

GESTEK

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Report #: 98C010E



**Measurement Report
On Behalf Of
Advantech Co., Ltd.
RS-422/485 Communication Card**

Model # : PCL-743B, PCL-743S, PCL-745B, PCL-745S, PCM-3612

**Prepared for:
Advantech Co., Ltd.
F1. 4, No. 108-3, Ming-Chuan Road, Shing-Tien City,
Taipei, Taiwan, R.O.C**

**Report By : Global EMC Standard Tech. Corp.
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Declaration of Conformity

We, Manufacturer/Importer
(full address)

declare that the product
(description of the apparatus, system, installation to which it refers)

RS-422/485 Communication Card

PCL-743B, PCL-743S, PCL-745B, PCL-745S, PCM-3612

is in conformity with
(reference to the specification under which conformity is declared)
in accordance with 89/336 EEC-EMC Directive

- | | | | |
|---|--|---|--|
| <input type="checkbox"/> EN 55011 | Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) high frequency equipment | <input checked="" type="checkbox"/> EN 61000-3-2*
<input type="checkbox"/> EN60555-2 | Disturbances in supply systems caused by household appliances and similar electrical equipment "Harmonics" |
| <input type="checkbox"/> EN55013 | Limits and methods of measurement of radio disturbance characteristics of broadcast receivers and associated equipment | <input checked="" type="checkbox"/> EN61000-3-3*
<input type="checkbox"/> EN60555-3 | Disturbances in supply systems caused by household appliances and similar electrical equipment "Voltage fluctuations" |
| <input type="checkbox"/> EN 55014 | Limits and methods of measurement of radio disturbance characteristics of household electrical appliances, portable tools and similar electrical apparatus | <input type="checkbox"/> EN 50081-1
<input type="checkbox"/> EN 50082-1 | Generic emission standard Part 1: Residual, commercial and light industry
Generic immunity standard Part 1: Residual, commercial and light industry |
| <input type="checkbox"/> EN 55015 | Limits and methods of measurement of radio disturbance characteristics of fluorescent lamps and luminaries | <input checked="" type="checkbox"/> EN 50081-2
<input type="checkbox"/> EN 50082-2 | Generic emission standard Part 2: Industrial environment
Generic immunity standard Part 2: Industrial environment |
| <input type="checkbox"/> EN 55020 | Immunity from radio interference of broadcast receivers and associated equipment | <input type="checkbox"/> EN 55104 | Immunity requirements for household appliances tools and similar apparatus |
| <input checked="" type="checkbox"/> EN 55022 | Limits and methods of measurement of radio disturbance characteristics of information technology equipment | <input type="checkbox"/> EN 50091-2 | EMC requirements for uninterruptible power systems (UPS) |
| <input type="checkbox"/> DIN VDE 0855
<input type="checkbox"/> part 10
<input type="checkbox"/> part 12 | Cabled distribution systems; Equipment for receiving and/or distribution from sound and television signals | | |

CE marking



The manufacturer also declares the conformity of above mentioned product with the actual required safety standards in accordance with LVD 73/23 EEC

- | | | | |
|-----------------------------------|---|-------------------------------------|---|
| <input type="checkbox"/> EN 60065 | Safety requirements for mains operated electronic and related apparatus for household and similar general use | <input type="checkbox"/> EN 60950 | Safety for information technology equipment including electrical business equipment |
| <input type="checkbox"/> EN 60335 | Safety of household and similar electrical appliances | <input type="checkbox"/> EN 50091-1 | General and Safety requirements for uninterruptible power systems (UPS) |

Manufacturer/Importer

Signature : _____

Name : _____

(Stamp)

Date :

Signature : *Terry Chung*

Name : Terry Chung / Manager

Tested by **GesTek** EMC Lab.
FCC / VCCI / NEMKO / DNV approved

Ref. No. 98C010E
Date: December. 23, 1998

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1. Test Report Certification

Applicant : Advantech Co., Ltd.

EUT Description : RS-422/485 Communication Card

Model Number : PCL-743B, PCL-743S, PCL-745B, PCL-745S, PCM-3612

Serial Number : ProtoType

Power Supply : 230V/50Hz

MEASUREMENT PROCEDURE USED :

EN50081-2/1993 RULES AND EN55022/1994+A1/1995 RULES AND EN61000-3-2,-3

EN50082-2/1995 RULES AND EN 61000-4 SERIES REGULATIONS

For EN50081-2/1993 and EN55022/1994+A1/1995:

The measurement shown in the attachment where made in accordance with the procedures indicated, and the maximum energy emitted by the equipment was found to be within the EN55022/1994+A1/1995 limits applicable.

For EN50082-2/1995 Rules and EN 61000-4 Series Regulations:

The device described above was evaluated by Global EMC Standard Tech. Corp. to determine the severity levels of the device, and the severity levels of the device can endure and its performance criterion. The measurement results are contained in this test report and show that the EUT to be technically compliant with EN50082-2/1995/EN 61000-4 Series regulations. Global EMC Standard Tech. Corp. recommends that the measurement results can pass performance criterion of above regulations.

GENERAL REMARK:

The tests were performed according to the technical requirement of EUT .

- Electron-magnetic Radiation Emission Interference (EN55022/55011)
- Electron-magnetic Conduction Emission Interference (EN55022/55011)
- Disturbance Measurement (EN60555-2 & 3/ EN61000-3-2,-3)
- ESD Measurement (IEC1000-4-2/ EN61000-4-2)
- RF Field strength Susceptibility Measurement(IEC1000-4-3/ EN 61000-4-3/ENV50140/ ENV50204)
- Electrical Fast Transient/Burst Measurement (IEC1000-4-4/ EN61000-4-4)
- Surge Measurement (IEC1000-4-5/ EN61000-4-5)
- Conducted Susceptibility Measurement (EN61000-4-6/ ENV50141)
- Low Frequency Signals Immunity (IEC1000-2-2)
- Magnetic Field Measurement (EN61000-4-8)
- Voltage Dips/Interruption Measurement (EN61000-4-11)

Sample Received Date : December. 07, 1998

Final Test Date : December. 23, 1998

Documented by : JOAN CHEIN

Test Engineer :

Approve & Authorized Signer:

Jack Huang

JACK HUANG

Terry Chung

TERRY CHUNG

2. General Information

2.1 Production Description

Description : RS-422/485 Communication Card
 Model Number : PCL-743B, PCL-743S, PCL-745B, PCL-745S, PCM-3612
 Serial Number : ProtoType
 Applicant : Advantech Co., Ltd.
 Address : F1. 4, No. 108-3, Ming-Chuan Road, Shing-Tien City,
 Taipei, Taiwan, R.O.C
 Manufacturer : Advantech Co., Ltd.
 Address : F1. 4, No. 108-3, Ming-Chuan Road, Shing-Tien City,
 Taipei, Taiwan, R.O.C

2.2 Results:

The EUT(s) met the EN55022/CISPR 22 Class A requirements.

The Worst Emission data was found as following,

	Worst Emission Frequency (MHz)	Emission Level	Limit	Height of Antenna, Angel of Turntable
Conduction	0.26736	45.4dBuV Line2 Q.P.	79dBuV	N/A
Radiation	167.038	35.54[dB(uV/m)], Horizontal	40.00 [dB(uV/m)],	4M, 188°

Note:

1. The EUT is a RS-422/485 Communication Card which install inside PC system. Test setup was to simulated it's usual configuration and the data shown in this test report reflects the worst-case data for each operation mode.

