

EMI TESTING REPORT

EUT : KEYBOARD
MODEL: NK-228
FCCID: NZHNK-22

PREPARED FOR:

DANWILL INDUSTRIAL LTD.
FLAT T, 10/F, VALIANT INDUSTRIAL
CENTRE 2-12 AU PUI WAN STREET.
FO TAN. SHATIN. NT.
HONG KONG.

PREPARED BY:

SPECTRUM RESEARCH & TESTING
LABORATORY INC.

NO. 101-10, LING 8, SHAN-TONG LI
CHUNG-LI CITY, TAOYUAN, TAIWAN, R.O.C.

TEL: (03) 4987684
FAX: (03) 4986528

TABLE OF CONTENTS

1. TEST REPORT CERTIFICATION.....	4
2. TEST STATEMENT	
2.1 TEST STATEMENT.....	5
2.2 DEPARTURE FROM DOCUMENT POLICIES, PROCEDURE OR SPECIFICATIONS.....	6
3. EUT MODIFICATIONS.....	7
4. MODIFICATION LETTER.....	8
5. CONDUCTED POWER LINE TEST	
5.1 TEST EQUIPMENT.....	9
5.2 TEST PROCEDURE.....	10-11
5.3 EUT OPERATING CONDITION.....	12
5.4 TEST PROCEDURE.....	13
5.5 TEST SETUP.....	14
5.6 RADIATED EMISSION LIMIT.....	15
5.7 CONDUCTED POWER LINE TEST RESULT.....	16
6. RADIATED EMISSION TEST	
6.1 TEST EQUIPMENT.....	17
6.2 CONFIGURATION OF THE EUT.....	18
6.3 EUT OPERATING CONDITION.....	18
6.4 TEST PROCEDURE.....	18
6.5 TEST SETUP.....	19-20
6.6 RADIATED EMISSION LIMIT.....	21
6.7 RADIATED EMISSION TEST RESULT.....	22
7. PHOTOS OF TESTING.....	23-28

1. TEST REPORT CERTIFICATION

APPLICANT : DANWILL INDUSTRIAL LTD.

ADDRESS : FLAT T, 10/F, VALIANT INDUSTRIAL
CENTRE 2-12 AU PUI WAN STREET.
FO TAN, SHATIN, NT.
HONG KONG.

EUT DESCRIPTION : KEYBOARD

(A) POWER SUPPLY : FROM PC

(B) MODEL : NK-228

(C) FCC ID : NZHNK-22

FINAL TEST DATE : 08/20/1998

MEASUREMENT PROCEDURE USED :

PART 15 SUB PART B OF FCC RULES AND
REGULATIONS (47 CFR PART 15)
FCC / ANSI C63.4 - 1992

WE HEREBY SHOW THAT:

THE MEASUREMENTS SHOWN IN THE ATTACHMENT WERE
MADE IN ACCORDANCE WITH THE PROCEDURES INDICATED,
AND THE ENERGY EMITTED BY THE EQUIPMENT WAS
FOUND TO BE WITHIN THE LIMITS APPLICABLE.

TESTING ENGINEER : Carrie Pang DATE 8/20
Carrie Pang

SUPERVISOR : Jesse Ho DATE 8/20/98
Jesse Ho

APPROVED BY : Johnson Ho DATE 8/20/98
Johnson Ho

2. TEST STATEMENT

2.1 TEST STATEMENT

TO whom it may concern,
THIS LETTER IS TO EXPLAIN.

**THE CLASS II APPLICATION.
THE DIFFERENT BETWEEN OLD KEYBOARD AND NEW KEYBOARD IS THE
NEW KEYBOARD WILL HAVE 2 MORE KEYS, THE OTHERS ARE SAME.**

The data shown in this report reflects the worst-case data for the condition as listed above.

2. TEST STATEMENT

2.2 DEPARTURE FROM DOCUMENT POLICIES, PROCEDURE OR SPECIFICATIONS

DID HAVE
ANY DEPARTURE FROM DOCUMENT POLICIES
& PROCEDURES OR FROM SPECIFICATIONS.

YES _____ , NO N/A .

IF YES, THE DESCRIPTION AS BELOW.

