



SPORTON LAB.

Certificate No. 810919

CERTIFICATE

- **Equipment Under Test : as shown on the rear page**
Model No. : PCM-3660, PCM-3730, PCM-3835, PCM-3840
PCD-1230, PCD-897, PCM-3661

Applicant : ADVANTECH CO., LTD.

Fl. 4, No. 108-3, Ming-Chuan Road, Shing-Tien City,

Taipei, Taiwan, R.O.C

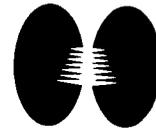


CERTIFY THAT:

THE MEASUREMENTS SHOWN IN THIS TEST REPORT WERE MADE IN ACCORDANCE WITH THE PROCEDURES GIVEN IN EUROPEAN COUNCIL DIRECTIVE 89/336/EEC. THE EQUIPMENT WAS PASSED THE TEST PERFORMED ACCORDING TO EUROPEAN STANDARD EN 55022/A1 Class A, EN 61000-3-2, EN 61000-3-3 and EN 50082-2 (IEC 801-2, IEC 801-3, IEC 801-4) (IEC 1000-4-2, IEC 1000-4-3, IEC 1000-4-4). THE TEST WAS CARRIED OUT ON Jan. 14, 1998 AT SPORTON INTERNATIONAL INC. LAB.

Lenore Chang Apr. 30, 1998

Lenore Chang
President



CE TEST REPORT

according to

**European Standard EN 55022:1994/A1:1995 Class A and
EN 61000-3-2:1995, EN 61000-3-3:1995 ,
EN 50082-2:1991 (IEC 801-2:1984, IEC 801-3:1984, IEC 801-4:1988)
(IEC 1000-4-2:1994, IEC 1000-4-3:1994, IEC 1000-4-4:1995)**

EQUIPMENT : LAN Card

(for more Product name please see Item 1.4)

MODEL NO. : PCM-3660, PCM-3730, PCM-3835, PCM-3840
PCD-1230, PCD-897, PCM-3661

APPLICANT : **ADVANTECH CO., LTD.**

Fl. 4, No. 108-3, Ming-Chuan Road, Shing-Tien City,
Taipei, Taiwan, R.O.C

- The test result refers exclusively to the test presented test model / sample.
- Without the written authorization of the test lab., the Test Report may not be copied.

SPORTON INTERNATIONAL INC.

6F, No. 106, Hsin Tai Wu Rd., Sec. 1, Hsi Chih, Taipei Hsien, Taiwan, R.O.C.

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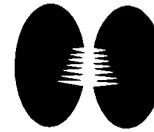
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CERTIFICATE NO. : C810919

CERTIFICATE OF COMPLIANCE

according to

**European Standard EN 55022:1994/A1:1995 Class A and
EN 61000-3-2:1995, EN 61000-3-3:1995 ,
EN 50082-2:1991 (IEC 801-2:1984, IEC 801-3:1984, IEC 801-4:1988)
(IEC 1000-4-2:1994, IEC 1000-4-3:1994, IEC 1000-4-4:1995)**

EQUIPMENT : LAN Card
(for more Product name please see Item 1.4)

MODEL NO. : PCM-3660, PCM-3730, PCM-3835, PCM-3840
PCD-1230, PCD-897, PCM-3661

APPLICANT : **ADVANTECH CO., LTD.**
Fl. 4, No. 108-3, Ming-Chuan Road, Shing-Tien City,
Taipei, Taiwan, R.O.C

I HEREBY CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **EUROPEAN COUNCIL DIRECTIVE 89/336/EEC**. The equipment was *passed* the test performed according to

**EUROPEAN STANDARD EN 55022:1994/ A1:1995 Class A,
EN 61000-3-2:1995, EN 61000-3-3:1995 and
EN 50082-2:1991 (IEC 801-2:1984, IEC 801-3:1984, IEC 801-4:1988).
(IEC 1000-4-2:1994, IEC 1000-4-3:1994, IEC 1000-4-4:1995)**

The test was carried out on **Jan. 14, 1998** at **SPORTON INTERNATIONAL INC. LAB.**



Lenore Chang
President

SPORTON INTERNATIONAL INC.

6F, No. 106, Hsin Tai Wu Rd., Sec. 1, Hsi Chih, Taipei Hsien, Taiwan, R.O.C.

1. GENERAL DESCRIPTION OF EQUIPMENT UNDER TEST**1.1. APPLICANT :****ADVANTECH CO., LTD.**Fl. 4, No. 108-3, Ming-Chuan Road, Shing-Tien City,
Taipei, Taiwan, R.O.C**1.2. MANUFACTURER :** Same as 1.1.**1.3. BASIC DESCRIPTION OF EQUIPMENT UNDER TEST**

EQUIPMENT : LAN Card

(for more Product name please see Item 1.4)

MODEL NO. : PCM-3660, PCM-3730, PCM-3835, PCM-3840, PCD-1230, PCD-897, PCM-3661

TRADE NAME : ADVANTECH

TP DATA CABLE : Non-shielded

BNC DATA CABLE : Shielded

POWER SUPPLY TYPE : N/A

POWER CORD : N/A

1.4. MULTIPLE LISTING OF MODEL NO. AND PRODUCT NAME

MODEL NO.	NAME OF PRODUCT
PCM-3660/PCM3661	LAN Card
PCM-3730	Digital I/O Card
PCM-3835	IDE Flash Disk Carrier Module
PCM-3840	Flash Disk Module
PCD-1230	IDE Flash Disk Module
PCD-897	Flash Disk Card

1.5. FEATURE OF EQUIPMENT UNDER TEST

- **PCM-3660/PCM-3661**
 - 1) **PC/104 form-factor** : 90 × 96mm (3.6" ×3.8").
 - 2) **Data Bus** : 8-bit, 16-bit or auto-sensing.
 - 3) **Connectors** : 16-bit PC/104 stackthrough connector RJ45 connector for 10BASE-T, 16-pin insulation displacement connector for AUI.
 - 4) PC/104 8-bit and 16-bit compatible.
 - 5) Built in IEEE 802.3 10Mbps CSMA/CD 10BASE-T transceiver.
 - 6) **Power** : +5V, 400mA (max.).

- **PCM-3730**
 - 1) 16 isolated DIO channels (8 inputs and 8 outputs)
 - 2) 32 TTL-level DIO channels (16 inputs and 16 outputs)
 - 3) High output driving capacity.
 - 4) High-voltage isolation on isolated I/O channels (2500 V_{DC}).
 - 5) Interrupt capacity.
 - 6) One 20-pin connectors for isolated input channels and output channels.
 - 7) High sink current on isolated output channels (200 mA/channel).

- **PCM-3835**
 - 1) The **PCM-3835** has been inspected both mechanically and electrically before shipping.
It should be free of marks and scratches and in perfect electrical order upon receipt.
 - 2) **Three methods of power entry** :
 1. Standard 4-pin power input.
 2. PC/104 connector.
 3. 2.5" HDD power input.
 - 3) **Two methods of data entry** :
 1. IDE 40-pin connector.
 2. IDE 44-pin connector.

- **PCM-3840**

- 1) Uses DiskOnChip 2000 single chip Flash memory.
- 2) 3 sockets, 2~24 MB capacity per socket, unable to link together.
- 3) 32-pin DIP JEDEC standard SRAM/EPROM/Flash compatible package.
- 4) High performance and superior read/write speeds.
- 5) ECC/EDC for high data reliability.
- 6) Full boot operability.
- 7) Built-in TrueFFS which provides full hard disk read/write compatibility.
- 8) **Current Consumption** : (per DiskOnChip 2000)
Standby 60 μ A (typical), 100 μ A (max.).
Read 25 mA (typical), 40 mA (max.).
Write 30 mA (typical), 40 mA (max.).
- 9) **Supply Voltage** : 5V (read and write)

- **PCD-1230**

- 1) Fully compatible with standard IDE interface.
- 2) On board flash memory chips 2/4 MB option.
- 3) Supports True IDE mode.
- 4) ScanDisk chipset.
- 5) Low power consumption and automatic power saving mode.
- 6) Detect management and error correction technology.
- 7) Wear-leveling and free space management.
- 8) High performance ScanDisk 16-Mbit flash memory technology.
- 9) +5V=10% operating. voltage.
- 10) 44-pin header, pitch=2.0 mm connector.
- 11) Supports PIO mode 4.
- 12) **Power Consumption** : Standby 12 ~13 mA.
Read 16 ~18 mA.
Write 58 ~62mA.



- **PCD-897**

- 1) Uses DiskOnChip 2000 single chip Flash memory.
- 2) 3 sockets, 2~24 MB capacity per socket, unable to link together.
- 3) 32-pin DIP JEDEC standard SRAM/EPROM/Flash compatible package.
- 4) High performance and superior read/write speeds.
- 5) ECC/EDC for high data reliability.
- 6) Full boot operability.
- 7) Built-in TrueFFS which provides full hard disk read/write compatibility.
- 8) **Current Consumption** : (per DiskOnChip 2000)
 - Standby 60 μ A (typical), 100 μ A (max.).
 - Read 25 mA (typical), 40 mA (max.).
 - Write 30 mA (typical), 40 mA (max.).
- 9) **Supply Voltage** : 5V (read and write)



2. TEST CONFIGURATION OF EQUIPMENT UNDER TEST

2.1. TEST MANNER

- a. The SONY monitor, DELL keyboard, HP printer, two TAICOM modems, EUT and KYE mouse were connected to the ADVANTECH IPC for EMI test. During testing, the interface cables and equipment positions were varied according to European Standard EN 55022.
- b. The HP monitor, DELL keyboard, HP printer and EUT were connected to the ADVANTECH IPC for Harmonics, Flicker and EMS test

2.2. DESCRIPTION OF TEST SYSTEM

<< EMI >>

SUPPORT UNIT 1. --MONITOR (SONY)

Model No. : GDM-17SE2T
Data Cable : Shielded

SUPPORT UNIT 2. -- PRINTER (HP)

Model No. : 2225C
Data Cable : Shielded

SUPPORT UNIT 3. -- MODEM (TAICOM)

Model No. : MR34S
Data Cable : Shielded

SUPPORT UNIT 4. -- KEYBOARD (DELL)

Model No. : AT101(DE8M)
Data Cable : Shielded

SUPPORT UNIT 5. -- MOUSE (KYE)

Model No. : NETMOUSE
Data Cable : Shielded

SUPPORT UNIT 6. -- IPC (ADVANTECH)

Model No. : IPC-610

Data Cable : Shielded

<< EMS >>

SUPPORT UNIT 1. --MONITOR (HP)

Model No. : D2807A

Data Cable : Shielded

SUPPORT UNIT 2. -- PRINTER (HP)

Model No. : 2225C

Data Cable : Shielded

SUPPORT UNIT 3. -- KEYBOARD (DELL)

Model No. : AT101(DE8M)

Data Cable : Shielded

SUPPORT UNIT 4. -- IPC (ADVANTECH)

Model No. : IPC-610

Data Cable : Shielded

3. TEST SOFTWARE

3.1. EMI TEST

An executive programs, EMITEST.EXE, which generates a complete line of continuously repeating " H " pattern was used as the test software.

The program was executed as follows :

- a. Turn on the power of all equipment.
- b. The PC reads the test program from the floppy disk drive and runs it.
- c. The PC sends " H " messages to the monitor, and the monitor displays " H " patterns on the screen.
- d. The PC sends " H " messages to the printer, then the printer prints them on the paper.
- e. The PC sends " H " messages to the modem.
- f. The PC sends " H " messages to the internal Hard Disk, and the Hard Disk reads and writes the message.
- g. Repeat the steps from b to f.

3.2. HARMONICS, VOLTAGE FLUCTUATIONS AND EMS TEST

An program, RSET8019.EXE, which provided by the applicant was used during testing.



4. GENERAL INFORMATION OF TEST

4.1. TEST FACILITY

This test was carried out by SPORTON INTERNATIONAL INC.

Test Site Location : No. 30-1, Lin 6, Diing-Fwu Tsuen, Lin-Kou-Hsiang,
Taipei Hsien, Taiwan, R.O.C.

TEL : 886-2-601-1640

FAX : 886-2-601-1695

4.2. STANDARD FOR METHODS OF MEASUREMENT

EMI Test (conduction and radiation) : European Standard EN 55022, Class A.

EMS Test (ESD, RS and EFT) : European Standard EN 50082-2.

(ESD : IEC 801-2, RS : IEC 801-3, EFT : IEC 801-4)

(ESD : IEC 1000-4-2, RS : IEC 1000-4-3, EFT: IEC 1000-4-4)

4.3 .TEST IN COMPLIANCE WITH

EMI Test (conduction and radiation) : European Standard EN 55022, Class A.

EMS Test (ESD, RS and EFT) : European Standard EN 50082-2.

(ESD : IEC 801-2, RS : IEC 801-3, EFT : IEC 801-4)

(ESD : IEC 1000-4-2, RS : IEC 1000-4-3, EFT: IEC 1000-4-4)

4.4. FREQUENCY RANGE INVESTIGATED

- a. Conducted emission test: from 150 KHz to 30 MHz
- b. Radiated emission test: from 30 MHz to 1000 MHz
- c. Radio frequency electromagnetic field immunity test : from 27 MHz to 1000 MHz.

4.5. TEST DISTANCE

The test distance of radiated emission test from antenna to EUT is 10 M.

The test distance of radio frequency electromagnetic field immunity test from antenna to EUT is 3 M.

5. TEST OF CONDUCTED POWERLINE

Conducted Emissions were measured from 150 KHz to 30 MHz with a bandwidth of 9 KHz on the 230 VAC power and return leads of the EUT according to the methods defined in European Standard EN 55022 Clause 9. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in Figure 5-3. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position producing maximum conducted emissions.