2.3 Tested System Details

The FCC IDs/TYPES for all equipment, plus descriptions of all cables used in the tested system (including inserted cards, which have grants) are:

Host Personal Computer

Manufacture : HEWLETT PACKARD
 System : D3496A
 S/N : SG52902154
 FCC ID : HCJVECTRAVE4
 VGA Card : On Board
 I/O Card : On Board
 CPU Card : Intel Pentium 486MHz, Clock:66MHz
 Power Cord : Non-Shielded , Detachable, 1.8m

Monitor M01-010

Model Number : SyncMaster 700p
 Serial Number : H3MH903296Y
 Manufacturer : SAMSUNG
 FCC ID : A3LCGH760
 BCIQ ID : 3872A230
 Data Cable : Shielded, Undetachable, 1.8m
 Power Cord : Shielded, Detachable, 1.8m

Keyboard K01-033

Model Number : KB-5923
 Serial Number : 8060032215
 FCC ID : E8HKB-5923
 Manufacturer : TATUNG
 BCIQ ID : 3862A177
 Data Cable : Sheiled, Undetachable, 2.0 m

Modem M03-012

Model Number : 1414
 Serial Number : 960018042
 FCC ID : IFAXDM1414
 Manufacturer : ACEEX
 Adaptor & Power Cord : Non-Shielded, Detachable, 1.5m
 Data Cable : Shielded, Detachable, 1.2m

Mouse(PS2) M02-028

Model Number : MUS3P
Serial Number : N/A
FCC ID : JKGMUS3P01
Manufacturer : Tremon Enterpnses Co., Ltd.
Data Cable : Shielded, Undetachable, 1.5m

 Printer P01-013

Model Number : C2642A(DJ-400)
Serial Number : MY7851C521
FCC ID : B94C2642X
Manufacturer : HP
Adaptor & Power Cord : AC 110V, 60Hz To DC 30V
: Non-Shielded, Detachable, 1.9m
Data Cable : Shielded, Detachable, 1.8m

2.4 Test Methodology

EMI Test:

Both conducted and radiated testing were performed according to the procedures in EN55022/1994+A1/1995. Radiated testing was performed at an antenna to EUT distance of 10 meters.

EMS Test:

Performed according to procedures in EN 61000-4(IEC 1000 Series Regulations)

2.5 Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	25-28
Humidity (%RH)	25-75 (45-75 for ESD, 1 st , ed.) (30-60 for ESD, 2 nd . Ed)	42-60 for ESD 50-70 for others
Barometric pressure (mbar)	860-1060	950-1000

Site Description : Oct. 17, 1995 File on NEMKO EMC Laboratory Authorization
Gautstadalleen 30, Postboks 73 Blindern, 0314 Oslo, Aut. No.: ELA 126

Aug. 15, 1996 Recognition on Det Norske Veritas AS
Statement No:510-96-1017

Sep. 30, 1996 Accreditation on NVLAP
NVLAP Lab Code: 200085-0

Dec. 13, 1995 Registration on VCCI
Registration No.: R-291 and C-305

Name of firm : Global EMC Standard Tech. Corp.

Site location : No. 3 Pau-Tou-Tsuo Valley, Chia-Pau Tsuen, Lin Kou
Hsiang, Taipei County, Taiwan, R.O.C.



3. Conducted Emission Test

3.1 Test Equipments

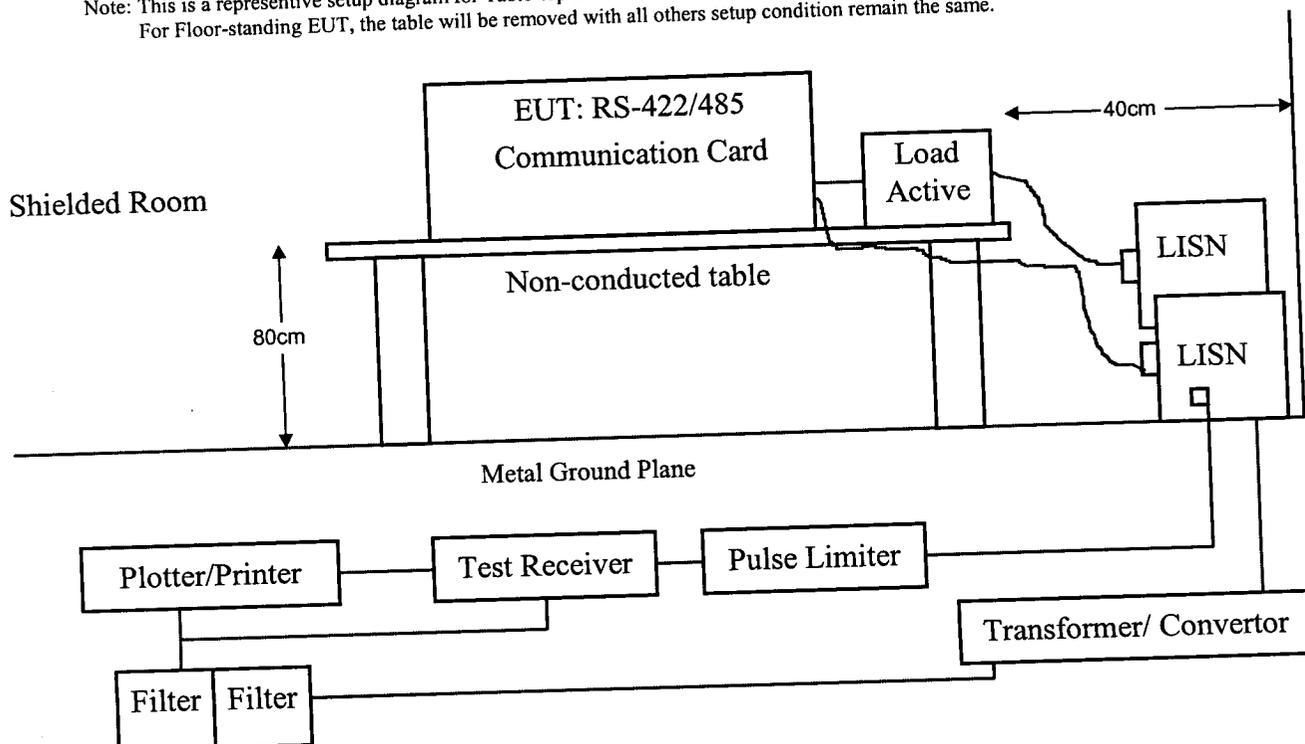
The following test equipments are used during the conducted power line tests:

Instrument	Manufacturer	Type /Serial No.	Last Calibration	Location	C.E.
Test Receiver	Rohde & Schwarz	ESHS 30 / 828109/010	Dec. 24, 1997	Shield Room #1	✓
L.I.S.N.	Kyoritsu	KNW-407	Oct. 03, 1998	Shield Room #1	✓
L.I.S.N.	Solar	8012-50-R24 / 90038	Jun. 02, 1998	Shield Room #1	
L.I.S.N.	Rohde & Schwarz	ESH3-Z5 / 840567/002	Oct. 02, 1998	Shield Room #1	✓
L.I.S.N.	Schwarzbeck	NNLK 8121/8121358	Jun. 02, 1998	Shield Room #1	
Pulse Limiter	Rohde & Schwarz	ESH3-Z2/357.8810.52	Nov. 01, 1998	Shield Room #1	✓
Shielded Room	GesTek	GTK-RF-S04	Sep. 17, 1998	Shield Room #1	✓
RF CABLE	GesTek	GTK-RF-C07	Sep. 17, 1998	Shield Room #1	✓
50 Ohm Terminator	GesTek	GTK-RF-T01	Oct. 03, 1998	Shield Room #1	✓

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

3.2 Block Diagram of Test Setup

Note: This is a representative setup diagram for Table-top EUT.
For Floor-standing EUT, the table will be removed with all others setup condition remain the same.