2.3 TEST STATEMENT

1. THE CERTIFICATE OR REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL OF THE LABORATORY.
2. THE REPORT MUST NOT BE USED BY THE CLIENT TO CLAIM PRODUCT ENDORSEMENT BY NVLAP OR ANY AGENCY OF THE U.S. GOVERNMENT.

3. EUT MODIFICATIONS

THE FOLLOWING ACCESSORIES WERE ADDED TO THE EUT
DURING TESTING:

- 1). KEYBOARD CONNECT LINE IS ADDED A CORE (IMP:100MHz AT 125OHM)
INSIDE KEYBOARD AND IS LOSED TO PCB SIDE WITH THREE CIRCLES.

4. MODIFICATION LETTER

THIS SECTION CONTAINS THE FOLLOWING DOCUMENTS:

A. LETTER OF MODIFICATIONS

N/A

定田實業有限公司
DANWILL INDUSTRIAL LTD.

香港新界沙田火炭坳背灣街2至12號威力工業中心10樓T室
電話: (852) 2602-3827 圖文傳真: (852) 2602-3956
FLAT T, 10/F, VALIANT INDUSTRIAL CENTRE,
2-12 AU PUI WAN STREET, FO TAN, SHATIN, N.T., HONG KONG.
TEL: (852) 2602-3827 FAX: (852) 2602-3956

September 23, 1997

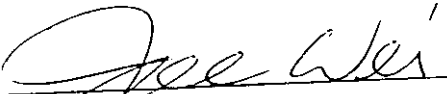
Federal Communications Commission
Authorization and Evaluation Division
7435 Oakland Mills Road
Columbia MD 21046

To whom it may concern:

This is to serve as proper notice that our company agrees to make all modifications to keyboard, model number EBK-2068A-9 as listed in section 3.0 of the test report submitted by Spectrum Research & Testing Laboratory, Inc.

Respectfully,

Name :


Joe Wei

Title : General Manager

Effective Dates : From October 01, 1997 To October 01, 1999

5. CONDUCTED POWER LINE TEST

5.1 TEST EQUIPMENT

THE FOLLOWING TEST EQUIPMENT WAS USED DURING THE CONDUCTED POWER LINE TEST :

EQUIPMENT/ FACILITIES	SPECIFICAT -IONS	MANUFACTURER	MODEL#/ SERIAL#	DATE OF CAL. & CAL.CENTER	DUE DATE
SPECTRUM ANALZER	9 KHz TO 1 GHz	HP	8590L/ 3624A01317	OCT, 1997 ETC	1Y
EMI TEST RECEIVER	9 KHz TO 30 MHz	ROHDE & SCHWARZ	ESHS30/ 893517/013	OCT, 1997 ETC	1Y
LISN	50 uH, 50 ohm	SOLAR ELECTRONICS	9252-50- R24-BNC/ 951315	AUGUST, 1997 ETC	1Y
LISN	50 uH, 50 ohm	SOLAR ELECTRONICS	9252-50- R24-BNC/ 951318	AUGUST, 1997 ETC	1Y
SIGNAL GENERATOR	9 KHz TO 1080 MHz	ROHDE & SCHWARZ	SMY01/ 841104/019	APRIL, 1998 ITRI	1Y
POWER CONVERTER	0 TO 300 VAC 47 - 500 Hz	AFC	AFC-1KW/ 850510	APRIL, 1998 SRT	1Y

5.2 CONFIGURATION OF THE EUT

THE EUT WAS CONFIGURED ACCORDING TO ANSI C63.4 - 1992.
ALL INTERFACE PORTS WERE CONNECTED TO THE APPROPRIATE
PERIPHERALS. ALL PERIPHERALS AND CABLES ARE LISTED
BELOW.