5.1. DESCRIPTION OF MAJOR TEST INSTRUMENTS

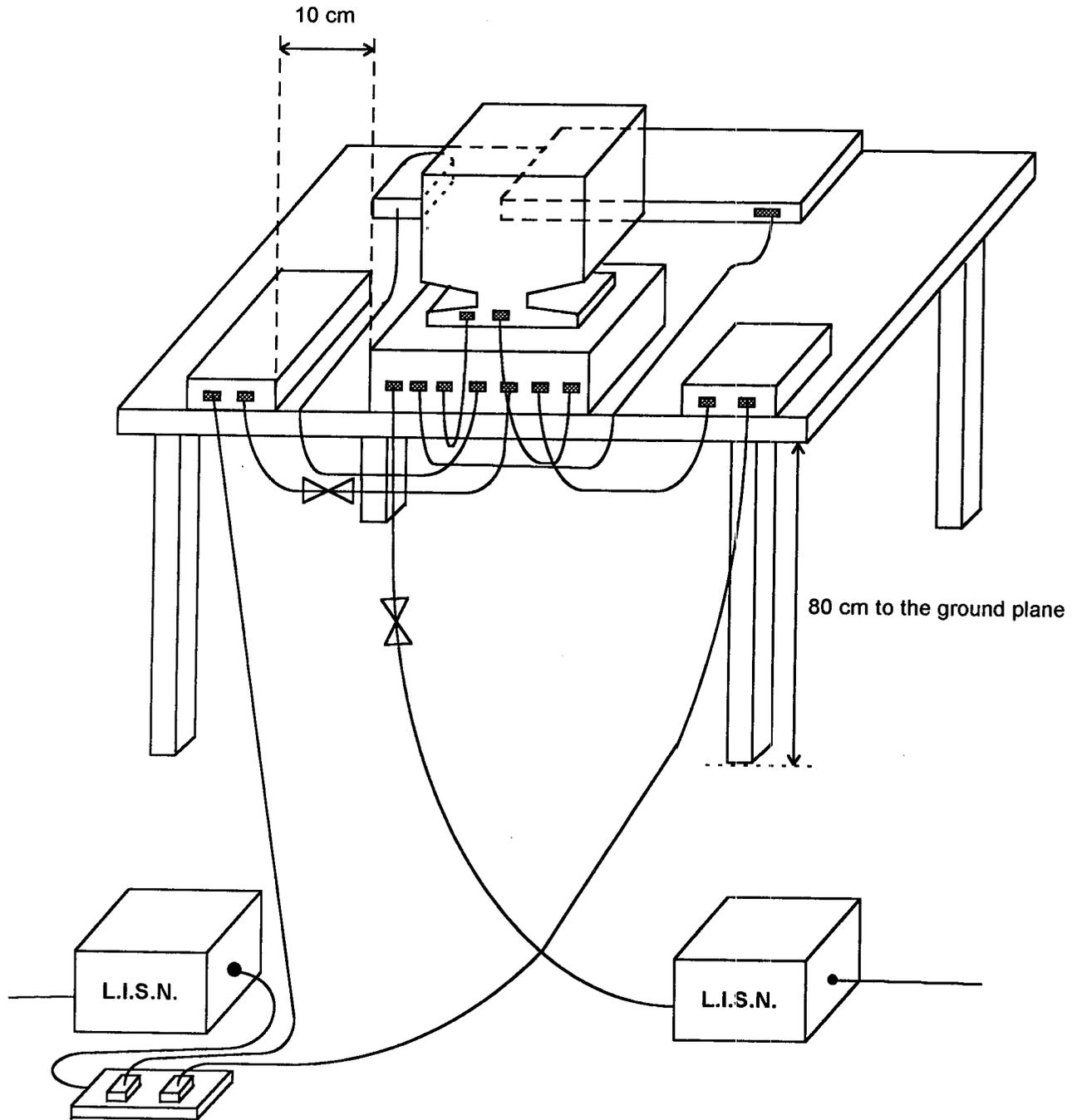
- Test Receiver (HP 85462A)
 - Attenuation 0 dB
 - Start Frequency 0.15 MHz
 - Stop Frequency 30 MHz
 - Step MHz 0.007 MHz
 - IF Bandwidth 9 KHz



5.2. TEST PROCEDURES

- a. The EUT was placed on a desk 0.8 meters height from the metal ground plane and 0.4 meter from the conducting wall of the shielding room and it was kept at least 0.8 meters from any other grounded conducting surface.
- b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
- c. All the support units are connect to the other LISN.
- d. The LISN provides 50 ohm coupling impedance for the measuring instrument.
- e. The CISPR states that a 50 ohm , 50 microhenry LISN should be used.
- f. Both sides of AC line were checked for maximum conducted interference.
- g. The frequency range from 150 KHz to 30 MHz was searched.
- h. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- i. If the emission level of the EUT in peak mode was 6 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 6 dB margin will be retested one by one using the quasi-peak method and/or average methods and reported.

5.3. TYPICAL TEST SETUP LAYOUT OF CONDUCTED POWERLINE





5.4. TEST RESULT OF AC POWERLINE CONDUCTED EMISSION

- Equipment meets the technical specifications of EN 55022 (1994)
- Frequency Range of Test : from 0.15 MHz to 30 MHz
- Temperature : 16 °C
- Relative Humidity : 65% RH
- Test Mode : Normal mode
- Test Date : Jan. 13, 1998

The Conducted Emission test was passed at Neutral 0.19 MHz / 42.50 dBuV.

Frequency (MHz)	Line or Neutral	Meter Reading				Limits				Margin	
		Q.P. (dBuV)	A.V. (dBuV)	Q.P. (uV)	A.V. (uV)	Q.P. (dBuV)	A.V. (dBuV)	Q.P. (uV)	A.V. (uV)	Q.P. (dB)	A.V. (dB)
0.15	L	38.80	10.00	87.10	3.16	79.00	66.00	8912.51	1995.26	-40.20	-56.00
0.19	L	42.00	36.00	125.89	63.10	79.00	66.00	8912.51	1995.26	-37.00	-30.00
1.30	L	32.50	32.70	42.17	43.15	73.00	66.00	4466.84	1995.26	-40.50	-33.30
0.19	N	42.50	31.00	133.35	35.48	79.00	66.00	8912.51	1995.26	-36.50	-35.00
1.30	N	32.60	32.70	42.66	43.15	73.00	66.00	4466.84	1995.26	-40.40	-33.30
3.60	N	32.30	31.60	41.21	38.02	73.00	66.00	4466.84	1995.26	-40.70	-34.40

Test Engineer:

Pony



6. TEST OF RADIATED EMISSION

Radiated emissions from 30 MHz to 1000 MHz were measured with a bandwidth of 120 KHz according to the methods defines in European Standard EN 55022, Clause 10. The EUT was placed on a nonmetallic stand in the open-field site, 0.8 meter above the ground plane, as shown in Figure 6-3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

6.1. DESCRIPTION OF MAJOR TEST INSTRUMENTS

- Spectrum Analyzer

Attenuation	0 dB
Start Frequency	30 MHz
Stop Frequency	1000 MHz
Resolution Bandwidth	100 KHz
Video Bandwidth	300 KHz
Signal Input	50 ohm, 50 VDC MAX., +30 dBm MAX.

- Quasi-Peak Adapter

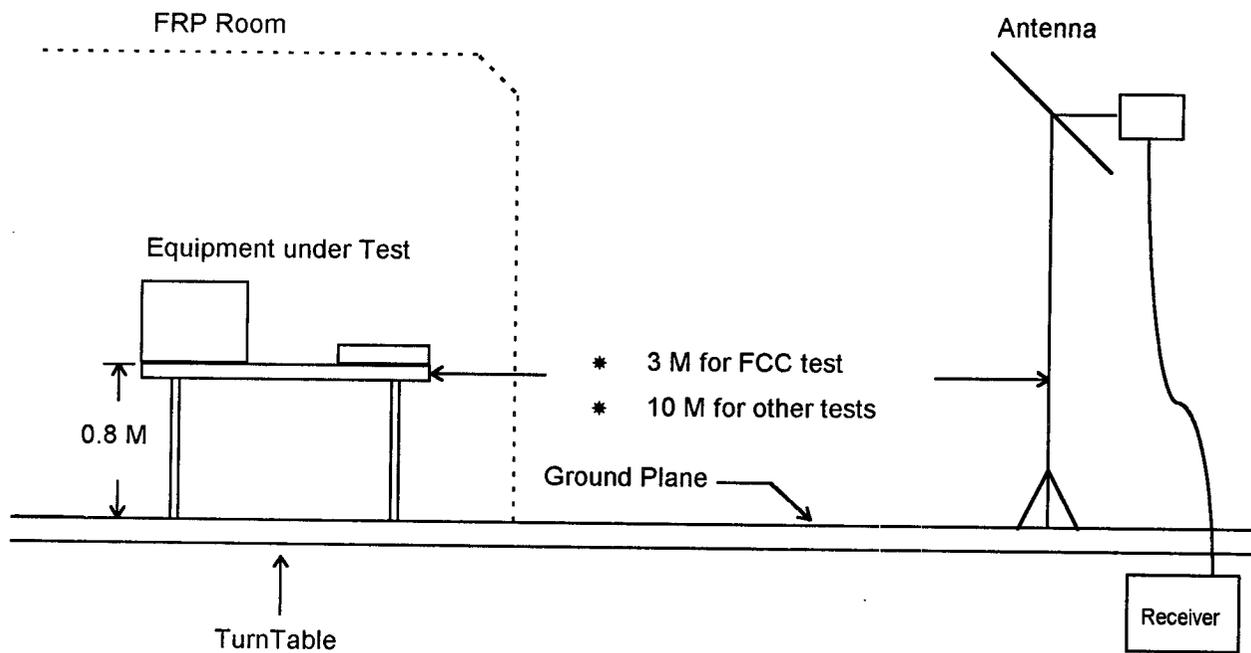
Resolution Bandwidth	1 MHz
Frequency Band	120 KHz
Quasi-Peak Detector	1 ms/MHz (OFF), 20s/MHz (ON)



6.2. TEST PROCEDURES

- a. The EUT was placed on a rotatable table top 0.8 meter above ground.
- b. The EUT was set 10 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- c. The table was rotated 360 degrees to determine the position of the highest radiation.
- d. The antenna is a half wave dipole and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- f. Set the test-receiver system (HP 8568B) to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 6 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 6 dB margin will be repeated one by one using the quasi-peak method and reported.

6.3. TYPICAL TEST SETUP LAYOUT OF RADIATED EMISSION





6.4. TEST RESULT OF RADIATED EMISSION

- Equipment meets the technical specifications of EN 55022 (1994)
- Frequency Range of Test : from 30 MHz to 1000 MHz
- Test Distance : 10 M
- Temperature : 12 °C
- Relative Humidity : 70% RH
- Test Mode : Normal mode
- Test Date : Jan. 12, 1998

- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Sample Calculation at 52.90 MHz
Corrected Reading = 7.07 + 1.20 + 24.37= 32.64 (dBuV/m)

The Radiated Emission test was passed at

Horizontal 214.78 MHz / 33.51 dBuV (Q.P.)

Antenna Height 4.0 Meter , Turntable Degree 60°.

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Emission (uV/m)	Level (dBuV/m)	Margin (uV/m)	Margin (dB)	Detect Mode
52.90	V	7.07	1.20	24.37	40.00	100	32.64	42.85	-7.36	Peak
214.40	V	9.33	2.42	17.20	40.00	100	28.95	28.02	-11.05	Peak
429.60	V	16.89	3.58	14.52	47.00	224	34.99	56.17	-12.01	Peak
133.80	H	11.39	2.19	15.37	40.00	100	28.95	28.02	-11.05	Peak
214.78	H	9.34	2.42	21.76	40.00	100	33.51	47.37	-6.49	Q.P.
357.60	H	15.03	3.15	15.18	47.00	224	33.35	46.51	-13.65	Peak

Test Engineer : *Pony Chang*

6.5. PHOTOGRAPHS OF RADIATED EMISSION TEST CONFIGURATION

FRONT VIEW



REAR VIEW



7. HARMONICS TEST

7.1. STANDARD

- Product Standard : EN 61000-3-2 (1995)

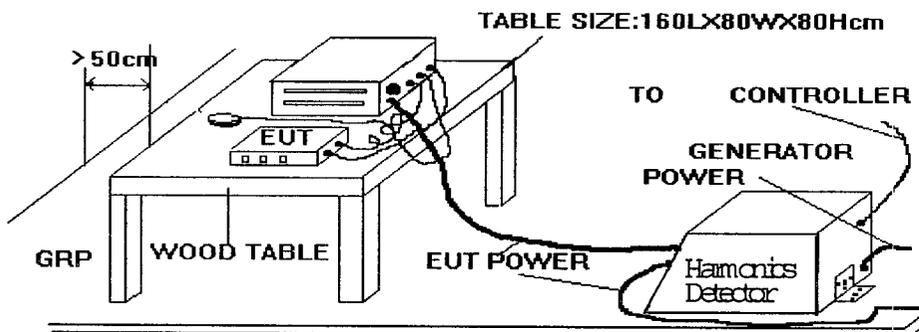
7.2. TEST PROCEDURE

The measured values of the harmonics components of the input current, including line current and neutral current, shall be compared with the limits given in Clause 4.