3.3 Conducted Emission

Frequency MHz	Maximum RF Line Voltage dB(uV)			
	Class A		Class B	
	QUASI-PEAK	AVERAGE	QUASI-PEAK	AVERAGE
0.15 - 0.50	79	66	66-56	56-46
0.50-5.0	73	60	56	46
5.0 - 30	73	60	60	50

Remarks : In the Above Table, the tighter limit applies at the band edges.

3.4 EUT Configuration on Measurement

The equipments which is listed 3.2 are installed on Conducted Power Line Test to meet the Commission requirement and operating in a manner which tends to maximize its emission characteristics in a normal application. The device under test, installed in a representative system as described in section 3.2, was placed on a non-conductive table whose total height equaled 80 CM. Powered from one LISN which signal output to receiver, and the other peripherals was powered from another LISN which signal output was terminated by 50Ω.

3.5 EUT Exercise Software

The EUT exercise program used during conducted testing was designed to exercise the EUT in a manner similar to a typical use. The exercise sequence is listed as below:

- 3.5.1 Setup the EUT and simulators as shown on 3.2
- 3.5.2 Turn on the power of all equipments and EUT.
- 3.5.3 Boot the PC from Floppy.
- 3.5.4 Run the EUT test program name:CE3612.EXE.
- 3.5.5 Start EMC test

3.6 Conducted Emission Data

The measurement range of conducted emission which is from **0.15 MHz to 30 MHz** was investigated. The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range for all the test modes. Then the worst modes were reported the following data pages . The final measurement equal to Receiver reading plus Correction factor if available. When LISN insertion loss bigger than 0.5dB then the receiver will add correction factor to reading level automatically.

The total uncertainty for this test is as follows:

- Uncertainty in the field strength measured:

< ± 2.0 dB

The uncertainty is calculated in accordance with NAMAS document NIS 81, and is given as 2 standard deviations.

GESTEK

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CONDUCTED EMISSION DATA

Date of Test	December. 17, 1998	Temperature	22.6 °C
EUT	RS-422/485 Communication Card	Humidity	56 %
Test Mode	Mode 1	Display Pattern	N/A

FREQUENCY MHz	READING LEVEL dBuV				LIMIT	
	LINE1 QP	LINE1 AV	LINE2 QP	LINE2 AV	QP	AV
**0.26736	43.6	*	45.4	*	79	69
0.72089	33.8	*	33.7	*	79	69
1.46965	33.1	*	33.2	*	79	69
3.53875	27.4	*	29.8	*	79	69
9.54997	31.7	*	31.6	*	73	60
29.54934	32.1	*	33.5	*	73	60

- Remarks :
1. All readings are Quasi-peak and average values.
 2. “ * ” means that the quasi-peak reading level is lower then the average limits, it is not necessary to measure the average level.
 3. “ ** ” means that this data is the worse case emission level.
 4. Final measurement = (Receiver reading) + (Correction factor if available)

Attached 2 individual pages of peak scan curve data sheets.

ROHDE & SCHWARZ ESHS30

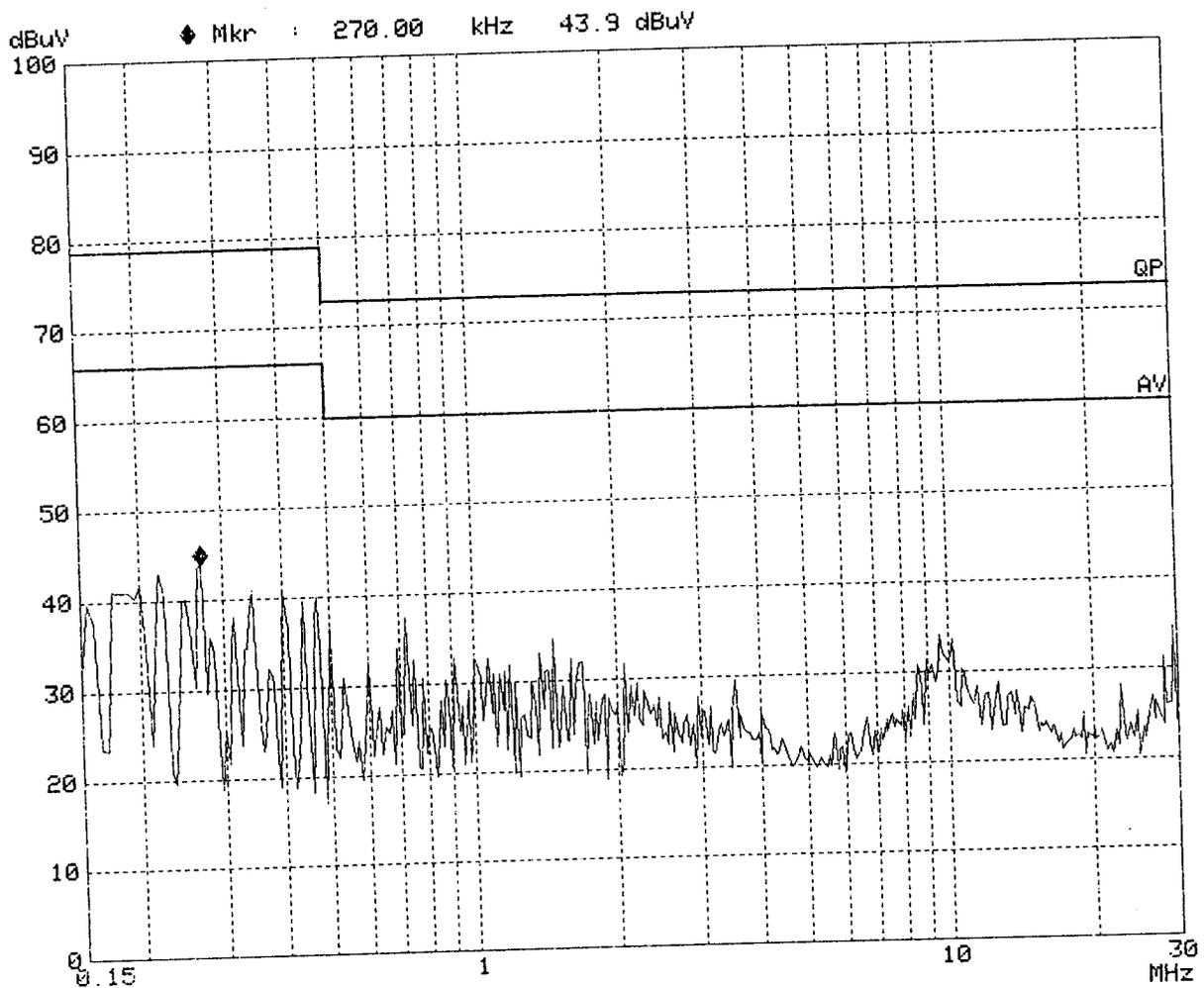
GesTek, PowerLine Conducted Emission

EUT: RS-422/485 COMMUNICATION CARD
 Manuf: ADVANTECH
 Op Cond: WORKING
 Operator: JACK
 Test Spec: EN55022 CLASS A
 Comment: Line 1
 Date: 17. Dec 98 15:56