-EUT

DEVICE	MANUFACTURER	MODEL #	FCCID
KEYBOARD	DANWILL INDUSTRIAL LTD.	NK-228	NZHNK-22

-REMARK

1. KEYBOARD CABLE : UNSHIELDING

-INTERNAL DEVICES

<u>DEVICE</u>	<u>MANUFACTURER</u>	<u>MODEL #</u>	<u>FCCID/DoC</u>
MAIN BOARD	MICRO-STAR	MS6117	DoC
POWER SUPPLY	SEASONIC	SS-250GPX	DoC
HDD	SEAGATE	4092CPL2111	N/A
FDD (3.5")	PANASONIC	JU-257A606P	N/A
VGA CARD	ASUS	PC1-V775V2C	DoC

-PERIPHERALS

DEVICE	MANUFAC- TURER	MODEL# / SERIAL#	FCCID	CABLE
PRINTER	HP	2225C+	DS16XU2225	POWER-UNS DATA-S
MODEM	HAYES	07-00038	BFJ9D907-00038	POWER-UNS DATA-S
MOUSE	LOGITECH	M-S34	DZL210472	DATA-UNS

-REMARK

- (1). CABLE - UNS : UNSHIELDED CABLE
S : SHIELDED CABLE
- (2). CABLES - ALL 1m OR GREATER IN LENGTH-
BUNDLED ACCORDING TO ANSI C63.4 - 1992.

5.3 EUT OPERATING CONDITION

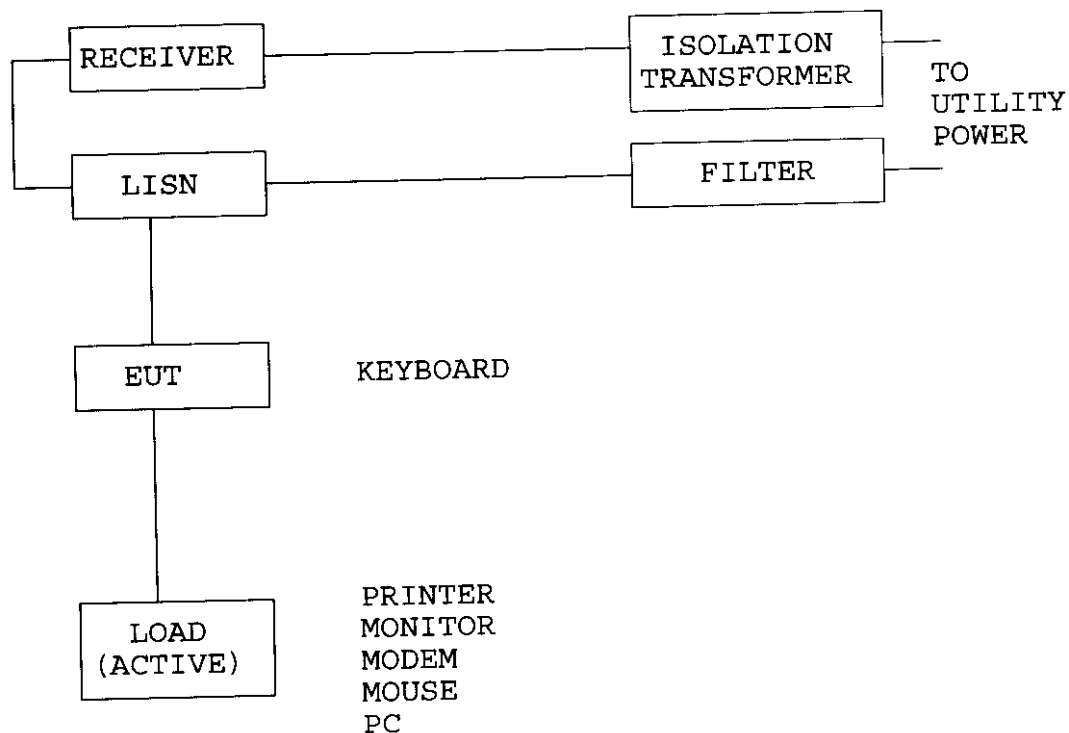
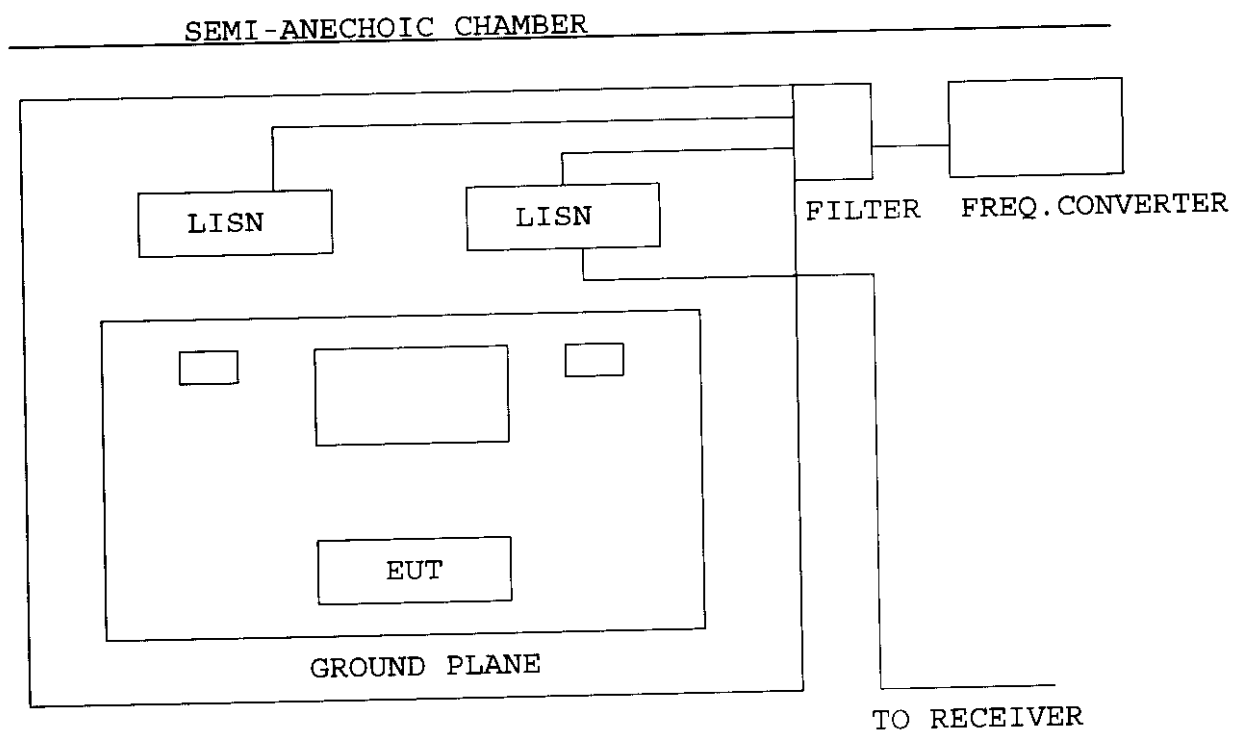
OPERATING CONDITION IS ACCORDING TO ANSI C63.4 - 1992.