7.3. TEST EQUIPMENT SETTINGS :

- Line Voltage : 230 V
- Line Frequency : 50 Hz
- Device Class : D
- Current Measurement Range : High
- Measurement Delay : 10.0 second
- Test Duration : 2.00 minutes
- Class determination Pre-test Duration : 10.00 seconds

7.4. TEST SETUP



7.5. CURRENT HARMONICS TEST

7.5.1. TEST DATA OF CURRENT HARMONICS

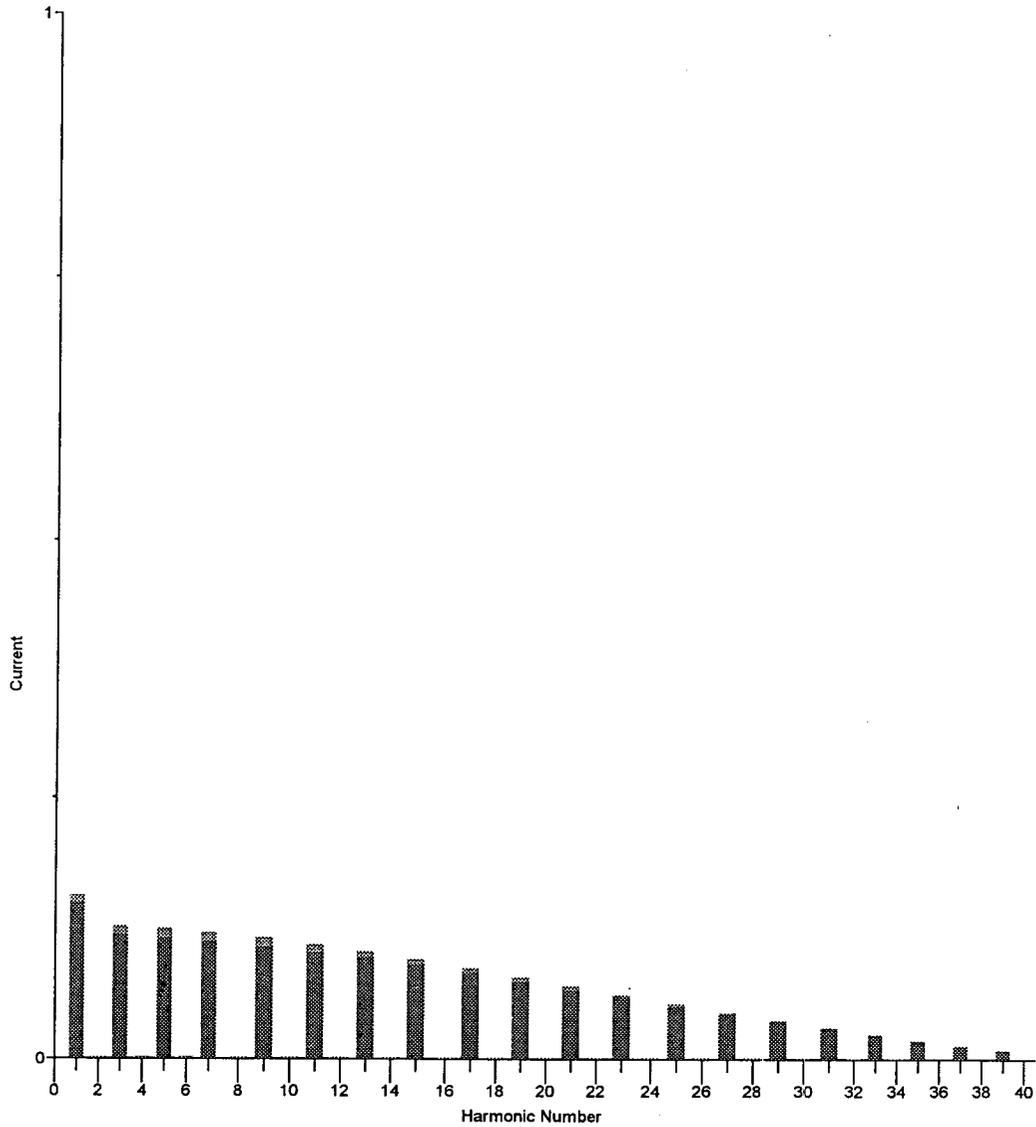
- FINAL TEST RESULT : **PASS**
- Fundamental Current : 0.152A
- Real Power : 27.70 W
- Power Factor : 0.340
- Percent in Envelope : 100.0 %
- Temperature : 24 °C
- Relative Humidity : 59% RH
- Test Date : Jan. 07, 1998

Harmonic Number	Standard Limit (A rms)	Max. Span Values (A rms)	Harmonic Number	Standard Limit (A rms)	Max. Span Values (A rms)
1	Fund	0.1561	21	0.1070	0.0702
2	1.0800	0.0021	22	0.0840	0.0014
3	2.3000	0.1264	23	0.0980	0.0615
4	0.4300	0.0022	24	0.0770	0.0016
5	1.1400	0.1242	25	0.0900	0.0532
6	0.3000	0.0022	26	0.0710	0.0014
7	0.7700	0.1203	27	0.0830	0.0450
8	0.2300	0.0019	28	0.0660	0.0013
9	0.4000	0.1157	29	0.0780	0.0372
10	0.1840	0.0018	30	0.0610	0.0012
11	0.3300	0.1093	31	0.0730	0.0301
12	0.1530	0.0018	32	0.0580	0.0010
13	0.2100	0.1025	33	0.0680	0.0236
14	0.1310	0.0016	34	0.0540	0.0009
15	0.1500	0.0951	35	0.0640	0.0182
16	0.1150	0.0016	36	0.0510	0.0008
17	0.1320	0.0871	37	0.0610	0.0135
18	0.1020	0.0016	38	0.0480	0.0007
19	0.1180	0.0787	39	0.0580	0.0097
20	0.0920	0.0015	40	0.0460	0.0005

Test Engineer : *Pang Chang*

7.5.2. TEST GRAPH OF HARMONICS

Harmonics



Span: 0:00:02:00.00

810919.STA

Cursor: 0:00:02:00.00

8. VOLTAGE FLUCTUATIONS TEST

8.1. STANDARD

- Product Standard : EN 61000-3-3 (1995)

8.2. TEST PROCEDURE

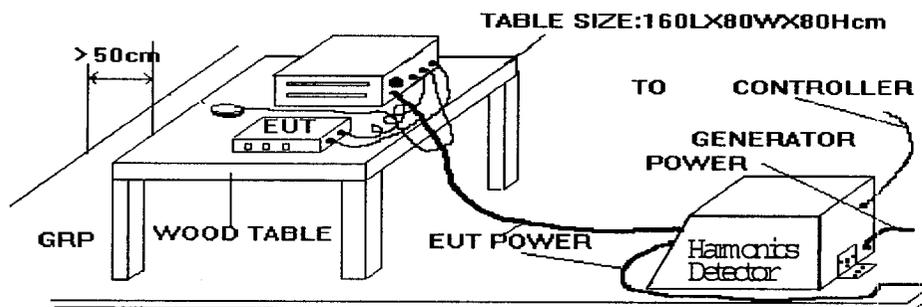
The equipment shall be tested under the conditions of **Clause 5**.

The total impedance of the test circuit, excluding the appliance under test, but including the internal impedance of the supply source, shall be equal to the reference impedance. The stability and tolerance of the reference impedance shall be adequate to ensure that the overall accuracy of $\pm 8\%$ is achieved during the whole assessment procedure.

8.3. TEST EQUIPMENT SETTINGS :

- Line Voltage : 230 V
- Line Frequency : 50 Hz
- Measurement Delay : 10.0 seconds
- Pst Integration Time : 10 minutes
- Pst Integration Periods : 1
- Test Duration : 00:10:00 minutes

8.4. TEST SETUP



8.5. TEST RESULT OF VOLTAGE FLUCTUATION AND FLICKER TEST**FINAL TEST RESULT : PASS**

- Temperature : 24 °C
- Relative Humidity : 59% RH
- Test Date : Jan. 07, 1998

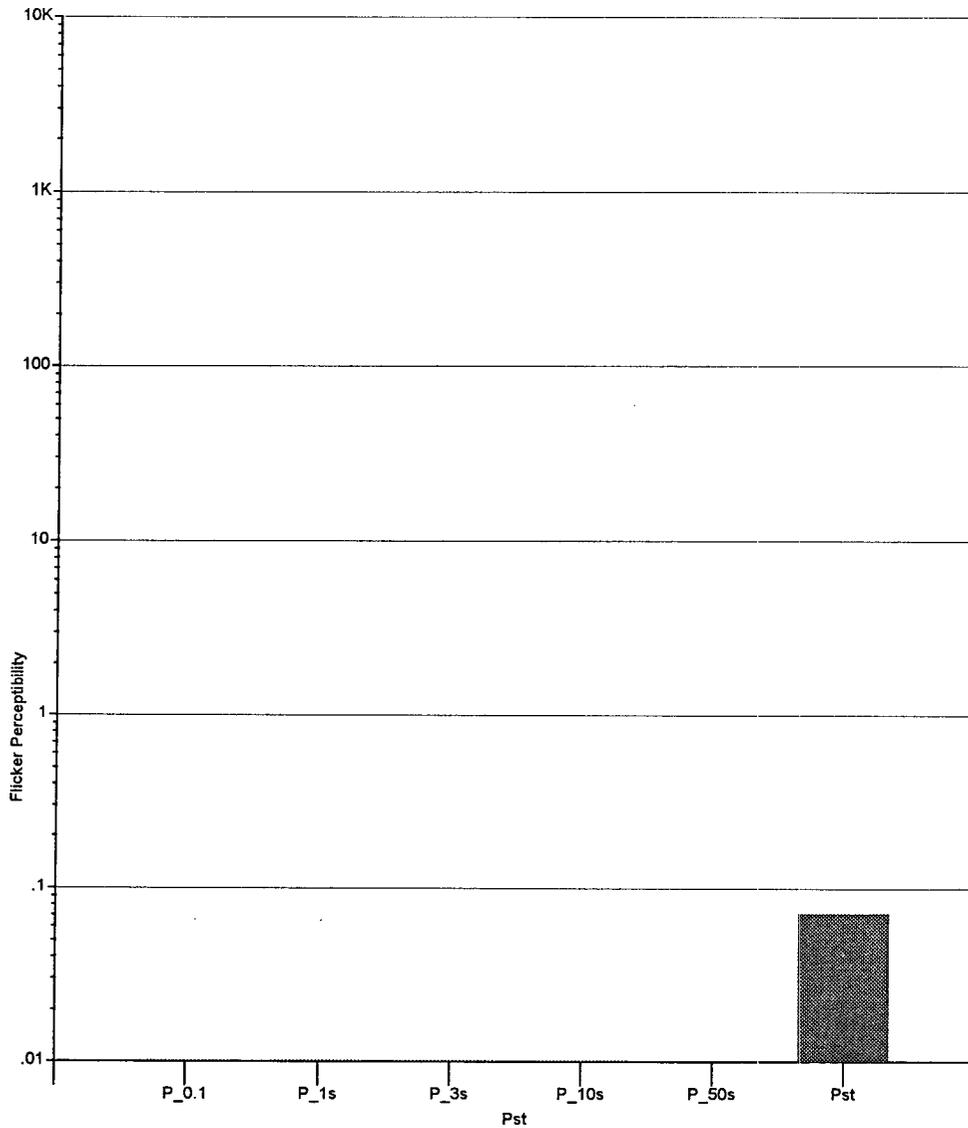
8.5.1. TEST DATA OF VOLTAGE FLUCTUATION AND FLICKER

	Pst	Plt	Dc (%)	Dmax (%)	Dt (%)
Reading	0.070	0.00	0.00	0.00	0.00
Limit	0.65	1.0	3.0	4.0	3.0

Test Engineer : *Richard Ann*

8.5.2. TEST GRAPH OF VOLTAGE FLUCTUATION AND FLICKER

Pst Histogram



Span: 0:00:10:00.00

810919.FLK

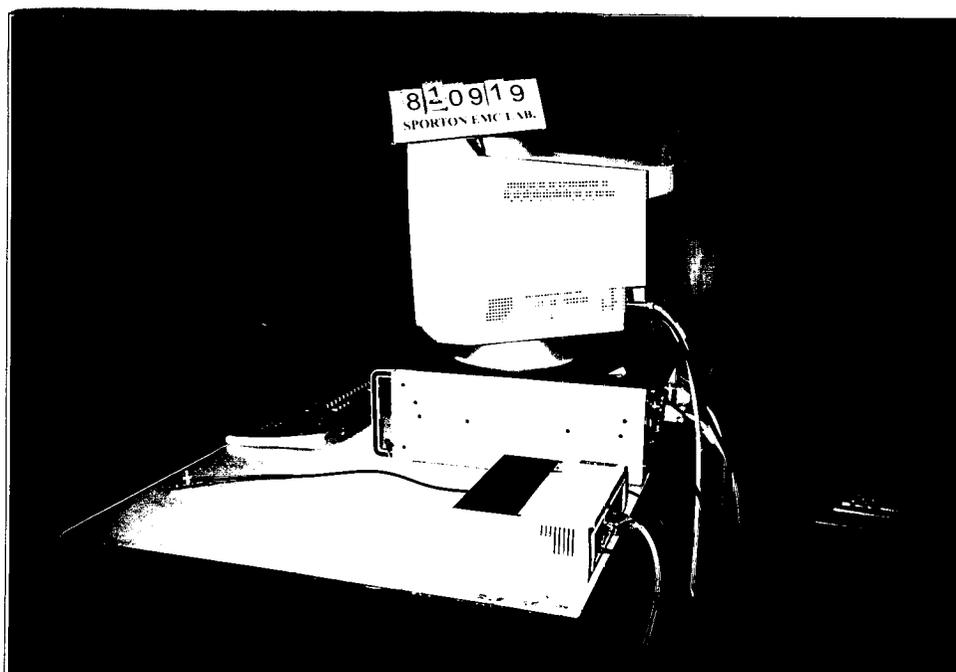
Cursor: 0:00:10:00.00

8.6. PHOTOGRAPHS OF HARMONICS TEST, VOLTAGE FLUCTUATION AND FLICKER TEST

FRONT VIEW



REAR VIEW

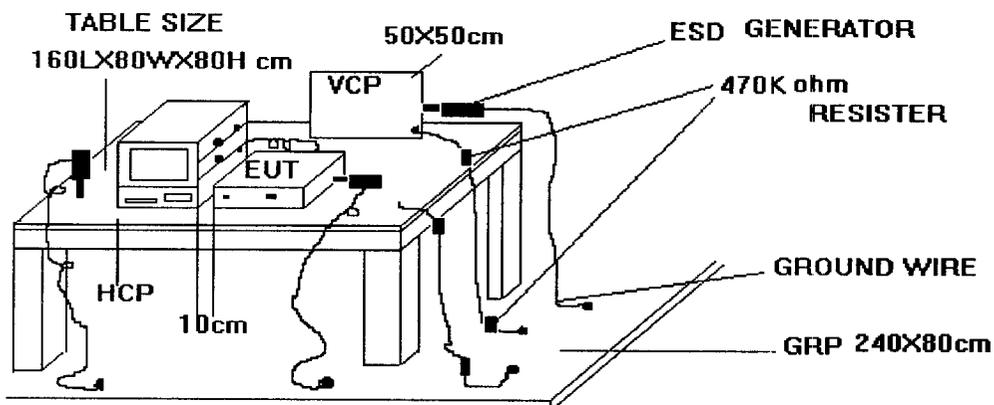


9. ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD)

FINAL TEST RESULT : PASS

- Basic Standard : IEC 801-2 (1984), IEC 1000-4-2 (1994)
- Generic Standard : EN 50 082-2 (1991)
- Performance Criteria : B
- Level : 3 for Air discharge,
2 for Contact discharge
- Tested Voltage : $\pm 2 / \pm 4 / \pm 8$ KV for Air discharge,
 $\pm 2 / \pm 4$ KV for Contact discharge
- Temperature : 21 °C
- Relative Humidity : 52 %
- Test Date : Jan. 14, 1998

9.1. TEST SETUP



The test setup consists of the test generator, EUT and auxiliary instrumentation necessary to perform DIRECT and INDIRECT application of discharges to the EUT as applicable, in the follow manner :

- (a) CONTACT DISCHARGE to the conductive surfaces and to coupling plane;
- (b) AIR DISCHARGE at insulating surfaces.