Scan Settings (3 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	
150k	500k	5k	9k	PK	1ms	10dBLN	OFF	
500k	5M	10k	9k	PK	1ms	10dBLN	OFF	
5M	30M	25k	9k	PK	1ms	10dBLN	OFF	

Final Measurement: x QP
 Meas Time: 1 s
 Subranges: 25
 Acc Margin: 6dB



ROHDE & SCHWARZ ESHS30

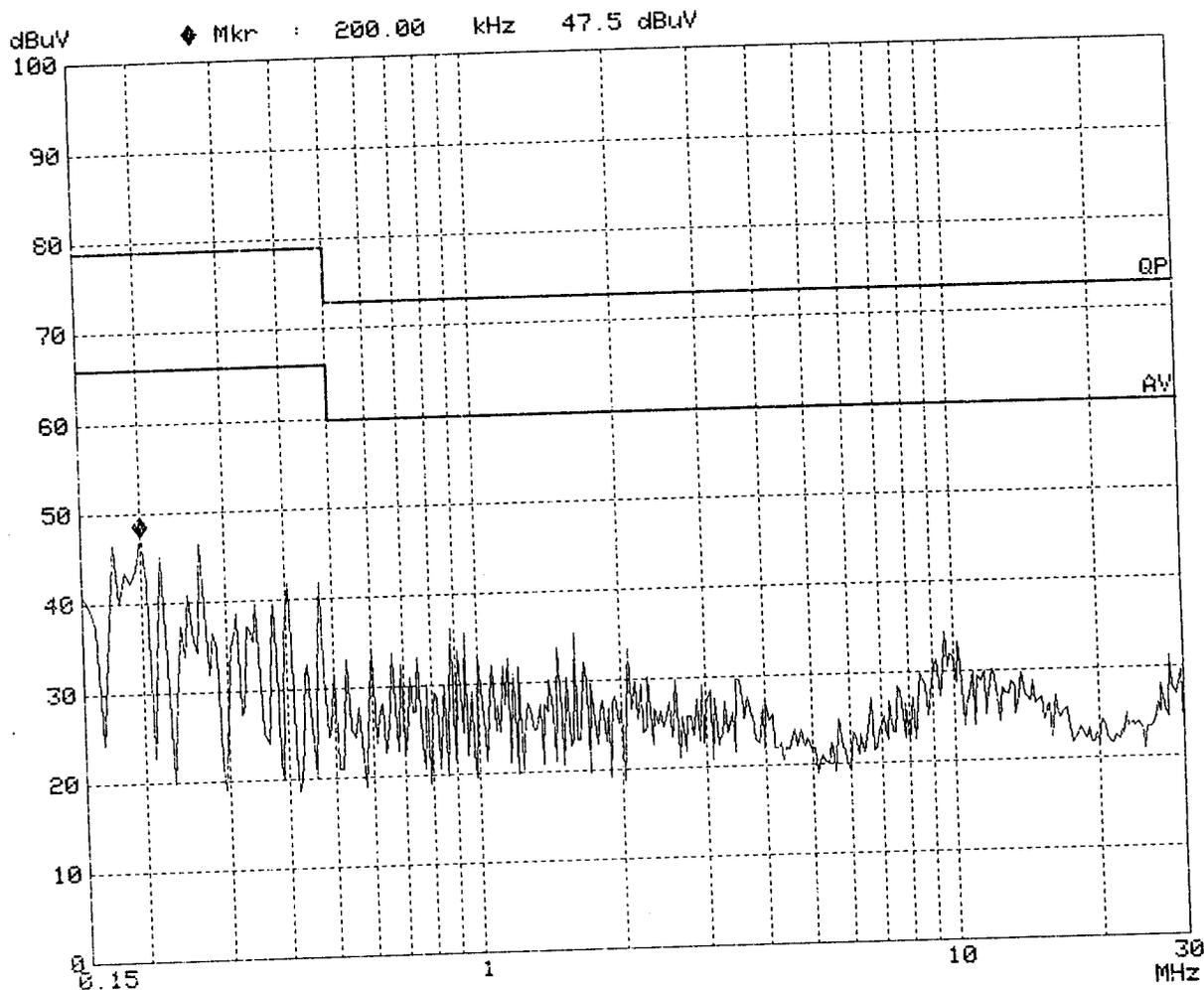
GesTek, PowerLine Conducted Emission

EUT: RS-422/485 COMMUNICATION CARD
 Manuf: ADVANTECH
 Op Cond: WORKING
 Operator: JACK
 Test Spec: EN55022 CLASS A
 Comment: Line 2
 Date: 17. Dec 98 16:04

Scan Settings (3 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	
150k	500k	5k	9k	PK	1ms	10dBLN	OFF	
500k	5M	10k	9k	PK	1ms	10dBLN	OFF	
5M	30M	25k	9k	PK	1ms	10dBLN	OFF	

Final Measurement: x QP
 Meas Time: 1 s
 Subranges: 25
 Acc Margin: 6dB



4. Radiation Emission Test

4.1 Test Equipment

The following test equipments are used during the radiated emission tests:

