| Frequency | $\pm 15\text{ppm} + 50\text{Hz}$ |
| Amplitude | $\pm 2.3\text{dB}$               |

## 9 RADIATED EMISSIONS PLOTS

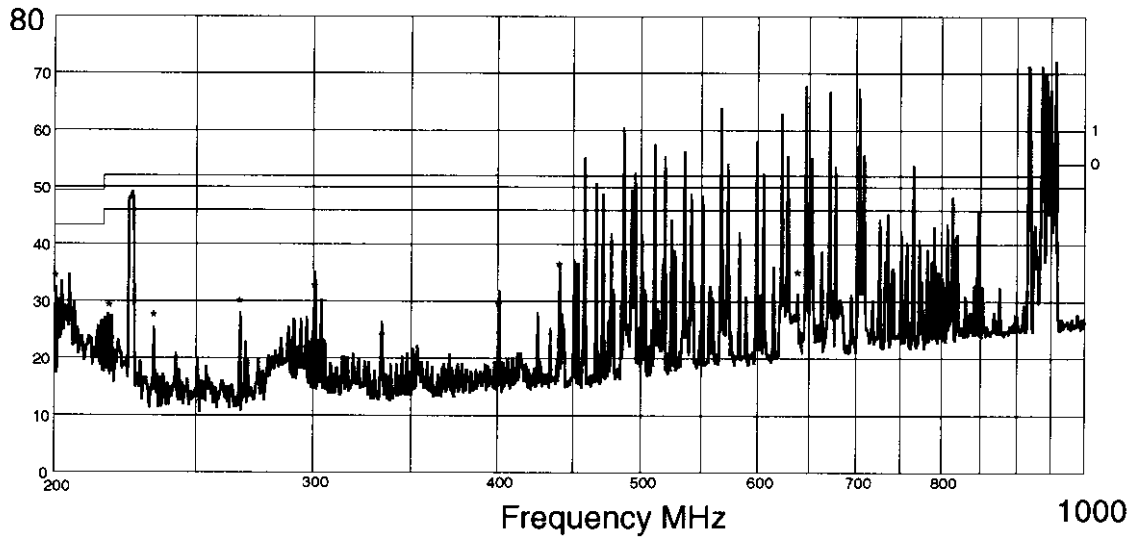
### 9.1 30MHz - 200MHz

dBuV/m



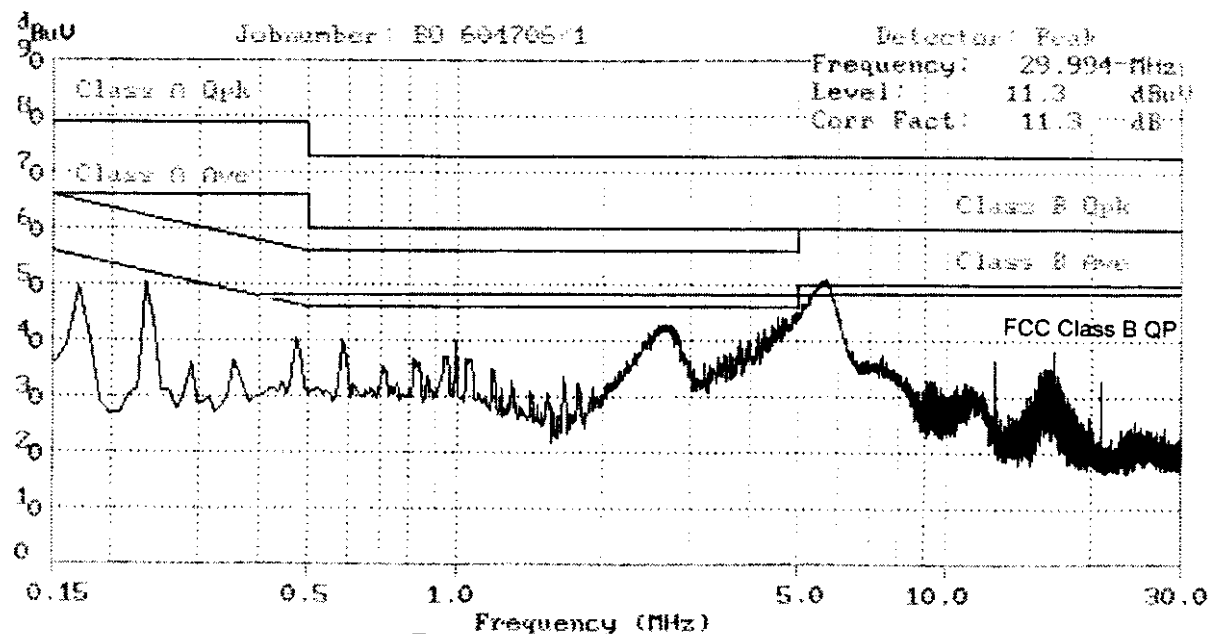
### 9.2 200MHz - 1000MHz

dBuV/m

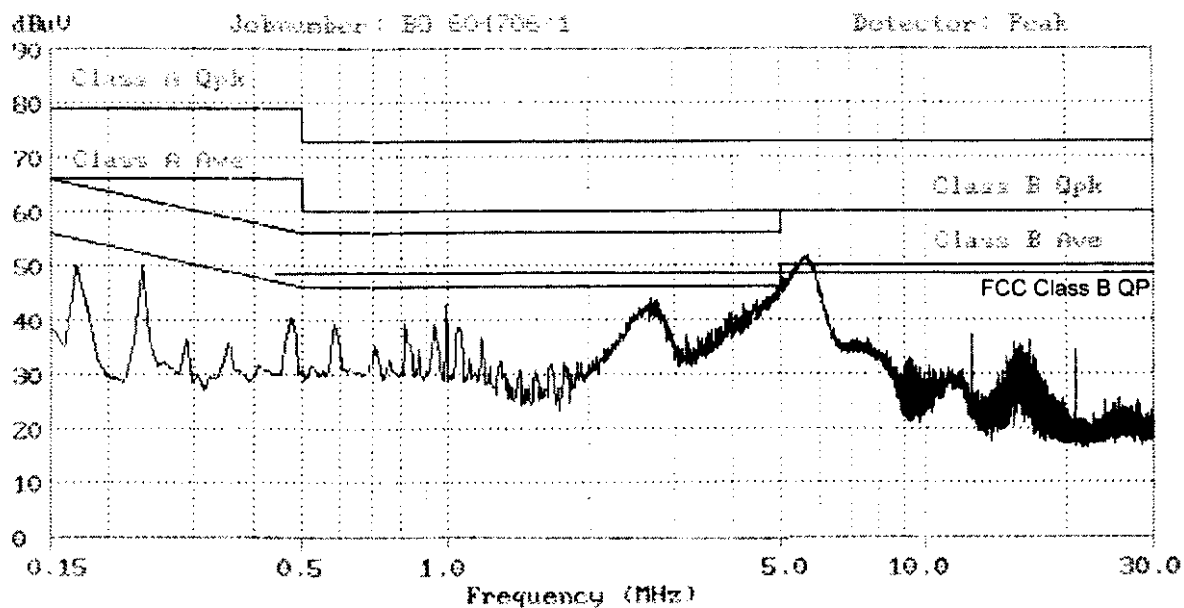