1. EUT POWER ON.
2. "H" PATTERN SENT TO THE FOLLOWING PERIPHERALS:
 - PRINTER
 - MONITOR
 - MODEM
3. CPU : PENTIUM II - 233MHz
CLOCK CHIP : 66MHz

5.4 TEST PROCEDURE

THE EUT WAS TESTED ACCORDING TO ANSI C63.4 - 1992. THE CONDUCTED TEST WAS PERFORMED ACCORDING TO ANSI C63.4 7.2 TEST PROCEDURES. THE FREQUENCY SPECTRUM FROM 0.45 MHz TO 30 MHz WAS INVESTIGATED. THE LISN USED WAS 50 ohm / 50 uHenry AS SPECIFIED BY SECTION 5.1 OF ANSI C63.4 - 1992. CABLES AND PERIPHERALS WERE MOVED TO FIND THE MAXIMUM EMISSION LEVELS FOR EACH FREQUENCY.

5.5 TEST SETUP



5.6 CONDUCTED POWER LINE EMISSION LIMIT

FREQUENCY RANGE (MHz)	CLASS A	CLASS B
0.045 - 1.705	1000 uV	250 uV
1.705 - 30	3000 uV	250 uV

NOTE : IN THE ABOVE TABLE, THE TIGHTER LIMIT
APPLIES AT THE BAND EDGES.