Radiated test was performed on : Site #1 Site #2

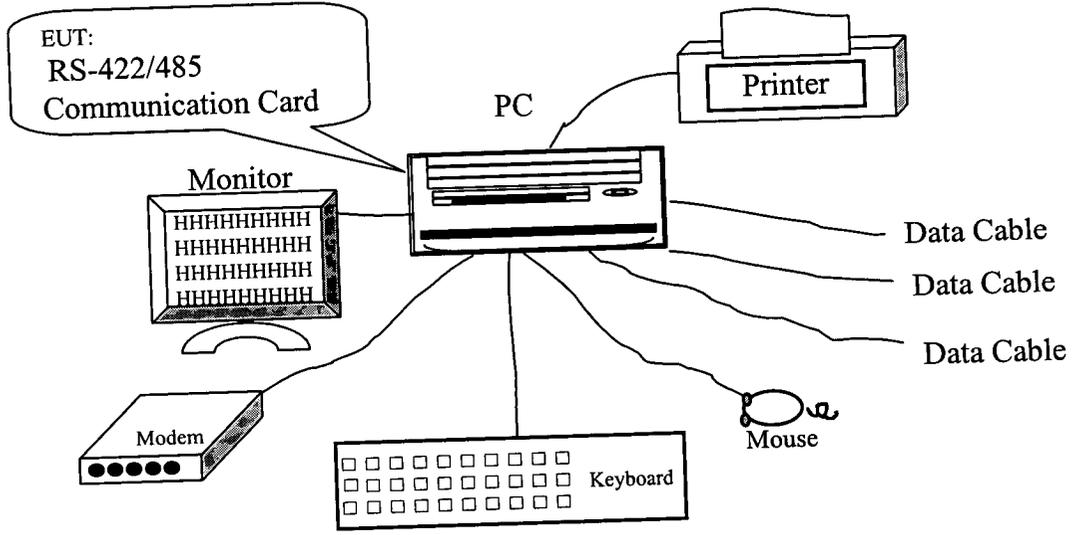
Instrument	Manufacturer	Type /Serial No.	Last Cal.	Site #1	Site #2
Test Receiver	Rohde & Schwarz	ESVS 10/8421122/001	Dec. 26,1997	✓	
Spectrum Analyzer	HP	8594E / 3543A02689	N/A	✓	
Pre-Amplifier	HP	8447D / 2944A08272	N/A	✓	
Test Receiver	Rohde & Schwarz	ESCS 30/825022/003	Jul. 20,1998		✓
Spectrum Analyzer	HP	8591E/3543A05040	N/A		✓
Pre Amplifier	HP	8447D/2944A08273	N/A		✓
BILOG ANTENNA	Chase	CBL6112B/2417	May. 16,1998	✓	
BILOG ANTENNA	Chase	CBL6112B/2416	May. 16,1998		✓
Pre Amplifier	HP	8347A/3307A01401	N/A	✓	✓
Dipole Antenna	Schwarzbeck	VHAP/736,,737	May.19,1998	✓	✓
Dipole Antenna	Schwarzbeck	UHAP/719,,720	May.19,1998	✓	✓
Open Site	GesTek	GTK-RF-S01	May. 16,1998	✓	
Open Site	GesTek	GTK-RF-S02	May. 16,1998		✓
RF Cable	GesTek	GTK-RF-C01	May. 16,1998	✓	
RF Cable	GesTek	GTK-RF-C02	May. 16,1998	✓	
RF Cable	GesTek	GTK-RF-C03	May. 16,1998		✓
RF Cable	GesTek	GTK-RF-C04	May. 16,1998		✓
Test Program Software	GesTek	GTK-RF-P01	N/A	✓	
Test Program Software	GesTek	GTK-RF-P02	N/A		✓

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

4.2 Test Setup

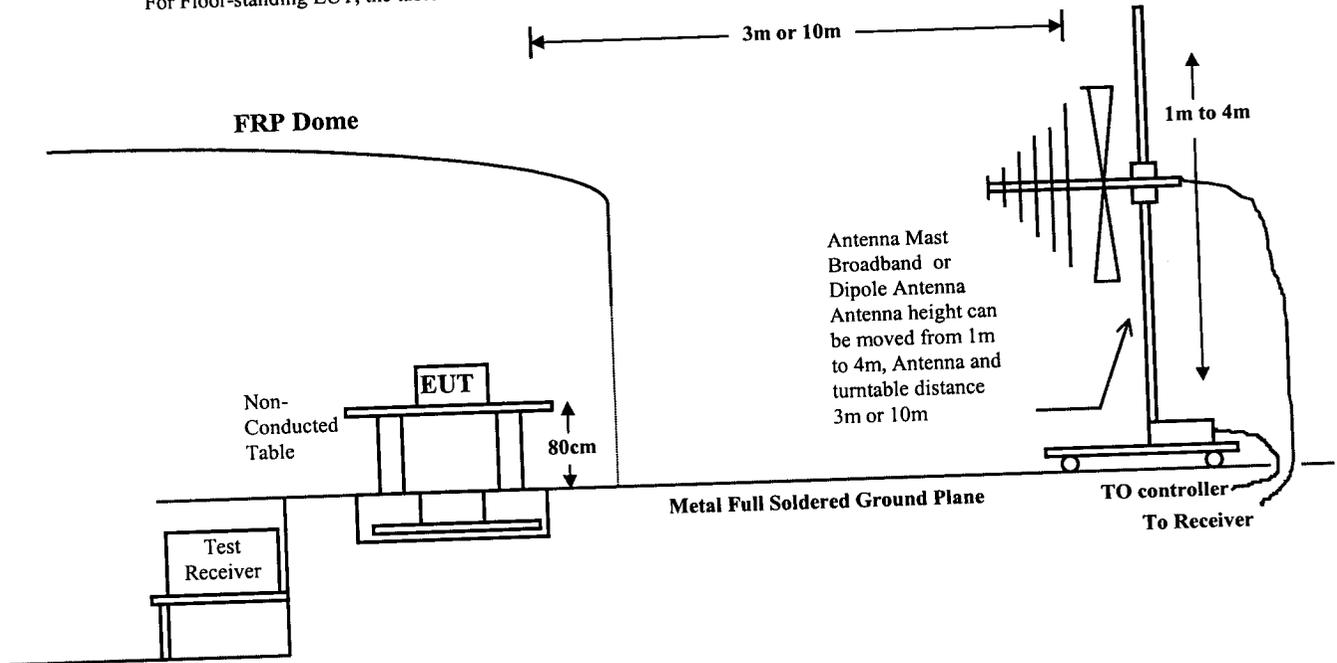
4.2.1 Block Diagram of Connections between EUT and simulators

Note: This is a representative setup diagram for Table-top EUT.
For Floor-standing EUT, the table will be removed with all others setup condition remain the same.



4.2.2 Open Test Site & Anechoic Chamber Setup Diagram

Note: This is a representative setup diagram for Table-top EUT.
 For Floor-standing EUT, the table will be removed with all others setup condition remain the same.



4.3 Radiated Emission Limit

Class B Limits

Frequency	Distance	Field Strength
MHz	Meter	dB(uV/M)
30 - 230	10	30
230 - 1000	10	37

Class A Limits

Frequency	Distance	Field Strength
MHz	Meter	dB(uV/M)
30 - 230	10	40
230 - 1000	10	47

- Remark: 1. The tighter limit shall apply at the edge between two frequency bands.
 2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

4.4 EUT Configuration

The equipments which is listed 3.2 are installed on Radiated Emission Test to meet the Commission requirement and operating in a manner which tends to maximize its emission characteristics in a normal application.

The device under test, installed in a representative system as described in section 4.2.2, was placed on a non-conductive table whose total height equaled 80 CM. This table can be rotated 360 degree. The measurement antenna was mounted to a non-conductive mast capable of moving the antenna vertically. Antenna height was varied from 1 meter to 4 meters and the system under test was rotated from 0 degree through 360 degrees relative to the antenna position and polarization (Horizontal and Vertical). Also the I/O cable position was investigated to find the maximum emission condition.

4.5 Operating Condition of EUT

Same as Conducted Power Line Test which is listed in 3.5.

4.6 Radiated Emission Data

The measurement range of radiated emission which is from **30 MHz to 1 GHz** was investigated. The initial step in collecting radiated data is a spectrum analyzer peak scan of the measurement range for all the test modes. Then the worst modes were reported the following data pages .

The total uncertainty for this test is as follows:

- Uncertainty in the field strength measured (3m antenna distance): $< \pm 4.0$ dB
- Uncertainty in the field strength measured (10m antenna distance): $< \pm 4.0$ dB

The uncertainty is calculated in accordance with NAMAS document NIS 81, and is given as 2 standard deviations.