The preferred test method is that of type tests performed in laboratories and the only accepted method of demonstrating conformance with this standard. The EUT was arranged as closely as possible to arrangement in final installed conditions.

9.2. TEST SETUP FOR TESTS PERFORMED IN LABORATORY

A ground reference plane was provided on the floor of the test site. It was a metallic sheet (copper or aluminum) of 0.25 mm ,minimum thickness; other metallic may be used but they shall have at least 0.65 mm thickness. In the SPORTON EMC LAB. we provided 1 mm thickness aluminum ground reference plane or 1 mm thickness stainless steel ground reference plane. The minimum size of the ground reference plane is 1 m x 1 m, the exact size depending on the dimensions of the EUT. It was connected to the protective grounding system.

The EUT was arranged and connected according to its functional requirements. A distance of 1m minimum was provided between the EUT and the wall of the lab. and any other metallic structure. In cases where this length exceeds the length necessary to apply the discharges to the selected points, the excess length shall , where possible, be placed non-inductively off the ground reference plane and shall not come closer than 0.2m to other conductive parts in the test setup.

Where the EUT is installed on a metal table, the table was connected to the reference plane via a cable with a 470k ohm resister located at each end, to prevent a build-up of charge. The test setup was consist a wooden table, 0.8m high, standing on the ground reference plane. A HCP, 1.6 m x 0.8 m, was placed on the table. The EUT and cables was isolated from the HCP by an insulating support 0.5 mm thick. The VCP size, 0.5 m x 0.5 m.

9.3. ESD TEST PROCEDURE

- a. In the case of air discharge testing the climatic conditions shall be within the following ranges:
 - ambient temperature : 15 °C to 35 °C;
 - relative humidity : 30 % to 60 %;
 - atmospheric pressure : 68 KPa (680 mbar) to 106 KPa (1060 mbar).
- b. Test programs and software shall be chosen so as to exercise all normal modes of operation of the EUT. The use of special exercising software is encouraged, but permitted only where it can be shown that the EUT is being comprehensively exercised.
- c. The test voltage shall be increased from the minimum to the selected test severity level, in order to determine any threshold of failure. The final severity level should not exceed the product specification value in order to avoid damage to the equipment.
- d. The test shall be performed with single discharges. On preselected points at least ten single discharges (in the most sensitive polarity) shall be applied.
- e. For the time interval between successive single discharges an initial value of one second is recommended. Longer intervals may be necessary to determine whether a system failure has occurred.
- f. In the case of contact discharges, the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.
- g. In the case of painted surface covering a conducting substrate, the following procedure shall be adopted :
 - If the coating is not declared to be an insulating coating by the equipment manufacturer, then the pointed tip of the generator shall penetrate the coating so as to make contact with the conducting substrate.
 - Coating declared as insulating by the manufacturer shall only be submitted to the air discharge.
 - The contact discharge test shall not be applied to such surfaces.
- h. In the case of air discharges, the round discharge tip of the discharge electrode shall be approached as fast as possible (without causing mechanical damage) to touch the EUT . After each discharge, the ESD generator (discharge electrode) shall be removed from the EUT. The generator is then retriggered for a new single discharge. This procedure shall be repeated until the discharges are completed. In the case of an air discharge test, the discharge switch, which is used for contact discharge, shall be closed.



9.4. TEST SEVERITY LEVELS

9.4.1. Contact discharge

Level	Test Voltage (KV) of Contact discharge
1	± 2
2	± 4
3	± 6
4	± 8
X	Specified

Remark : "X" is an open level.

9.4.2. Air discharge

Level	Test Voltage (KV) of Air Discharge
1	± 2
2	± 4
3	± 8
4	± 15
X	Specified

Remark : "X" is an open level.

9.5. TEST POINTS

9.5.1. TEST RESULT OF AIR DISCHARGE

TEST POINT	VOLTAGE	TESTED NO.	OBSERVATION	RESULT
CASE	$\pm 2 / \pm 4 / \pm 8$ KV	BY 10	NORMAL	PASS
BRACKET	$\pm 2 / \pm 4 / \pm 8$ KV	BY 10	NORMAL	PASS
BNC PORT	$\pm 2 / \pm 4 / \pm 8$ KV	BY 10	NORMAL	PASS

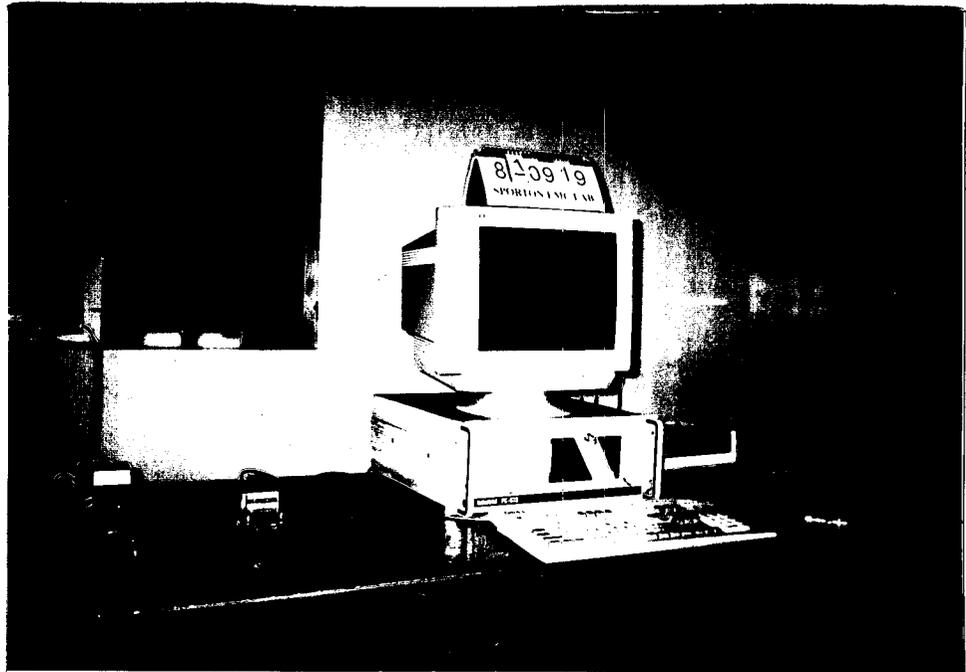
9.5.2. TEST RESULT OF CONTACT DISCHARGE

POLARITY	VOLTAGE	TESTED NO.	OBSERVATION	RESULT
HORIZONTAL(AT FRONT)	$\pm 2 / \pm 4$ KV	BY 10	NORMAL	PASS
HORIZONTAL (AT LEFT)	$\pm 2 / \pm 4$ KV	BY 10	NORMAL	PASS
HORIZONTAL (AT RIGHT)	$\pm 2 / \pm 4$ KV	BY 10	NORMAL	PASS
HORIZONTAL (AT REAR)	$\pm 2 / \pm 4$ KV	BY 10	NORMAL	PASS
VERTICAL (AT FRONT)	$\pm 2 / \pm 4$ KV	BY 10	NORMAL	PASS
VERTICAL (AT LEFT)	$\pm 2 / \pm 4$ KV	BY 10	NORMAL	PASS
VERTICAL (AT RIGHT)	$\pm 2 / \pm 4$ KV	BY 10	NORMAL	PASS
VERTICAL (AT REAR)	$\pm 2 / \pm 4$ KV	BY 10	NORMAL	PASS
CASE	$\pm 2 / \pm 4$ KV	BY 10	NORMAL	PASS
BRACKET	$\pm 2 / \pm 4$ KV	BY 10	NORMAL	PASS
BNC PORT	$\pm 2 / \pm 4$ KV	BY 10	NORMAL	PASS

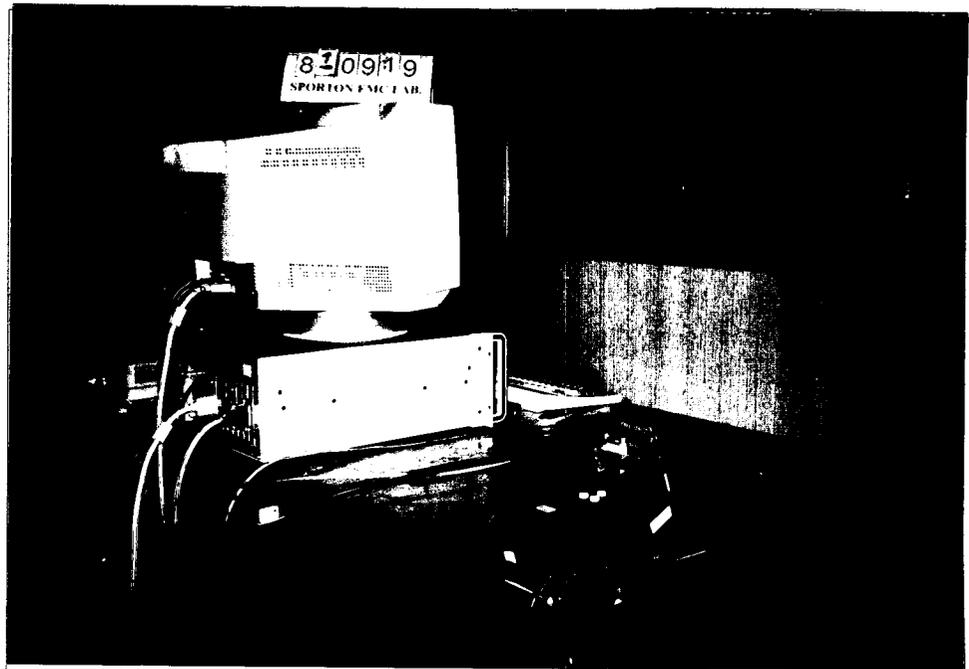
Test Engineer : *Richard Ann*

9.6. PHOTOGRAPHS OF ELECTROSTATIC DISCHARGE (ESD) IMMUNITY TEST

FRONT VIEW



REAR VIEW

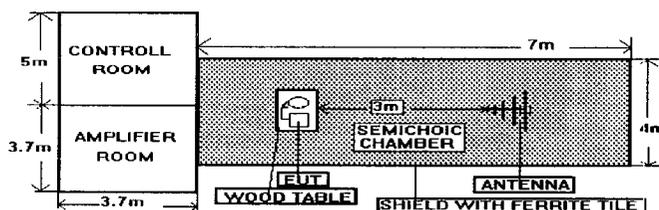


10. RADIO FREQUENCY ELECTROMAGNETIC FIELD IMMUNITY TEST (RS)

FINAL TEST RESULT : PASS

- Basic Standard : IEC 801-3 (1984), IEC 1000-4-3 (1994)
- Generic Standard : EN 50 082-2 (1991)
- Performance Criteria : A
- Level : 3
- Frequency Range : 27 to 500 MHz for IEC 801-3, 80 to 1000 MHz for IEC 1000-4-3
- Field Strength : 10 V/m
(Unmodulated for IEC 801-3, Modulated 80 % AM for IEC 1000-4-3)
- Temperature : 23°C
- Relative Humidity : 63%
- Test Date : Jan. 14, 1998

10.1. TEST SETUP



NOTE : The SPORTON 7m x 4m x 4m semicoic chamber is compliance with the sixteen points uniform field requirement as stated in IEC 1000-4-3 Section 6.2

The procedure defined in this part requires the generation of electromagnetic fields within which the test sample is placed and its operation observed. To generate fields that are useful for simulation of actual (field) conditions may require significant antenna drive power and the resultant high field strength levels. To comply with local regulations and to prevent biological hazards to the testing personnel, it is recommended that these tests be carried out in a shielded enclosure or semicoic chamber.

10.2. TEST PROCEDURE

- a. The equipment to be tested is placed in the center of the enclosure on a wooden table. The equipment is then connected to power and signal leads according to pertinent installation instructions.
- b. The bilog antenna which is enabling the complete frequency range of 27 MHz to 1000 MHz is placed 3m away from the equipment. The required field strength is determined by placing the field strength meter(s) on top of or directly alongside the equipment under test and monitoring the field strength meter via a remote field strength indicator outside the enclosure while adjusting the continuous-wave to the applicable antennae.
- c. The test is normally performed with the antenna facing the most sensitive side of the EUT. The polarization of the field generated by the biconical antenna necessitates testing each position twice, once with the antenna positioned vertically and again with the antenna positioned horizontally. The circular polarization of the field from the log-spiral antenna makes a change of position of the antenna unnecessary.
- d. At each of the above conditions, the frequency range is swept from 27 MHz to 1000 MHz, pausing to adjust the R.F. signal level or to switch oscillators and antenna. The rate of sweep is in the order of $1.5 * 10^{-3}$ decades/s. The sensitive frequencies or frequencies of dominant interest may be discretely analyzed.

10.3. TEST SEVERITY LEVELS

Frequency Band : 27 MHz to 1000 MHz

Level	Test field strength (V/m)
1	1
2	3
3	10
X	Specified

Remark : "X" is an open class.