5.7 CONDUCTED POWER LINE TEST RESULT

THE FREQUENCY SPECTRUM FROM 0.45 MHz TO 30 MHz WAS INVESTIGATED. ALL READINGS ARE QUASI-PEAK VALUES WITH A RESOLUTION BANDWIDTH OF 9 KHZ.

TEMPERATURE : 28 C

HUMIDITY : 78 %RH

FREQUENCY (MHz)	LINE 1 (uv)	LINE 2 (uv)	LIMIT (uv)
0.75	128.4	*	250
7.99	20.39	*	250
17.9	23.93	24.69	250
23.8	19.03	19.30	250
29.6	31.59	40.64	250

- REMARKS : (1). * = MEMENT DOES NOT APPLY FOR THIS FREQUENCY
 (2). UNCERTAINTY IN CONDUCTED EMISSION MEASURED IS <+/-2dB
 (3). CPU: PENTIUM II- 233MHz CLOCK CHIP : 66MHz
 (4). TEST CONFIGURATION PLEASE SEE 4.2
 (5). TEST EQUIPMENT PLEASE SEE 4.1
 (6). ANY DEPARTURE FROM SPECIFICATION : N/A

SIGNED BY TESTING ENGINEER :

Connie

6. RADIATED EMISSION TEST

6.1 TEST EQUIPMENT

THE FOLLOWING TEST EQUIPMENT WAS USED DURING THE
RADIATED EMISSION TEST :

EQUIPMENT / FACILITIES	SPECIFICAT -IONS	MANUFACTUR -ER	MODEL#/ SERIAL#	DATE OF CAL. & CAL. CENTER	DUE DATE
RECEIVER	20 MHz TO 1000 MHz	R & S	ESVS 30/ 841977/003	APRIL, 1998 ITRI	1Y
SPECTRUM ANALYZER	100 Hz TO 1500 MHz	HP	8568B/ 3019A05294	OCT , 1997 ETC	1Y
SPECTRUM ANALYZER	9 KHz TO 22 GHz	HP	8593E/ 3322A00670	APRIL, 1998 ITRI	1Y
SPECTRUM ANALYZER	100 Hz TO 1000 MHz	IFR	A-7550/ 2684/1248	JULY, 1998 ETC	1Y
SIGNAL GENERATOR	9 KHz TO 1080 MHz	ROHDE & SCHWARZ	SMY01/ 841104/019	APRIL, 1998 ITRI	1Y
DIPOLE ANTENNA	28 MHz TO 1000 MHz	EMCO	3121C/ 9003-535	DEC, 1997 SRT	1Y
DIPOLE ANTENNA	28 MHz TO 1000 MHz	EMCO	3121C/ 9611-1239	DEC, 1997 SRT	1Y
BI-LOG ANTENNA	26 MHz TO 2000 MHz	EMCO	3142/ 96081-1073	DEC, 1997 SRT	1Y
BI-LOG ANTENNA	26 MHz TO 1100 MHz	EMCO	3143/ 9509-1152	DEC, 1997 SRT	1Y
PRE-AMPLIFIER	0.1 MHz TO 1300 MHz	HP	8447D/ 2944A08402	APRIL, 1998 ITRI	1Y
PRE-AMPLIFIER	0.1 MHz TO 1300 MHz	HP	8447D/ 2944A06412	OCT, 1997 ETC	1Y
HORN ANTENNA	1 GHz TO 18 GHz	EMCO	3115/ 9012-3619	DEC, 1997 SRT	1Y

6.2 CONFIGURATION OF THE EUT

SAME AS SECTION 5.4 OF THIS REPORT.

6.3 EUT OPERATING CONDITION

SAME AS SECTION 5.3 OF THIS REPORT.