## 10 CONDUCTED EMISSIONS PLOTS

### 10.1 Live Line

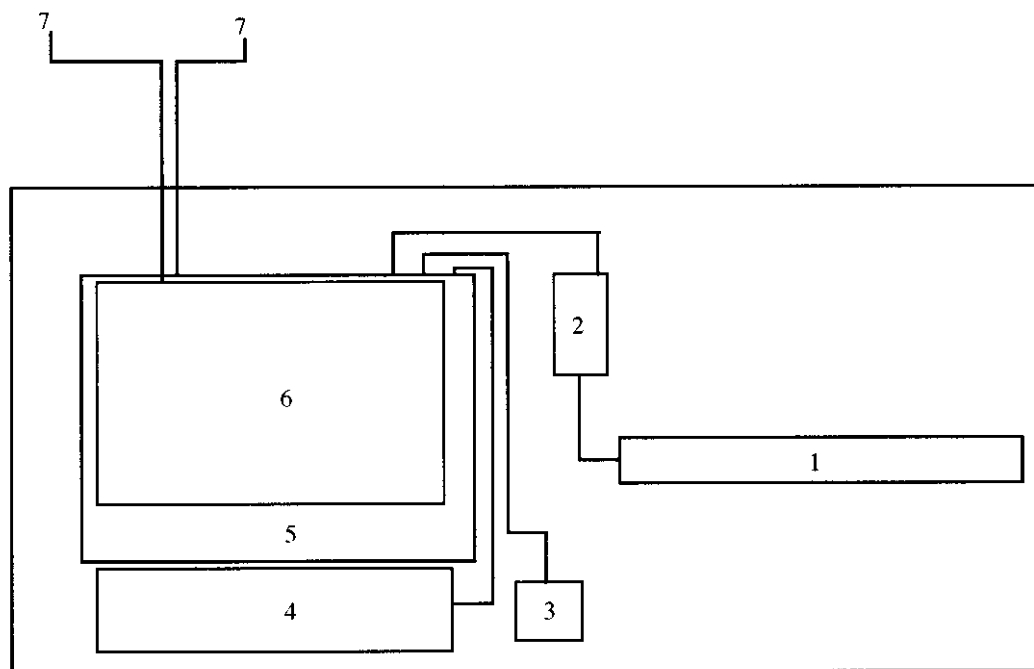


### 10.2 Neutral Line



## 11 TEST CONFIGURATIONS

### 11.1 Radiated Electric Field Emissions



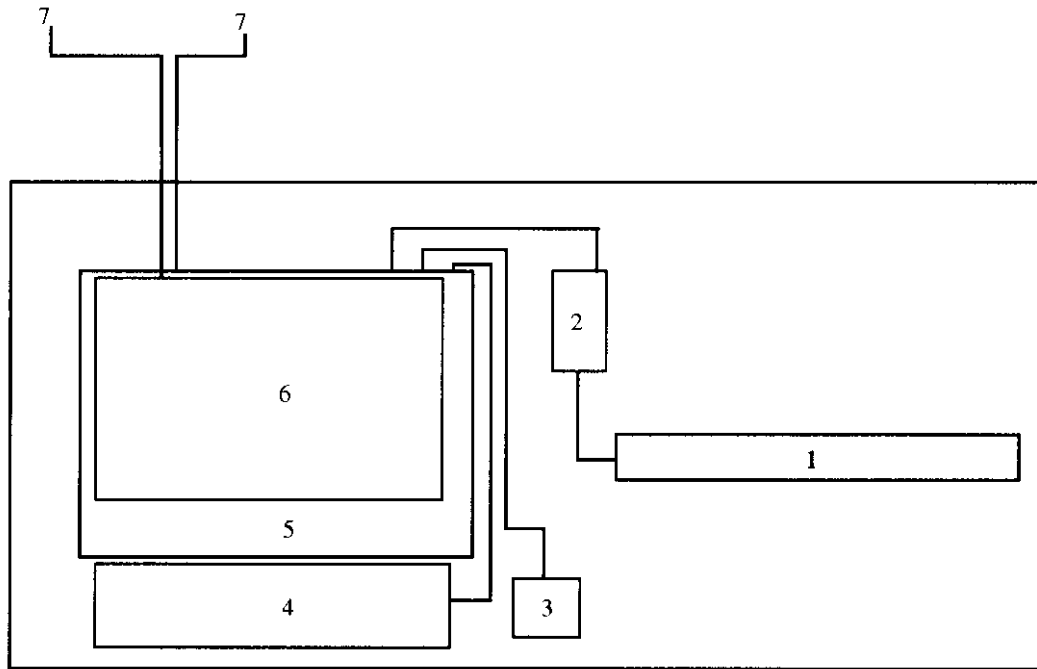
Basic Layout Configuration Used During Radiated Emissions Testing

|                            |               |          |             |
|----------------------------|---------------|----------|-------------|
| 1. Displaymate Touchscreen | 2. Controller | 3. Mouse | 4. Keyboard |
| 5. Personal Computer       | 6. Monitor    | 7. Power |             |