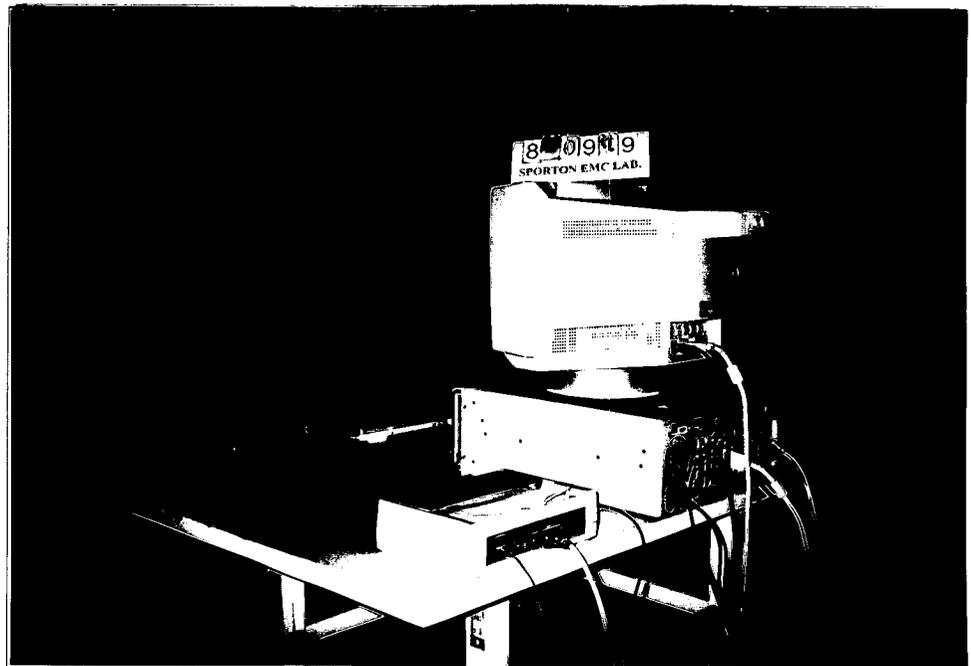
Test Engineer : *Richard Ann*

10.4. PHOTO OF RADIO FREQUENCY ELECTROMAGNETIC FIELD IMMUNITY TEST

FRONT VIEW



REAR VIEW

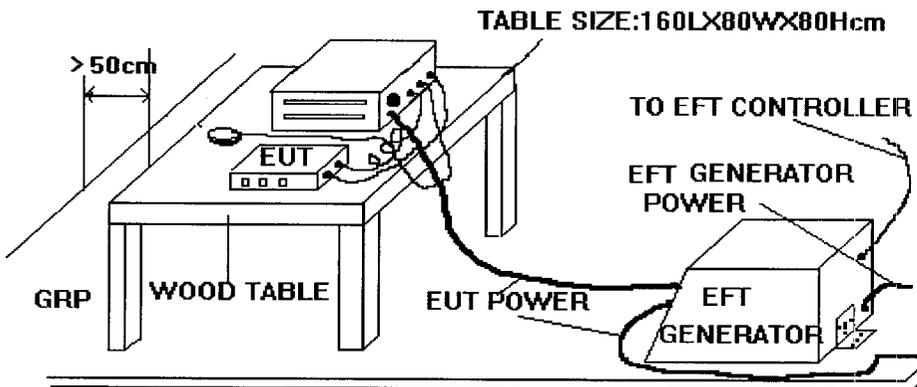


11. ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST (EFT/BURST)

FINAL TEST RESULT : PASS

- Basic Standard : IEC 801-4 (1988), IEC 1000-4-4 (1995)
- Generic Standard : EN 50 082-2 (1991)
- Performance Criteria : B
- Level : on Power Supply -- 3
on I/O signal, data and control line -- 3
- Test Voltage : on Power Supply -- $\pm 0.5 / 1.0 / 2.0$ KV
on I/O signal, data and control line -- $\pm 0.25 / 0.50 / 1.0$ KV
- Temperature : 24 °C
- Relative Humidity : 59 %
- Test Date : Jan. 14, 1998

11.1. TEST SETUP



The EUT was placed on a ground reference plane and was insulated from it by an insulating support about 0.1m thick. If the EUT is table-top equipment, it was located approximately 0.8m above the GRP.. The GRP. was a metallic sheet (copper or aluminum) of 0.25 mm ,minimum thickness; other metallic may be used but they shall have at least 0.65 mm thickness. It shall project beyond the EUT by at least 0.1m on all sides and connected to the protective earth. In the SPORTON EMC LAB. we provided 1 mm thickness aluminum ground reference plane or 1 mm thickness stainless steel ground reference plane. The minimum size of the ground reference plane is 1 m x 1 m, the exact size depending on the dimensions of the EUT. It was connected to the protective grounding system. The EUT was arranged and connected according to its functional requirements. The minimum distance between the EUT and other conductive structures, except the GRP. beneath the EUT, was more than 0.5 m. Using the coupling clamp, the minimum distance between the coupling plates and all other conductive structures, except the GRP. beneath the EUT, was more than 0.5 m. The length of the signal and power lines between the coupling device and the EUT was 1m or less.

11.2. TEST ON POWER LINE

- a. The EFT/B-generator was located on the GRP.. The length from the EFT/B-generator to the EUT as not exceed 1 m.
- b. The EFT/B-generator provides the ability to apply the test voltage in a non-symmetrical condition to the power supply input terminals of the EUT.

11.3. TEST ON COMMUNICATION LINES

- a. The coupling clamp is composed of a clamp unit for housing the cable (length more than 3 m), and was placed on the GRP..
- b. The coupling clamp provides the ability of coupling the fast transient/bursts to the cable under test.

11.4. TEST PROCEDURE

- a. In order to minimize the effect of environmental parameters on test results, the climatic conditions when test is carrying out shall comply with the following requirements :
 - ambient temperature : 15°C to 35°C;
 - relative humidity : 45% to 75%;
 - atmospheric pressure : 68 KPa (680 mbar) to 106 KPa (1060 mbar).

- b. In order to minimize the effect of environmental parameters on test results, the electromagnetic environment of the laboratory shall not influence the test results.

- c. The variety and diversity of equipment and systems to be tested make it difficult to establish general criteria for the evaluation of the effects of fast transients/bursts on equipment and systems.

- d. The test results may be classified on the basic of the operating conditions and the functional specification of the equipment under test, according to the following performance criteria :
 - Normal performance within the specification limits.
 - Temporary degradation or loss of function or performance which is selfrecoverable.
 - Temporary degradation or loss of function or performance which requires operator intervention or system reset.
 - Degradation or loss of function which is not recoverable due to damage of equipment (components).

11.5. TEST SEVERITY LEVELS

The following test severity levels are recommended for the fast transient/burst test :

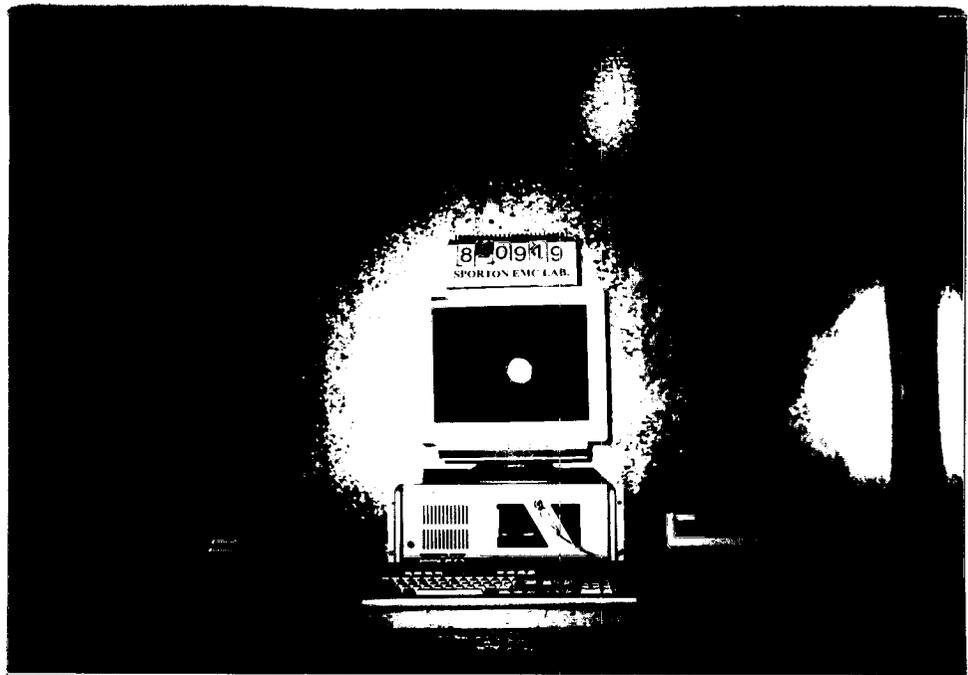
Open circuit output test voltage $\pm 10\%$		
Level	On Power Supply	On I/O signal, data and control line
1	0.5 KV	0.25 KV
2	1.0 KV	0.50 KV
3	2.0 KV	1.00 KV
4	4.0 KV	2.00 KV
X	Specified	Specified

Remark : " X " is an open level. The level is subject to negotiation between the user and the manufacturer or is specified by the manufacturer.

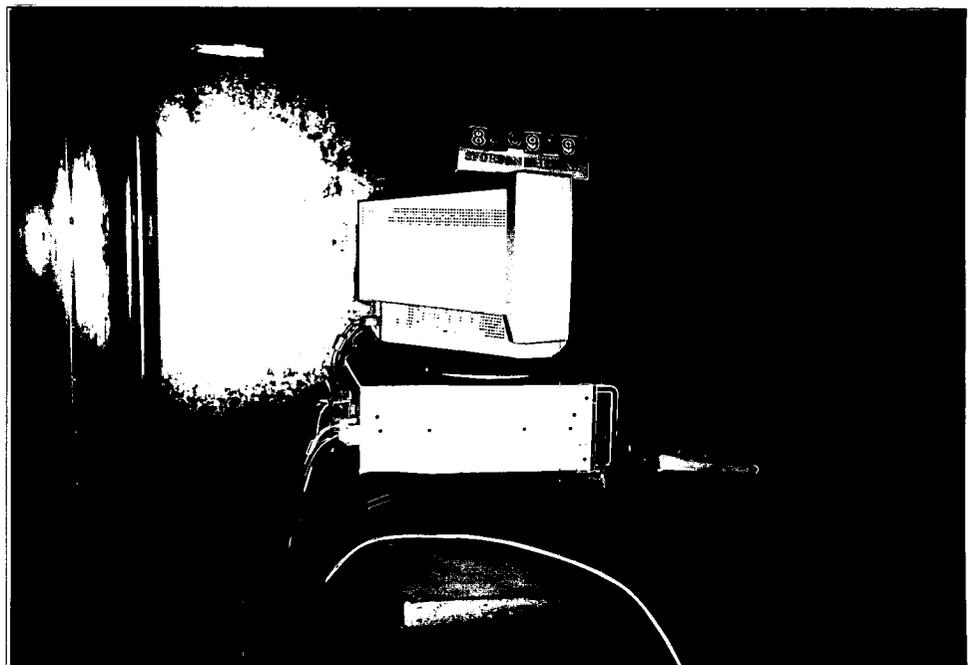
Test Engineer : *Richard Ann*

11.6. PHOTO OF ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST

FRONT VIEW



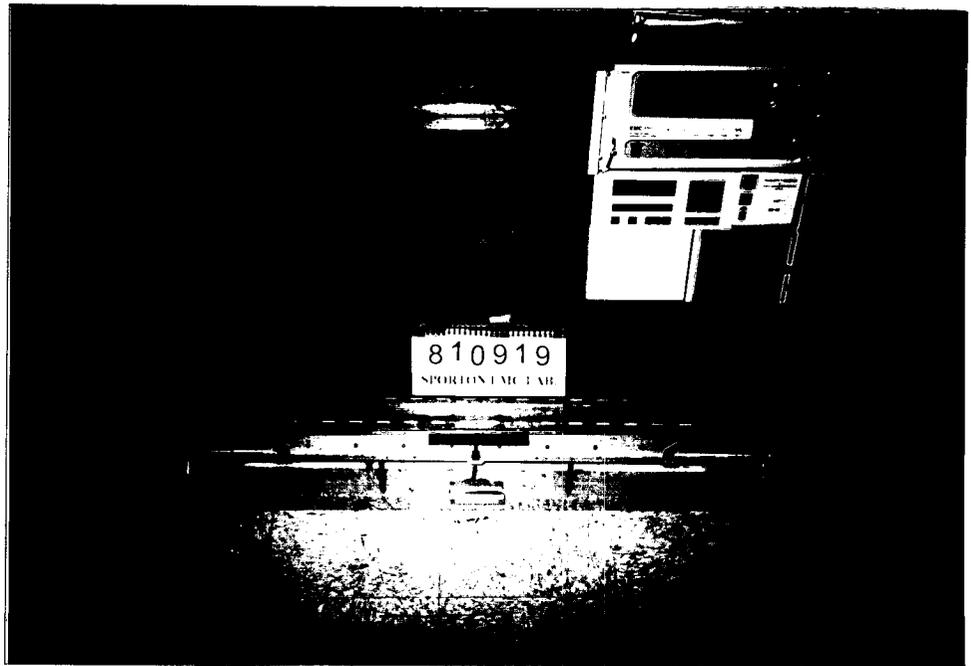
REAR VIEW



CLAMP
(TP)