Radiated Emission Data

Date of Test :12-21,1998 Mon	Temperature :31 deg/C
EUT :RS-422/485 Communication Card	Humidity :65 %RH
Working Cond.:Mode 1	Display Pattern:N/A

Frequency [MHz]	Cable Loss [dB]	Antenna Factor [dB/m]	Reading Level Horizontal [dB(uV)]	Emission Level Horizontal [dB(uV/m)]	Limit [dB(uV/m)]
66.817	1.60	6.08	22.59	30.27	40.00
*167.038	2.47	9.75	23.32	35.54	40.00
171.859	2.52	9.60	17.77	29.89	40.00
200.452	2.80	10.20	17.48	30.48	40.00
229.146	2.97	11.56	12.42	26.95	40.00
334.076	3.77	14.20	9.12	27.09	47.00
601.250	5.60	19.42	8.90	33.92	47.00

Remarks:

- 1.All Readings below 1GHz are Quasi-Peak, above are average value.
- 2.“ * ”, means this data is worse case emission level.
- 3.Emission Level = Reading Level + Antenna Factor + Cable loss
- 4.Deviations from the specifications: None.

Radiated Emission Data

Date of Test :12-21,1998 Mon

Temperature :31 deg/C

EUT :RS-422/485 Communication Card

Humidity :65 %RH

Working Cond.:Mode 1

Display Pattern:N/A

Frequency [MHz]	Cable Loss [dB]	Antenna Factor [dB/m]	Reading Level Vertical [dB(uV)]	Emission Level Vertical [dB(uV/m)]	Limit [dB(uV/m)]
*39.800	1.30	12.30	13.23	26.83	40.00
67.466	1.60	6.14	11.56	19.30	40.00
85.974	1.85	8.36	11.24	21.45	40.00
120.838	2.10	12.90	10.17	25.17	40.00
167.043	2.47	9.75	16.80	29.02	40.00
171.859	2.52	9.60	14.46	26.58	40.00
300.675	3.51	13.60	9.73	26.84	47.00

Remarks:

- 1.All Readings below 1GHz are Quasi-Peak, above are average value.
- 2.“ * ”, means this data is worse case emission level.
- 3.Emission Level = Reading Level + Antenna Factor + Cable loss
- 4.Deviations from the specifications: None.

5. Disturbance Measurement

5.1 Test Equipment

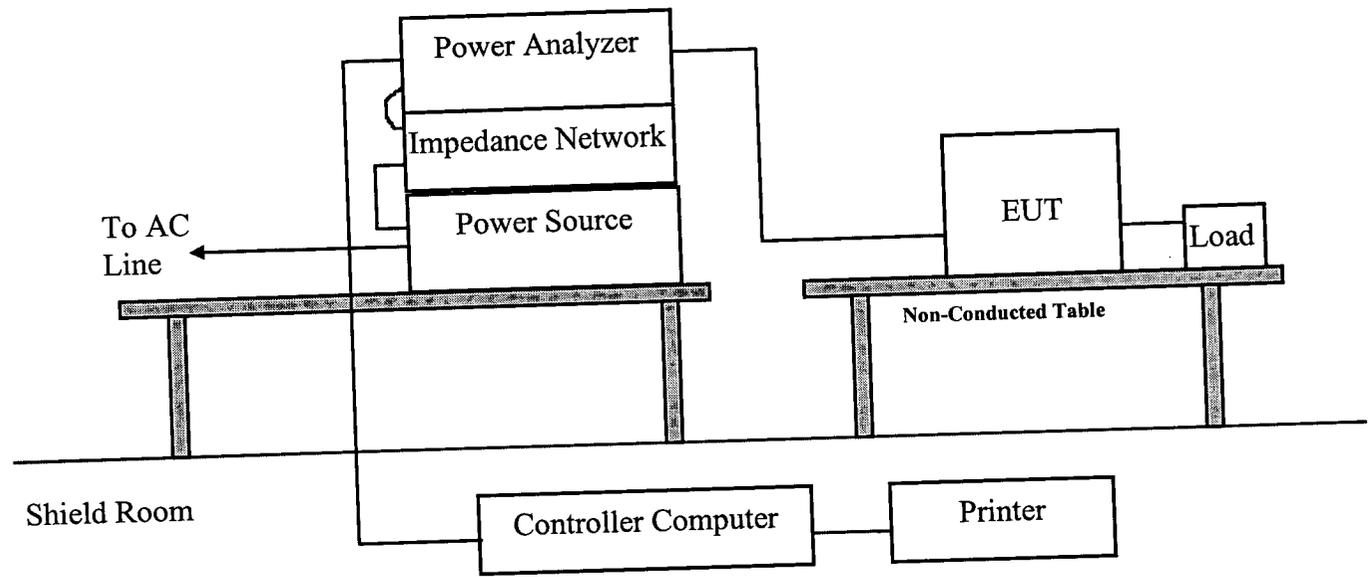
The following test equipments are used during the Disturbance tests:

Item	Instrument	Manufacturer	Type No.	Last Calibration
1	Power Analyzer	Voltech	PM 3000A	Aug. 20, 1998
2	Power Source	Pacific	345AMX/UPC32	Aug. 20, 1998
3	Impedance Network	Voltech	IB0718921	Aug. 20, 1998

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

5.2 Test Setup of EUT

Note: This is a representative setup diagram for Table-top EUT.
 For Floor-standing EUT, the table will be removed with all others setup condition remain the same.



5.3 Limits of Harmonics Currents

Harmonics Order	Maximum Permissible harmonic current (in amperes)	Harmonics Order	Maximum Permissible harmonic current (in amperes)
Odd harmonics		Even harmonics	
3	2.30	2	1.08
5	1.14	4	0.43
7	0.77	6	0.30
9	0.40	8 ≤ n ≤ 40	0.23 * 8/n
11	0.33		
13	0.21		
15 ≤ n ≤ 39	0.15 * 15/n		

5.4 EUT Operating Condition

1. Setup the EUT and Test Equipment as shown on 4.2.1
2. Power on.

5.5 Test Procedure

Power Harmonic:

The EUT is supplied in series with power analyzer from a power source having the same normal voltage and frequency as the rated supply voltage and the equipment under test. And the rated voltage at the supply voltage of EUT of 0.94 times and 1.06 times shall be performed.

5.6 Test Method.

According to EN61000-3-2,-3

5.7 Test Result

The measurement of the power harmonics which test at the extremes of EUT's supply range was investigated and test result were reported the following data pages.
 The measurement limit were met, and the EUT **passed** the test.

Attached 2 individual pages of peak scan curve data sheets.

The total uncertainty for this test is as follows:
 • Uncertainty in the current measured: < ± 10%
 The uncertainty is calculated in accordance with NAMAS document NIS 81, and is given as 2 standard deviations.