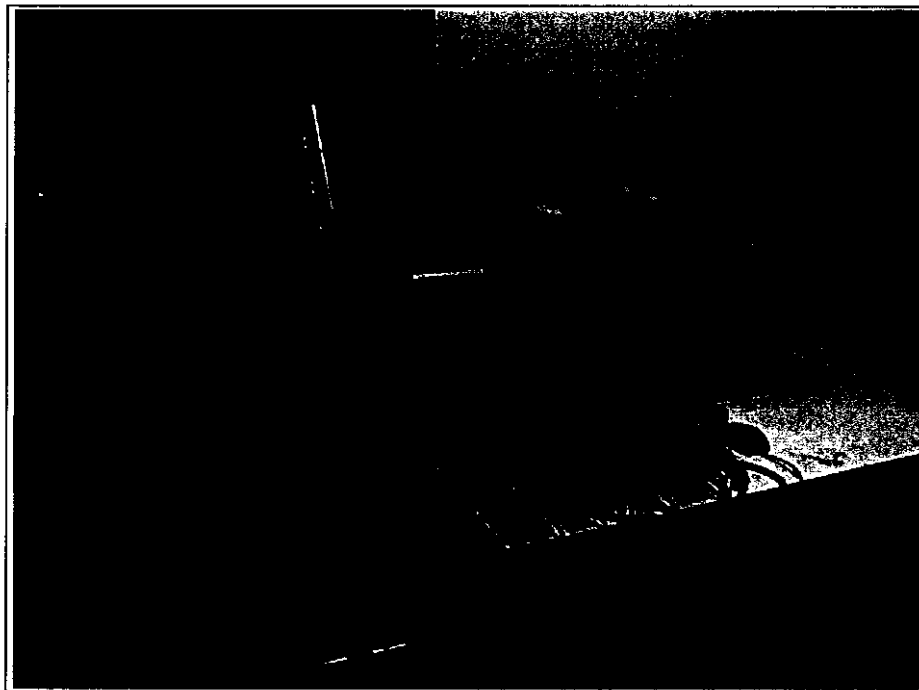
Photograph of the Radiated Emissions Testing Configuration

## 11.2 Conducted Emissions



Basic Layout Configuration Used During Conducted Emissions Testing

- |                            |               |          |             |
|----------------------------|---------------|----------|-------------|
| 1. Displaymate Touchscreen | 2. Controller | 3. Mouse | 4. Keyboard |
| 5. Personal Computer       | 6. Monitor    | 7. Power |             |



Photograph of the Conducted Emissions Testing Configuration

12 **FCC SITE COMPLIANCE LETTER**

**FEDERAL COMMUNICATIONS COMMISSION**

7435 Oakland Mills Road  
Columbia, MD 21046  
Telephone: 301-725-1585 (ext-218)  
Facsimile: 301-344-2050

October 20, 1997

IN REPLY REFER TO  
31040/SIT  
1300F2

Assessment Services  
Segensworth Road Titchfield  
Fareham Hampshire  
England PO15 5RH

Attention: K. F. Archer

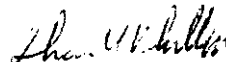
Re: Measurement facility located at Bearley  
(3 and 10 meter site)

Gentlemen:

Your submission of the description of the subject measurement facility has been reviewed and found to be in compliance with the requirements of Section 2.948 of the FCC Rules. The description has, therefore, been placed on file and the name of your organization added to the Commission's list of facilities whose measurement data will be accepted in conjunction with applications for certification or notification under Parts 15 or 18 of the Commission's Rules. Our list will also indicate that the facility complies with the radiated and AC line conducted test site criteria in ANSI C63.4-1992. Please note that this filing must be updated for any changes made to the facility, and at least every three years the data on file must be certified as current.

Per your request, the above mentioned facility has been also added to our list of those who perform these measurement services for the public on a fee basis. This list is updated monthly and is available on the Laboratory's Public Access Link (PAL) at 301-725-1072, and also on the Internet at the FCC Website [www.fcc.gov/oet/info/database/testsite/](http://www.fcc.gov/oet/info/database/testsite/).

Sincerely,



Thomas W. Phillips  
Electronics Engineer  
Customer Service Branch