6.4 TEST PROCEDURE

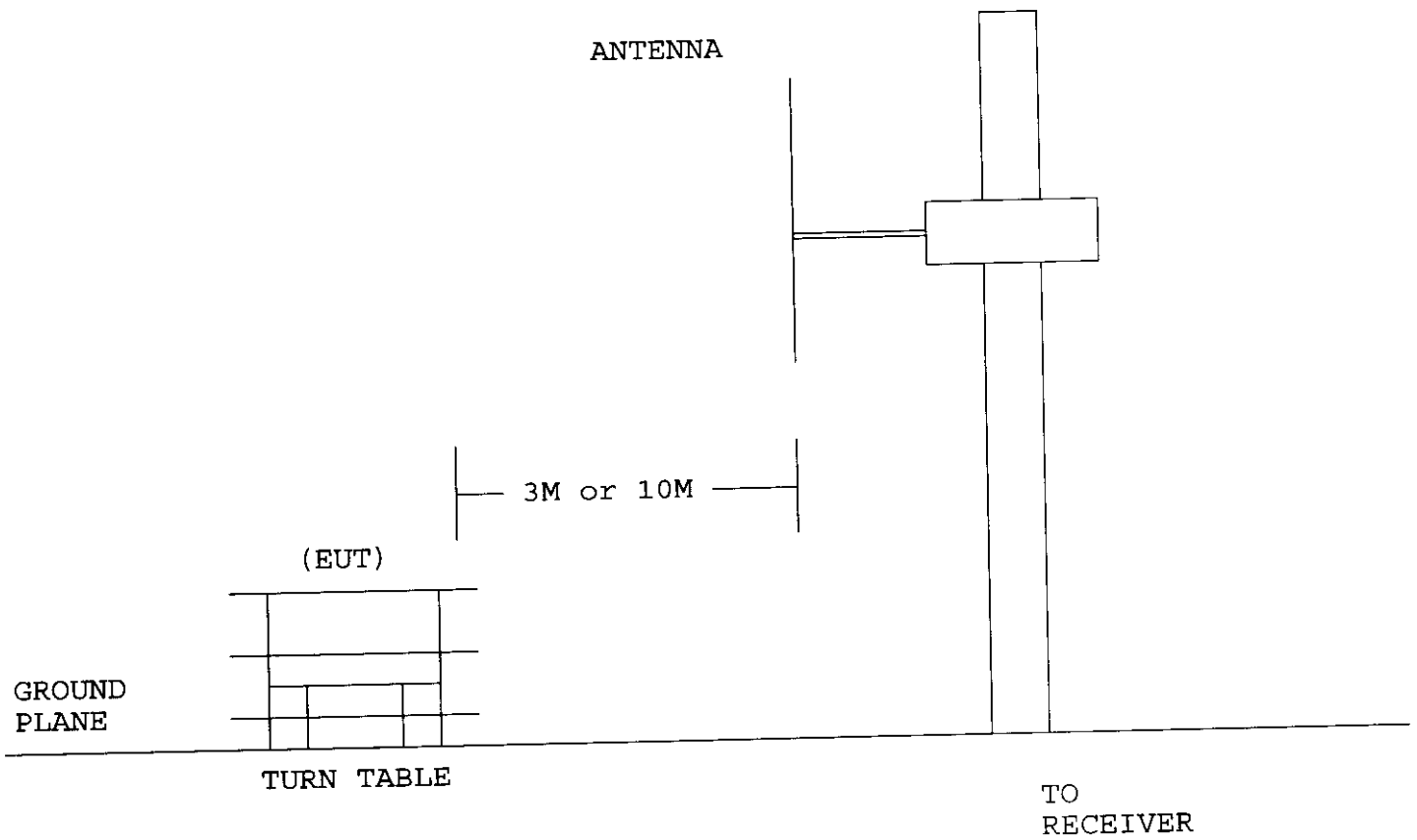
THE EUT WAS TESTED ACCORDING TO ANSI C63.4 - 1992. THE RADIATED TEST WAS PERFORMED AT SRT LAB'S OPEN SITE. THIS SITE IS ON FILE WITH THE FCC LABORATORY DIVISION, REFERENCE 31040/SIT.

THE FREQUENCY SPECTRUM FROM 30 MHz TO 2 GHz WAS INVESTIGATED. MEASUREMENTS WERE MADE AT THREE METERS WITH ANTENNA. PERIPHERALS, CABLES, EUT ORIENTATION, AND ANTENNA HEIGHT WERE VARIED TO FIND THE MAXIMUM EMISSION FOR EACH FREQUENCY.