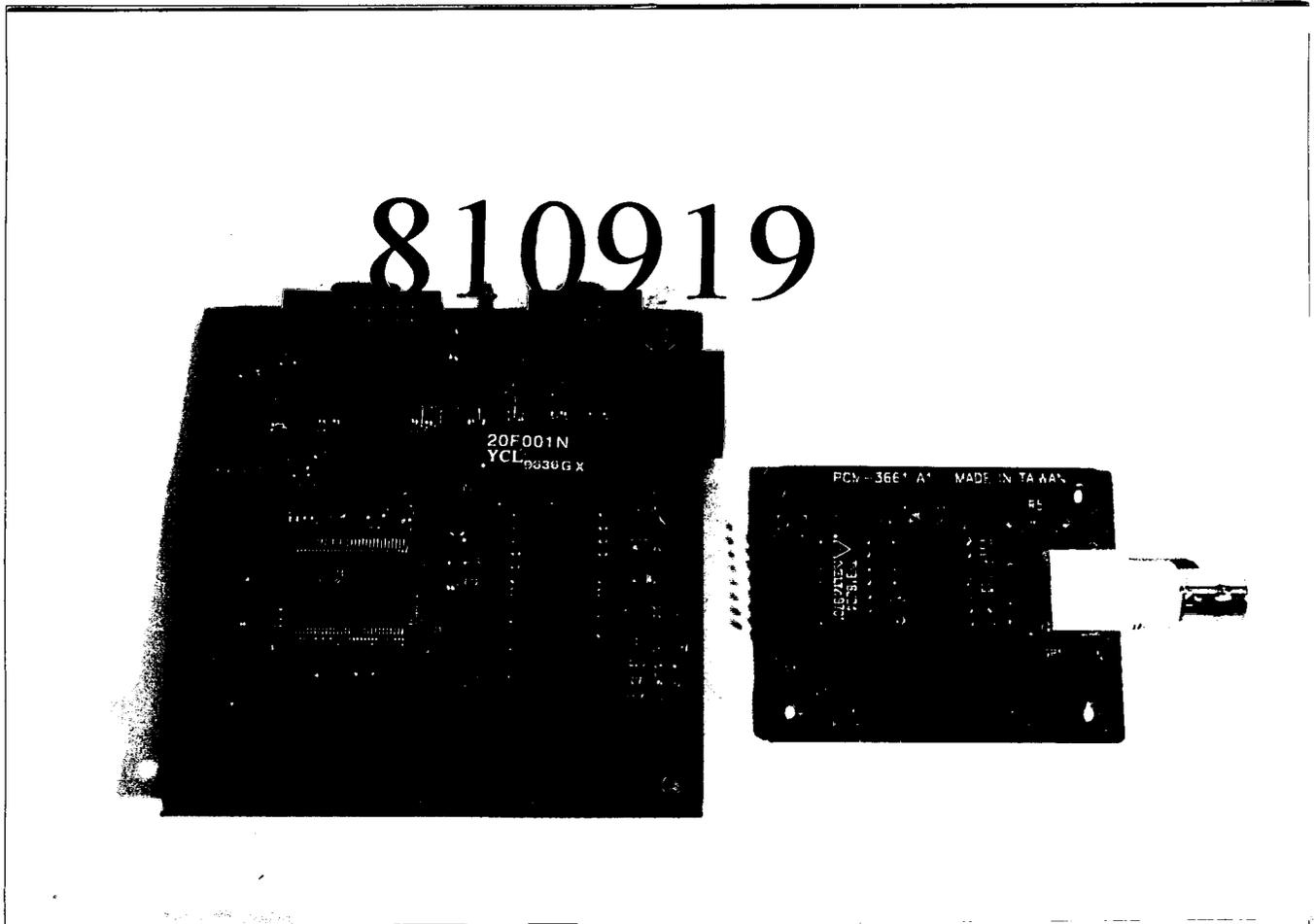


CLAMP
(BNC)

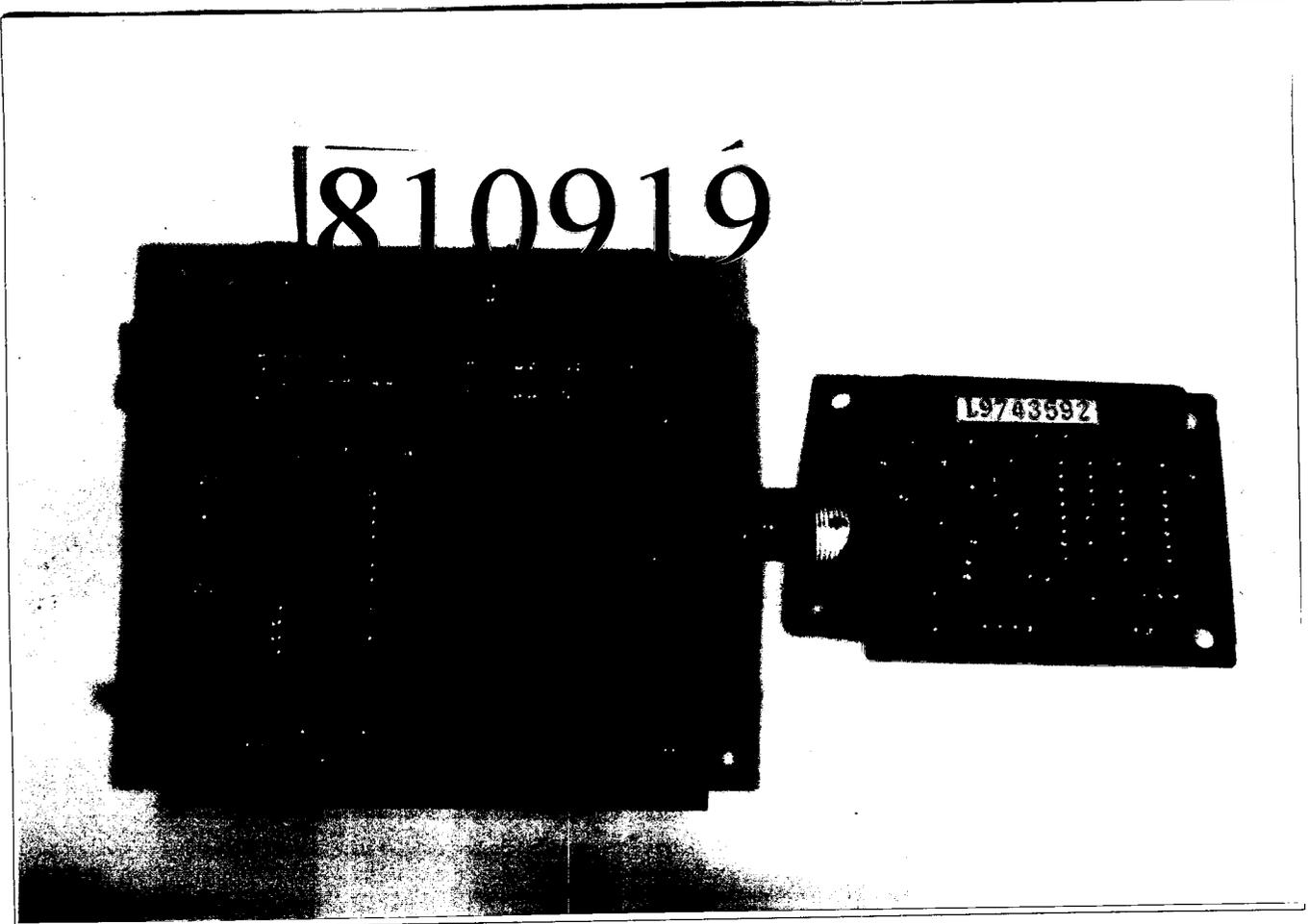


12. PHOTOGRAPHS OF EUT APPEARANCE

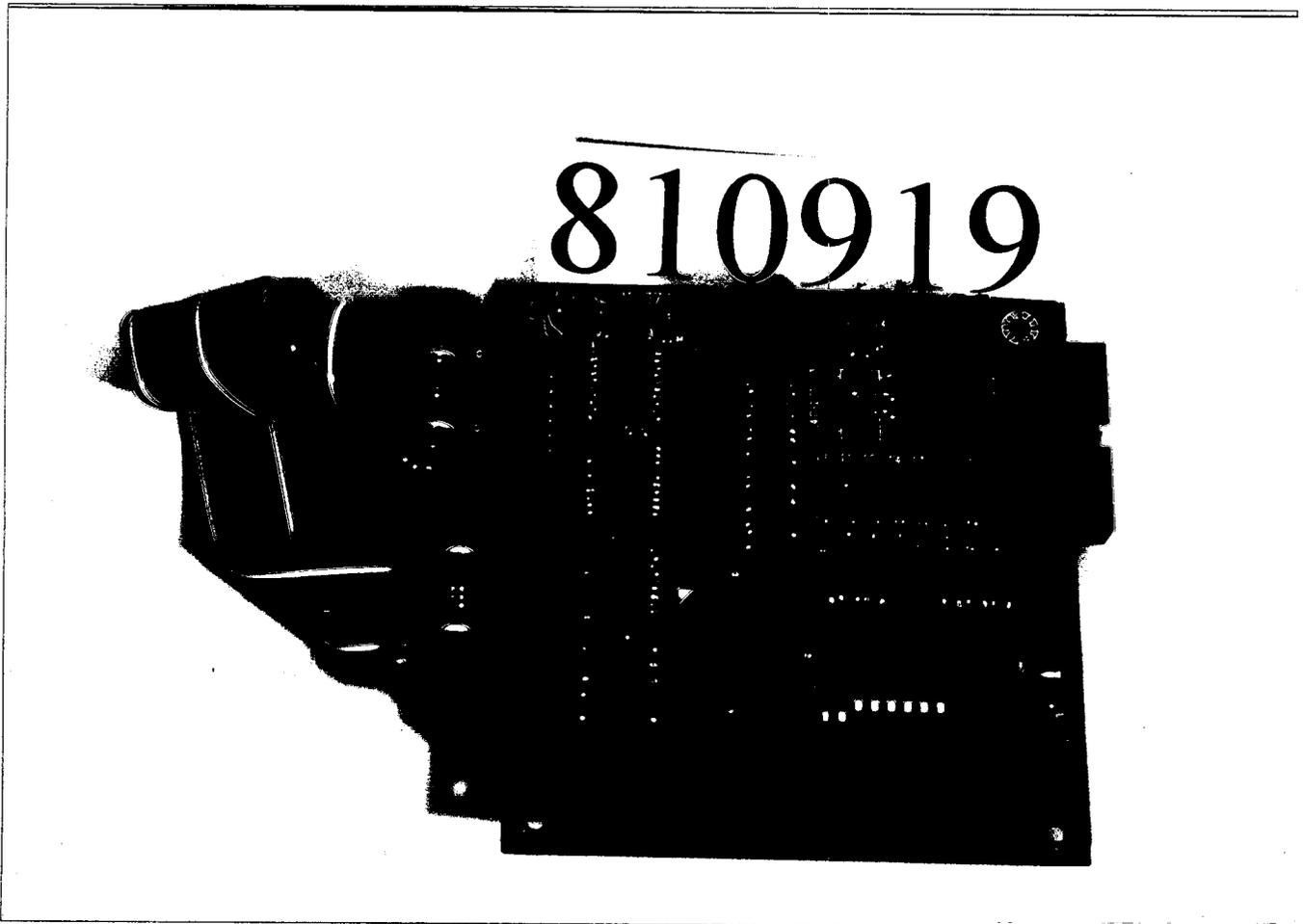
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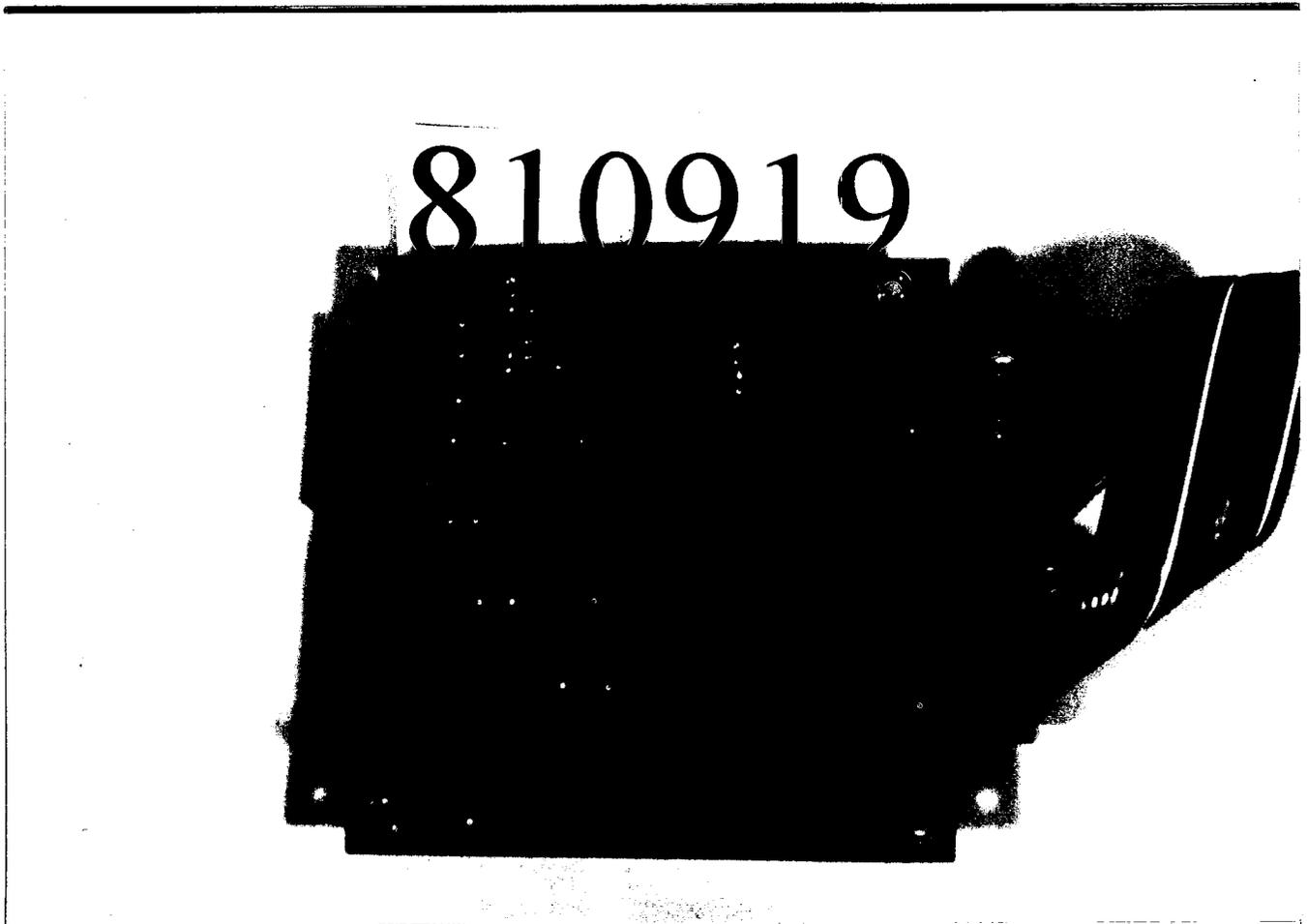
(PCM-3660/PCM-3661)