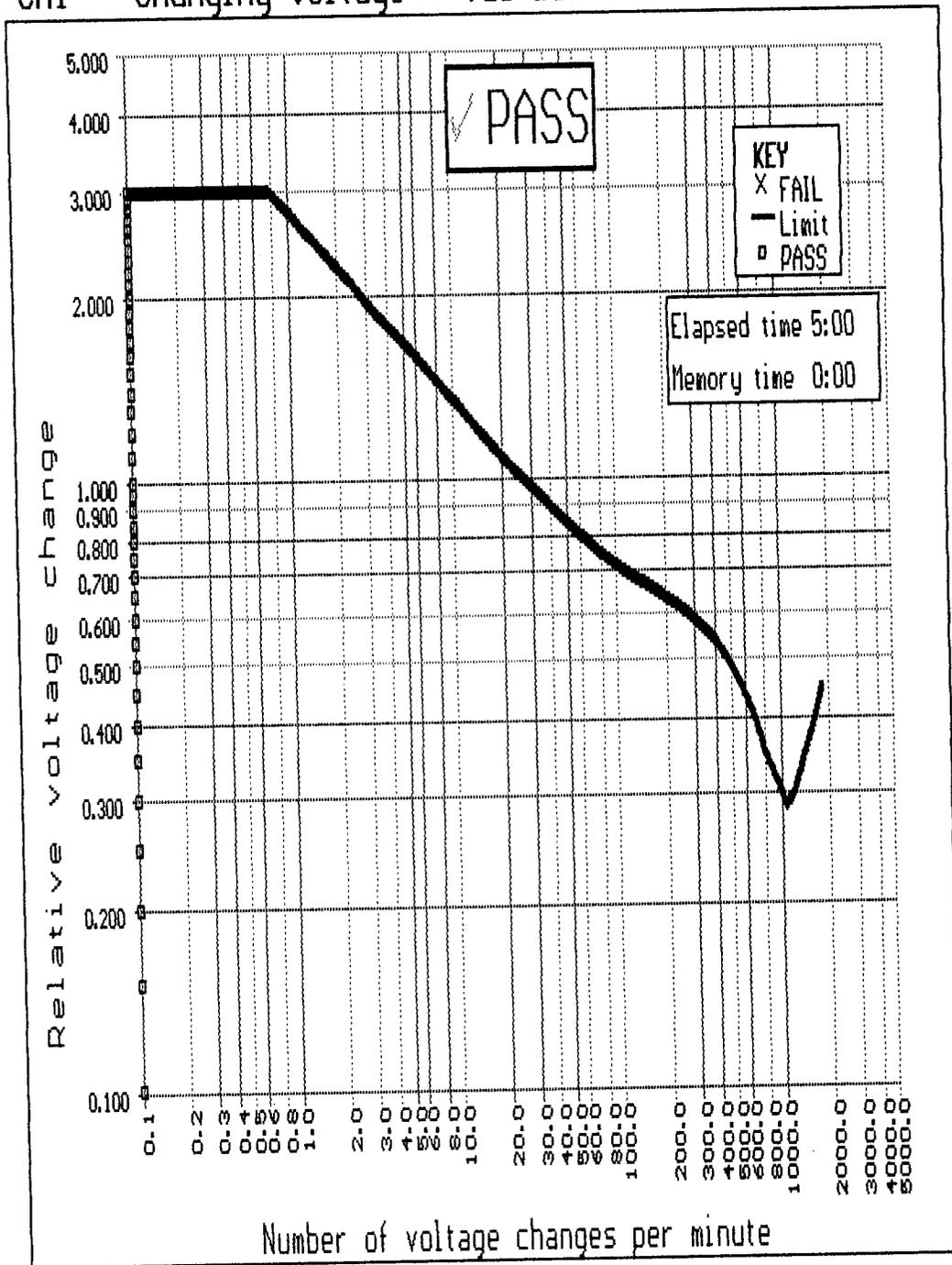
Manufacture: ADVANTECH
 EUT: RS-422/485 COMMUNICATION CARD

CH1 Steady State Harmonics Test. Tue Dec 22 13:20:08 1998

Volts 230.100006V
 Amps 0.282900A
 Watts 31.430000W
 Power Factor 0.482900
 Limits multiplied by 1.00

HNumber	IEC Limit (class A)	Magnitude	PASS FAIL
2	1.080A	0.001175A	PASS
3	2.300A	0.127120A	PASS
4	0.430A	0.001208A	PASS
5	1.140A	0.117800A	PASS
6	0.300A	0.000544A	PASS
7	0.770A	0.105100A	PASS
8	0.230A	0.000645A	PASS
9	0.400A	0.089750A	PASS
10	0.184A	0.000388A	PASS
11	0.330A	0.073070A	PASS
12	0.153A	0.000372A	PASS
13	0.210A	0.056250A	PASS
14	0.131A	0.000311A	PASS
15	0.150A	0.040590A	PASS
16	0.115A	0.000269A	PASS
17	0.132A	0.027090A	PASS
18	0.102A	0.000172A	PASS
19	0.118A	0.016668A	PASS
20	0.092A	0.000160A	PASS
21	0.107A	0.010254A	PASS
22	0.084A	0.000145A	PASS
23	0.098A	0.008165A	PASS
24	0.077A	0.000040A	PASS
25	0.090A	0.008119A	PASS
26	0.071A	0.000031A	PASS
27	0.083A	0.007771A	PASS
28	0.066A	0.000049A	PASS
29	0.078A	0.006664A	PASS
30	0.061A	0.000033A	PASS
31	0.073A	0.005126A	PASS
32	0.058A	0.000066A	PASS
33	0.068A	0.003802A	PASS
34	0.054A	0.000032A	PASS
35	0.064A	0.003368A	PASS
36	0.051A	0.000063A	PASS
37	0.061A	0.003462A	PASS
38	0.048A	0.000013A	PASS
39	0.058A	0.003572A	PASS
40	0.046A	0.000043A	PASS

Passed Steady State Harmonics test



6. ESD Measurement

6.1 Test Equipment

The following test equipments are used during the ESD tests:

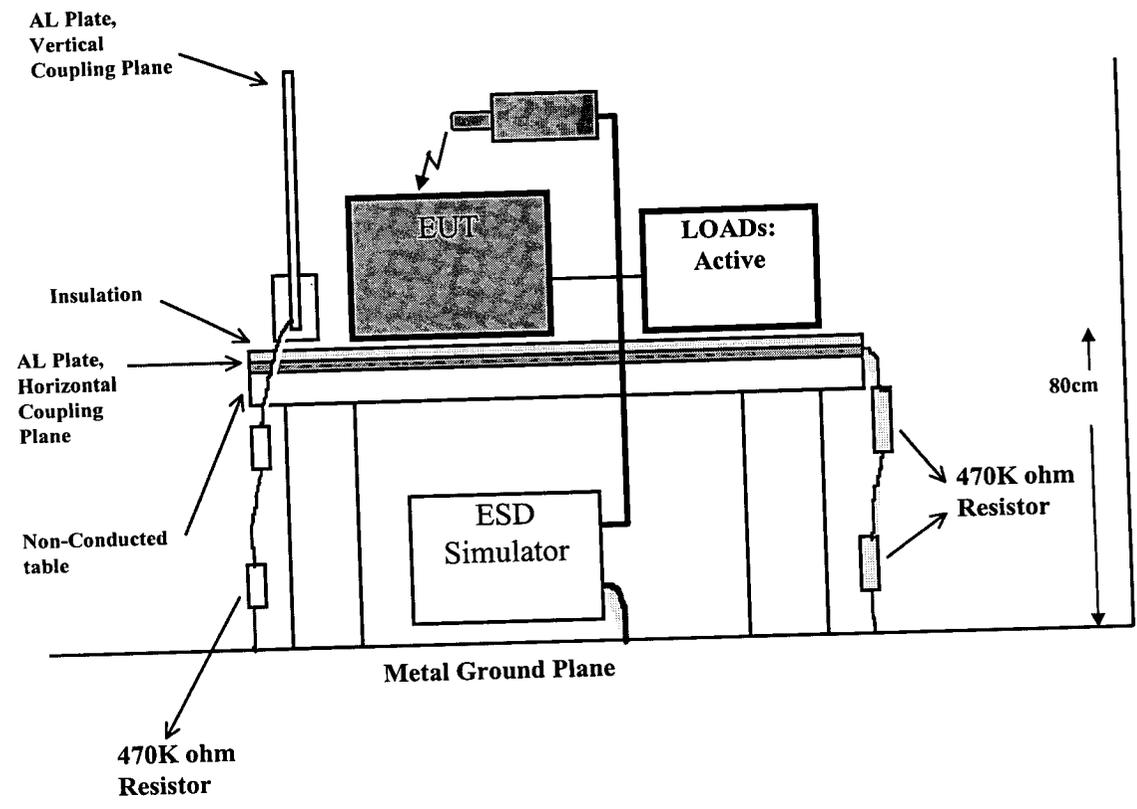
Item	Instrument	Manufacturer	Type No.	Last Calibration
1	Power Analyzer	Voltech	PM 3000A	Aug. 20, 1998
2	Power Source	Pacific	345AMX/UPC32	Aug. 20, 1998
3	Impedance Network	Voltech	IB0718921	Aug. 20, 1998