THE FREQUENCY SPECTRUM FROM 30 MHz TO 2 GHz WAS INVESTIGATED. THE MEASUREMENTS UNDER 1 GHz WITH RESOLUTION BANDWIDTH OF 120 KHz ARE QUASI-PEAK READING MADE AT THREE METERS PERIPHERALS, CABLES, EUT ORIENTATION, AND ANTENNA HEIGHT WERE VARIED TO FIND THE MAXIMUM EMISSION FOR EACH FREQUENCY.

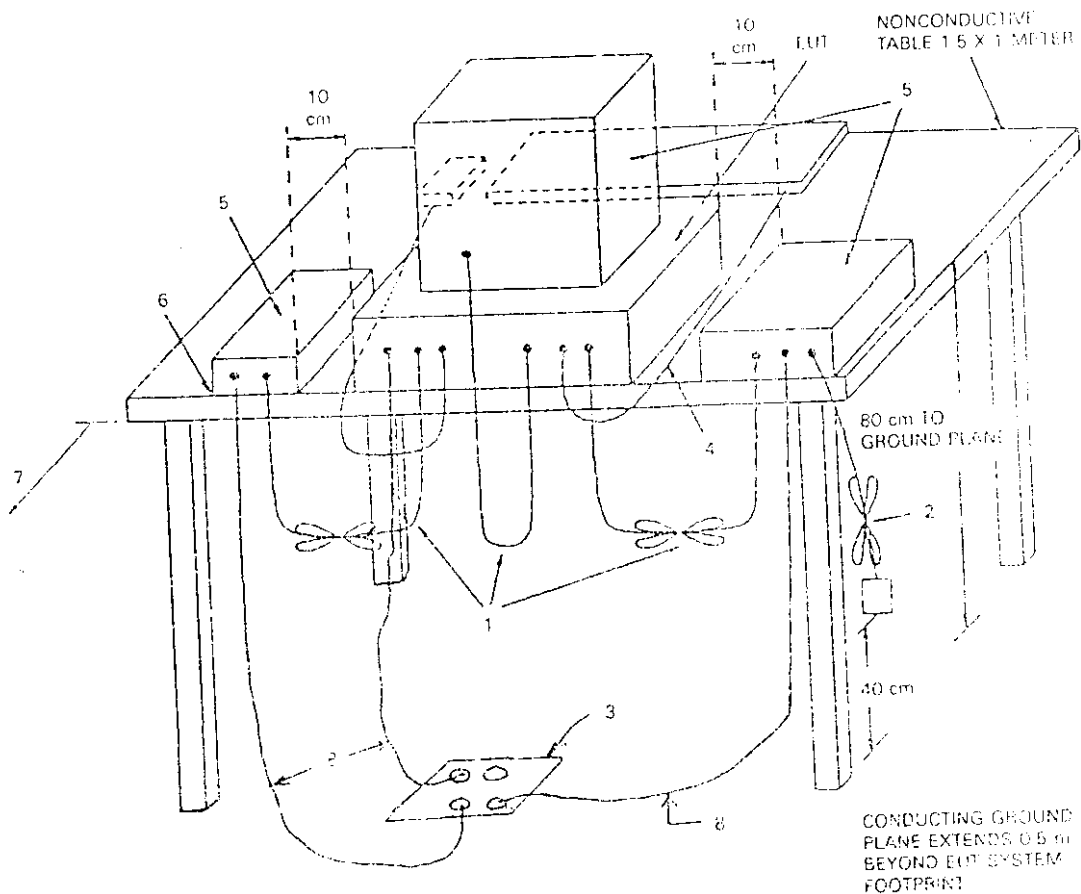
THE MEASUREMENTS ABOVE 1 GHz WITH A RESOLUTION BANDWIDTH OF 1 MHz ARE PEAK READING AT A DISTANCE OF THREE METERS WITH A HORN ANTENNA.