(PCM-3730)

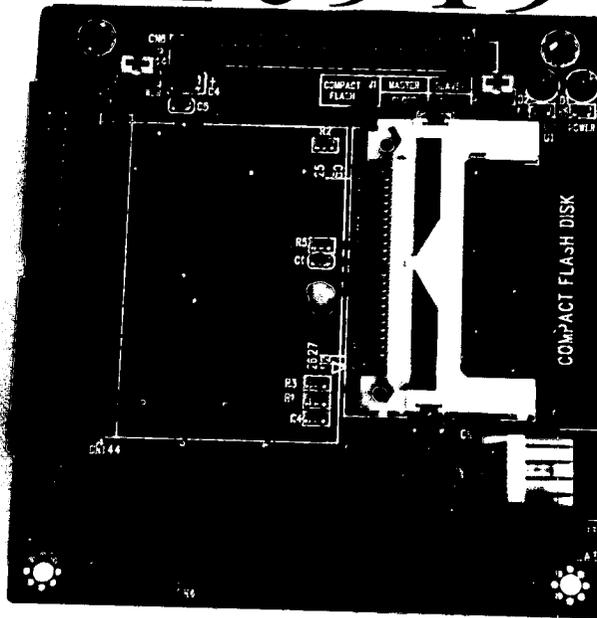


(PCM-3730)

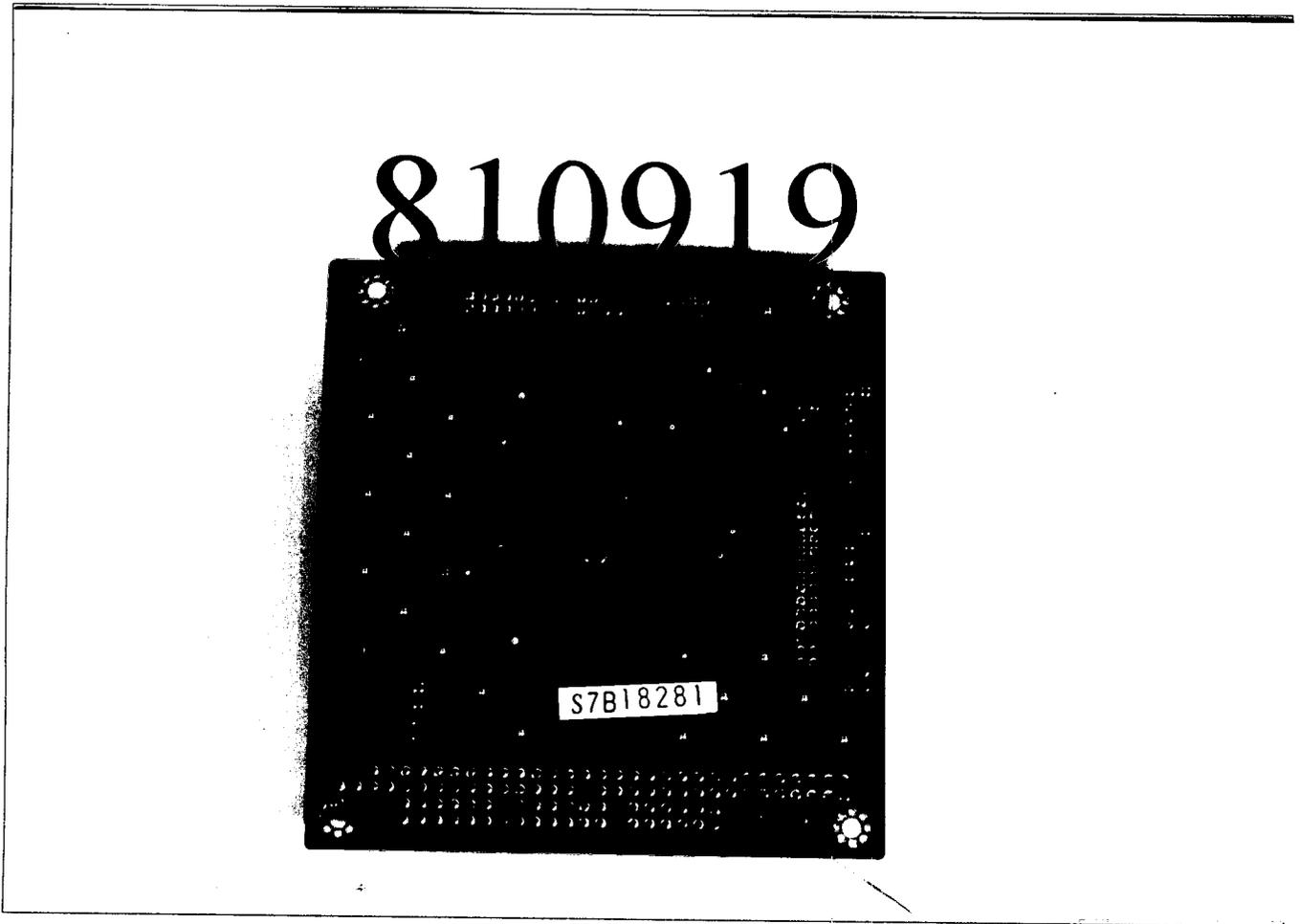


(PCM-3835)

810919

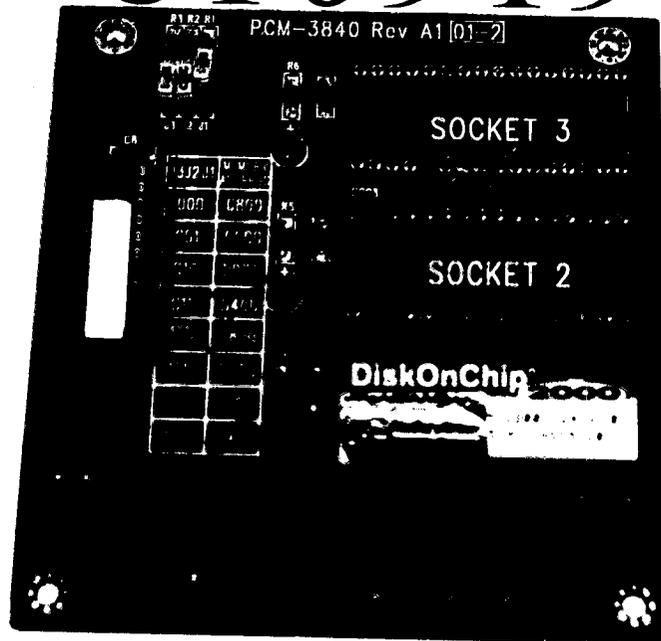


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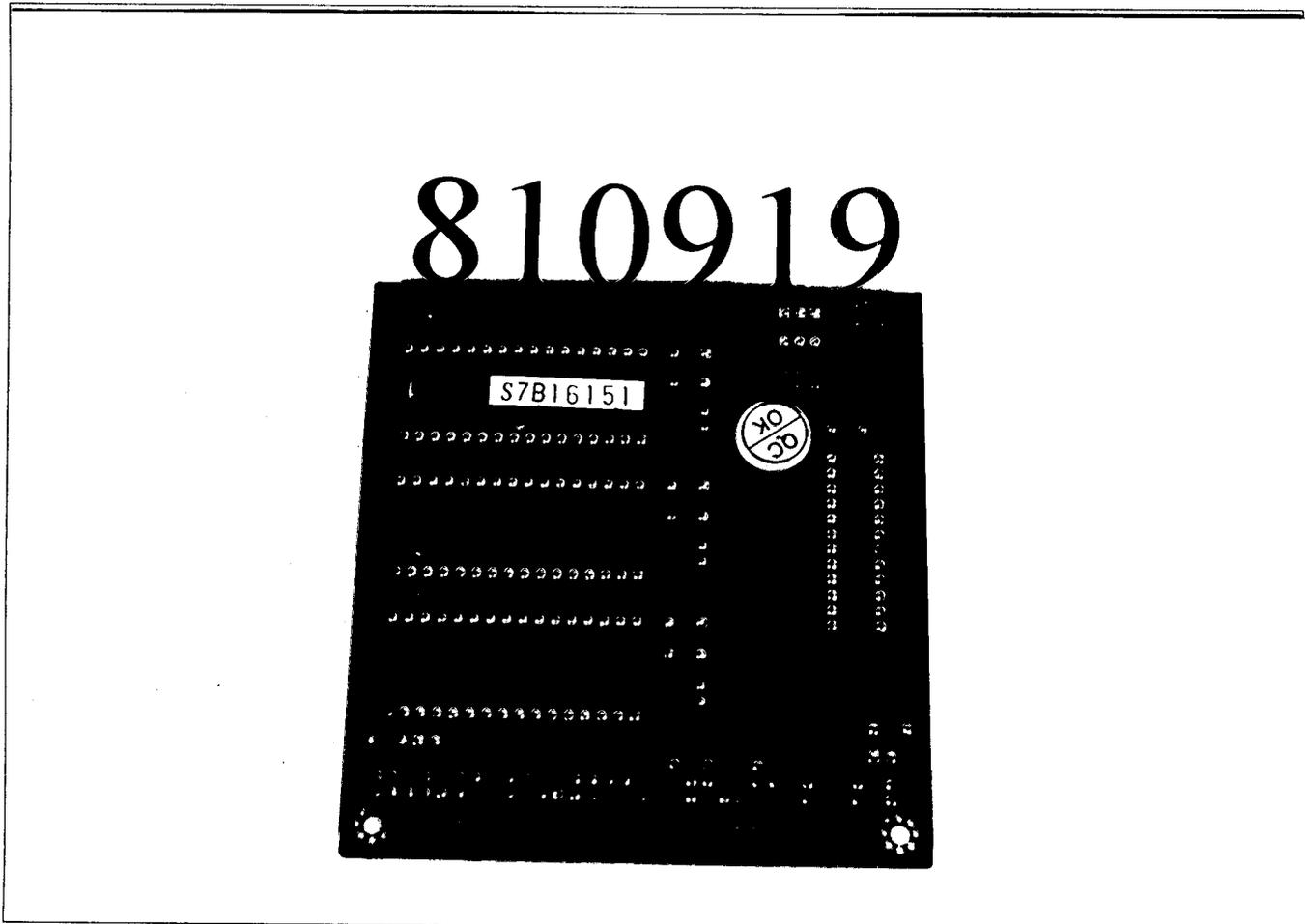


(PCM-3840)

810919

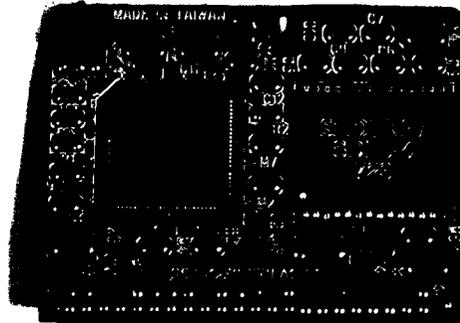


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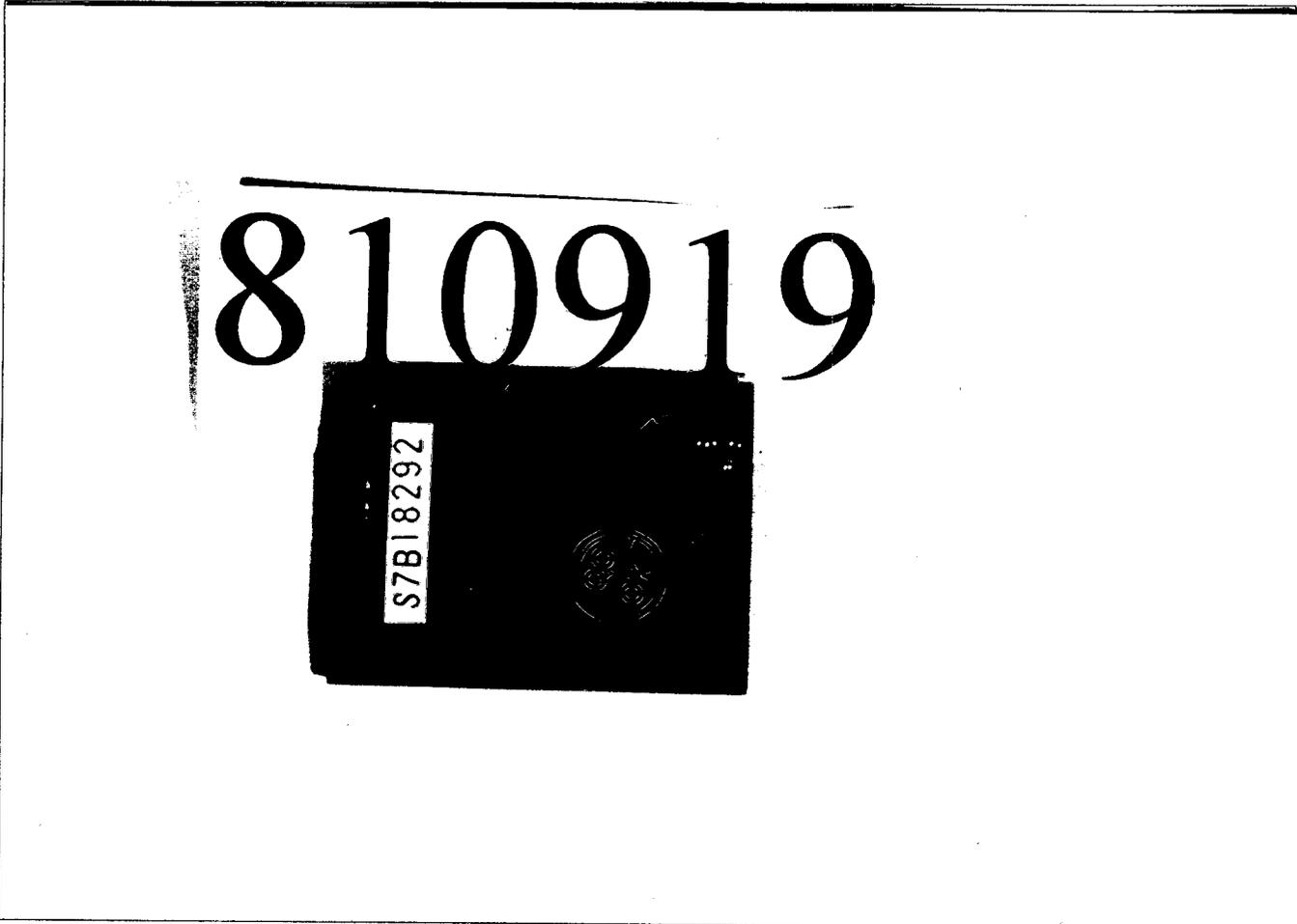