6.5 RADIATED TEST SETUP



6.5 RADIATED TEST SETUP

ELECTRICAL AND ELECTRONIC EQUIPMENT IN THE RANGE OF 9 KHz TO 40 GHz
ANSI C63.4-1992



LEGEND:

1. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth forming a bundle 30 to 40 cm long, hanging approximately in the middle between ground plane and table.
2. I/O cables that are connected to a peripheral shall be bundled in center. The end of the cable may be terminated if required using correct terminating impedance. The total length shall not exceed 3 m.
3. If LISNs are kept in the test setup for radiated emissions, it is preferred that they be installed under the ground plane with the receptacle flush with the ground plane.
4. Cables of hand-operated devices, such as keyboards, mouses, etc., have to be placed as close as possible to the controller.
5. Non-EUT components of EUT system being tested.
6. The rear of all components of the system, under test shall be located flush with the rear of the table.
7. No vertical conducting wall used.
8. Power cords drape to the floor and are routed over to receptacle.

6.6 RADIATED EMISSION LIMIT

ALL EMISSION FROM A DIGITAL DEVICE, INCLUDING ANY NETWORK OF CONDUCTORS AND APPARATUS CONNECTED THERETO, SHALL NOT EXCEED THE LEVEL OF FIELD STRENGTH SPECIFIED BELOW :

CLASS B

FREQUENCY (MHz)	DISTANCE (m)	FIELD STRENGTH (uV/m)
30 - 88	3	100
88 - 216	3	150
216 - 960	3	200
ABOVE 960	3	500

CLASS B (OPEN CASE)

FREQUENCY (MHz)	DISTANCE (m)	FIELD STRENGTH (uV/m)
30 - 88	3	199.5
88 - 216	3	298.5
216 - 960	3	398.1

CLASS A

FREQUENCY (MHz)	DISTANCE (m)	FIELD STRENGTH (uV/m)
30 - 88	3	316.3
88 - 216	3	473.2
216 - 960	3	613.0
ABOVE 960	3	1000.0

- NOTE : 1. IN THE EMISSION TABLES ABOVE, THE TIGHTER LIMIT APPLIES AT THE BAND EDGES.
2. DISTANCE REFERS TO THE DISTANCE BETWEEN MEASURING INSTRUMENT, ANTENNA, AND THE CLOSEST POINT OF ANY PART OF THE DEVICE OR SYSTEM.

6.7 RADIATED EMISSION TEST RESULT

THE FREQUENCY SPECTRUM FROM 30 MHz TO 2 GHz WAS INVESTIGATED. ALL READINGS UNDER 1 GHz ARE QUASI-PEAK VALUES WITH A RESOLUTION BANDWIDTH OF 120 KHZ. MEASUREMENTS WERE MADE AT 3 METERS.

THE MEASUREMENTS ABOVE 2 GHz WITH A RESOLUTION BANDWIDTH OF 1 MHz ARE PEAK READING AT A DISTANCE OF 3 METERS.

TEMPERATURE : 28 C HUMIDITY : 78 %RH

FREQ. (MHz)	CABLE LOSS (dB)	ANT. FACTOR (dB)	READING (dBuV)		EMISSION (uV)		LMTS (uV)
			HORIZ	VERT	HORIZ	VERT	
40.41	0.20	9.20	19.20	22.06	26.92	37.41	100
98.87	1.20	7.40	19.96	26.14	26.79	54.58	150
407.3	2.20	15.6	15.54	18.99	46.45	69.10	200
503.4	2.70	17.2	20.69	17.73	107.0	76.12	200
902.0	3.90	22.6	13.40	13.17	98.86	96.27	200

REMARKS : (1). MEASUREMENT DOES NOT APPLY FOR THIS FREQUENCY.

(2). THE MAXIMUM CONDITION WAS WITH THE MONITOR POWER CORD CONNECTED TO THE PERSONAL COMPUTER.

(3). CPU : PENTIUM II - 233MHz CLOCK CHIP : 66MHz

(4). SAMPLE CALCULATION
 $20 \text{ LOG(EMISSION) uV/m} = \text{CABLE LOSS (dB)} + \text{FACTOR (dB)} + \text{READING (dBuV/m)}$

(5). TEST EQUIPMENT PLEASE SEE 5.1

(6). UNCERTAINTY IN RADIATED EMISSION MEASURED IS $<+/-4\text{dB}$

(7). ANY DEPARTURE FROM SPECIFICATION : N/A

SIGNED BY TESTING ENGINEER : Camie