(PCD-1230)

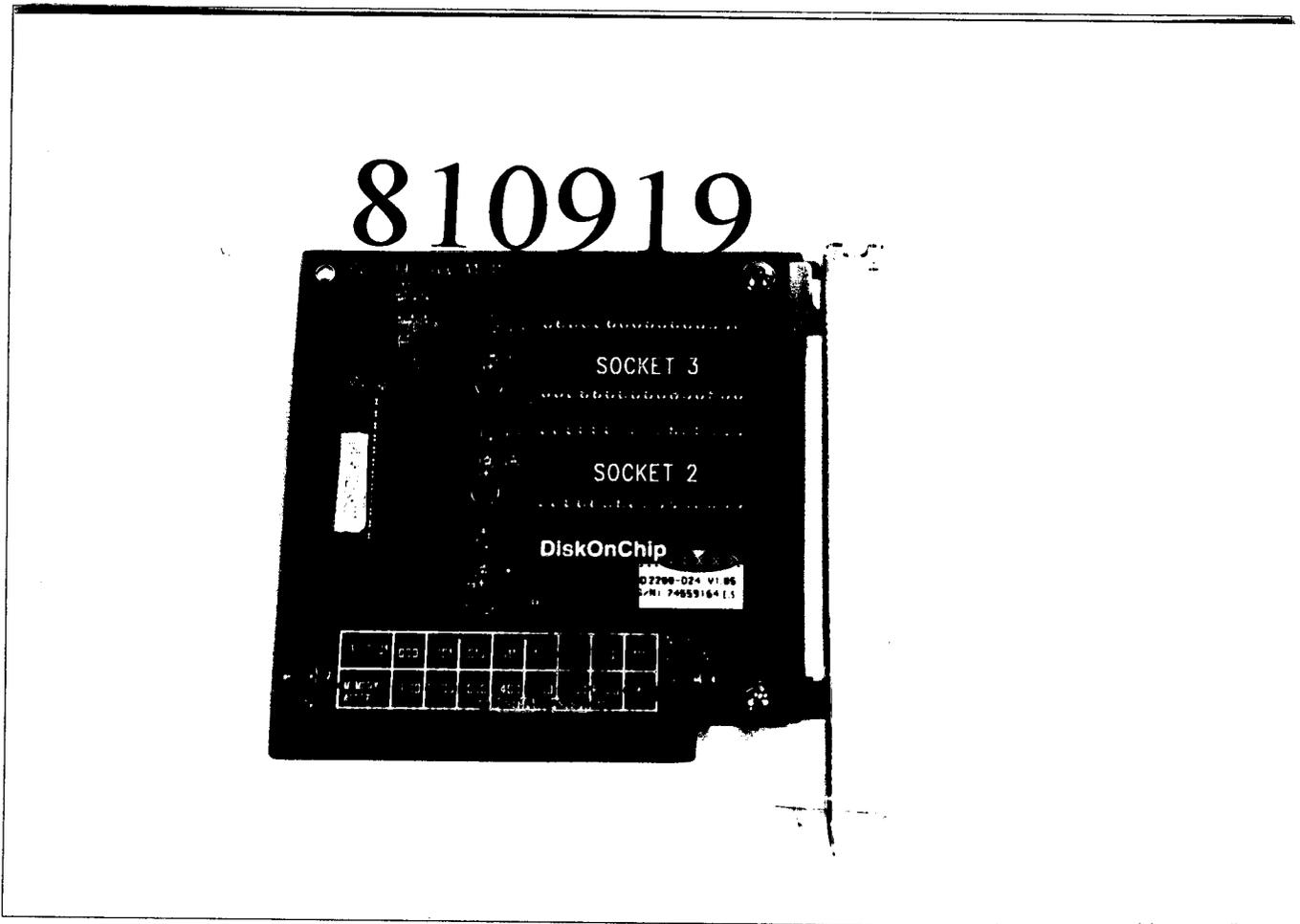
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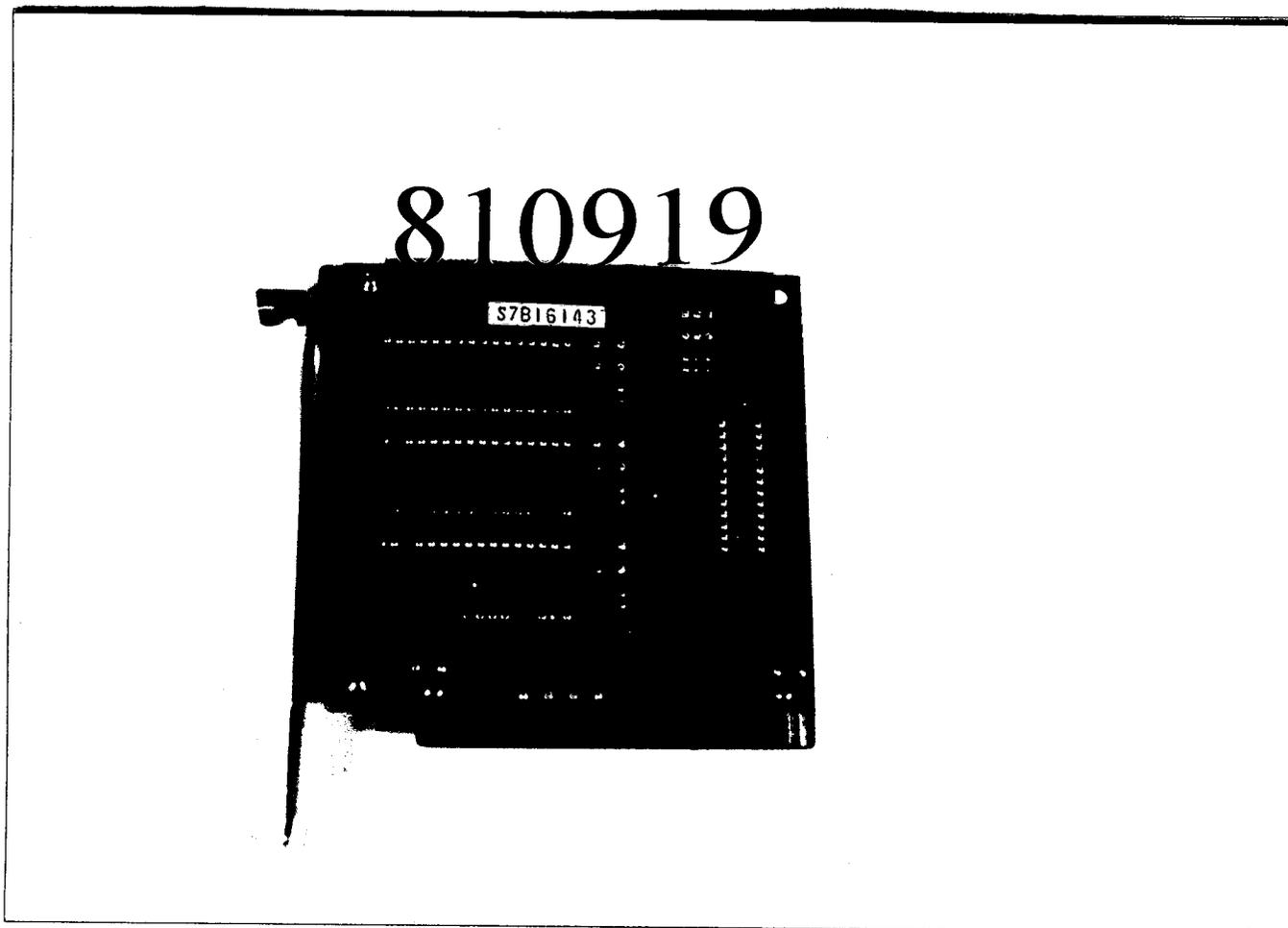
(PCD-1230)



(PCD-897)



(PCD-897)



**13. ANTENNA FACTOR & CABLE LOSS**

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
30	17.7	0.9
35	15.6	1.1
40	13.0	1.0
45	10.1	1.2
50	8.0	1.2
55	6.4	1.2
60	6.1	1.2
65	5.9	1.4
70	6.4	1.3
75	6.3	1.5
80	7.2	1.5
85	7.5	1.6
90	8.5	1.6
100	10.1	1.7
110	10.4	1.9
120	11.8	1.8
130	11.2	2.3
140	11.7	2.0
150	11.9	2.2
160	10.5	2.1
180	9.0	2.0
200	9.1	2.3
225	9.5	2.5
250	11.8	2.6
300	13.6	2.9
350	14.8	3.1
400	16.3	3.4
450	17.3	3.7
500	17.7	3.7
550	19.5	3.9
600	20.0	4.1
650	20.4	4.3
700	21.0	4.6
750	21.4	4.9
800	22.1	4.8
850	22.9	5.0
900	22.7	5.1
950	24.1	5.3
1000	24.9	5.5

14. LIST OF MEASURING EQUIPMENT USED

Instrument	Manufacturer	Model	Characteristics	Calibration Date	Used for
Receiver RF Section	HP	85462A	9 KHz - 6.5 GHz	Oct. 22, 1997	Conduction
RF Section	HP	85460A	9 KHz - 6.5 GHz	Oct. 22, 1997	Conduction
LISN	EMCO	3850/2	50 ohm / 50 uH	Oct. 27, 1997	Conduction
LISN	KYORITSU	KNW-407	50 ohm / 50 uH	Oct. 04, 1997	Conduction
EMI Filter	CORCOM	MRI-2030	N/A	N/A	Conduction
EMI Filter	CORCOM	MRI-2030	N/A	N/A	Conduction
Spectrum Analyzer Display	HP	8568B	100 Hz - 1500 MHz	Jun. 17, 1997	Radiation
Quasi-peak Adapter	HP	85650A	9KHz -1000 MHz	Jun. 17, 1997	Radiation
Amplifier	HP	8447D	0.1 MHz -1.3 GHz	Nov. 12, 1997	Radiation
Bilog Antenna (Site1)	CHASE	CBL6111	30 MHz -1000 MHz	Aug. 11, 1997	Radiation
Turn Table	EMCO	1060-1.211	0 ~360 degree	N/A	Radiation
Antenna Mast	EMCO	1051-1.2	1 m- 4 m	N/A	Radiation
Dipole Antenna	EMCO	3121C	28 MHz - 1000 MHz	May 19, 1997	Radiation
ESD Simulator	KEYTEK	MZ-15/EC	0 KV - 15 KV	Apr. 18, 1997	ESD
OMNI-Tip	KEYTEK	TPC-2	0 KV - 15 KV	Jul. 24, 1997	ESD
Amplifier	AR	100W 1000M3	80 MHz - 1 GHz	N/A	RS
Isotropic Field Probe	AR	FP3000A	10 KHz - 1 GHz	Jun. 20, 1997	RS
IEEE-488 Interface	AR	CP3000	N/A	N/A	RS
System Interface	EMC Automation	200	HP-IB INTERFACE	N/A	RS
Power Meter	EMC Automation	438A	100 KHz -4.2 GHz	N/A	RS
Video Camera controller	EMC Automation	VCC-01	N/A	N/A	RS
Signal Generator	HP	8648A	100 KHz - 1 GHz	Sep. 11, 1997	RS
Signal Generator	R&S	SMX	100 KHz - 1 GHz	Nov. 08, 1997	RS
Antenna	CHASE	CBL6121A	26 MHz - 1 GHz	Jun. 13, 1997	RS
Amplifier	AR	75W 75A220	25MHz - 300MHz	Jun. 15, 1997	RS
EFT Generator	KEYTEK	CE-40	0 KV - 4.4 KV	July 10, 1997	EFT
Capacitive Clamp	KEYTEK	CE-40-CCL	0 KV - 2 KV	Jun. 24, 1997	EFT
Harmonic/Flicker Test System	HP	6843A	4800VA 90A / 48A PEAK	Nov. 15, 1997	Harmonics, Flicker

15. DECLARATION OF CONFORMITY AND THE CE MARK

There are three possible procedures pertaining to the declaration of conformity :

15.1. Conformity testing and declaration of conformity by the manufacturer or his authorized representative established within the Community or by an importer.

- Article 10 (1) of the EMC Directive,
- § 3 (1) no. 2a of the EMC Act.

15.2. Declaration of conformity issued by the manufacturer or his authorized representative established within the Community or by an importer following testing of the product and issued of an *EC certificate of conformity by a competent body.*

- Article 10 (2) of the EMC Directive,
- § 3 (1) no. 2b of the EMC Act.

15.3. Declaration of conformity issued by the manufacturer or his authorized representative established within the Community or by an importer following *testing and certification of the product by a notified body.*

- Article 10 (5) of the EMC Directive,
- § 3 (1) no. 2b of the EMC Act (radio transmitting installations).

15.4. Specimen For The CE Marking Of Electrical / Electronical Equipment

The components of the CE marking shall have substantially the same vertical dimension, which may not be less than 5 mm.