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

6.2 Test Setup

6.2.1 Block Diagram of Connections between EUT and simulators

Note: This is a representative setup diagram for Table-top EUT.
 For Floor-standing EUT, the table will be removed with all others setup condition remain the same.



6.6 Test Method

According to EN 61000-4-2/1995. NEUTRAL LINE

6.7 Test Result

ITEM	AMOUNT OF DISCHARGE	VOLTAGE	REQUIRED CRITERIA	COMPLIED TO CRITERIA (A, B, C)	RESULTS
Direct Discharge Air	10	+8KV	B	A	PASS
	10	-8KV	B	A	PASS
Direct Discharge Contact	10	+4KV	B	A	PASS
	10	-4KV	B	A	PASS
Indirect Discharge VCP	10	+4KV	B	A	PASS
	10	-4KV	B	A	PASS
Indirect Discharge HCP	10	+4KV	B	A	PASS
	10	-4KV	B	A	PASS

NR: No Requirement

- Meet criteria A: Operate as intended during and after the test
- Meet criteria B: Operate as intended after the test
- Meet criteria C: Loss/Error of function
- Additional Information
 - EUT stopped operation and could / could not be reset by operator at ____ KV of mode ____.
 - No false alarms or other malfunctions were observed during or after the test. The acceptance criteria were met, and the EUT passed the test.

The total uncertainty for this test is as follows:

- Uncertainty in risetime (10%/90%) in first peak of the discharge pulse: < ±20%
- Uncertainty in first peak value of the discharge pulse: < ±8%
- Uncertainty in the discharge pulse value at 30ns: < ±30%
- Uncertainty in the discharge pulse value at 60ns: < ±30%

The uncertainty is calculated in accordance with NAMAS document NIS 81, and is given as 2 standard deviations.

7. RF Field Strength Susceptibility Measurement

7.1 Test Equipment

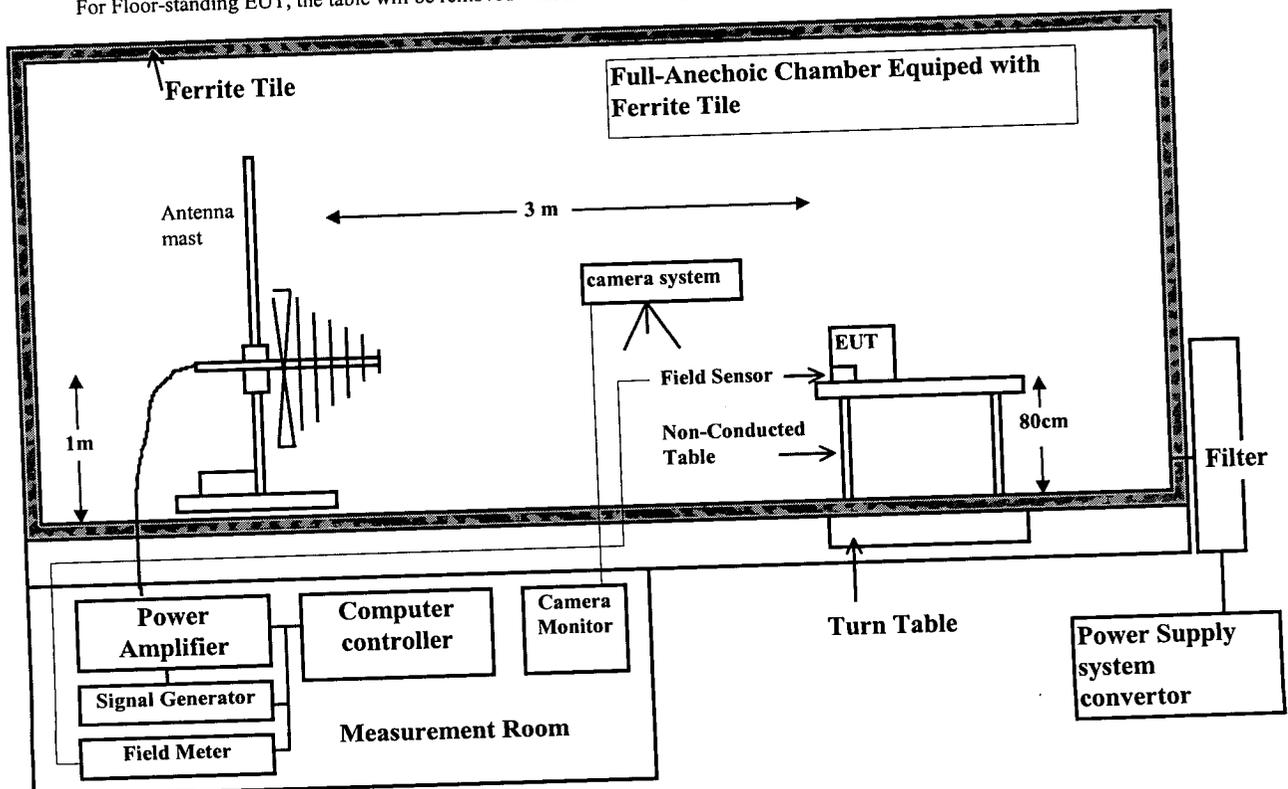
The following test equipments are used during the RS tests:

Item	Instrument	Manufacturer	Type No.	Last Calibration
1	Signal Generator	HP	8657A	Jul. 20, 1998
2	Power Amplifier	A & R	100W1000M1	Aug. 18, 1998
3	Field Strength Meter	A & R	FM2000	Aug. 18, 1998
4	Field Strength Sensor	A & R	FP2000	Aug. 18, 1998
5	Power Antenna	Chase	CBL 6111A	Aug. 2, 1998
6	Power Amplifier	A & R	75A220	Aug. 18, 1998
7	Spectrum	HP	8591E	Jul. 20, 1998
8	Pre-Amplifier	HP	8447F	Jul. 20, 1998

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

7.2 Block Diagram of Test Setup

Note: This is a representative setup diagram for Table-top EUT.
For Floor-standing EUT, the table will be removed with all others setup condition remain the same.



7.3 Severity Levels

LEVEL	FIELD STRENGTH V/M
1	1
2	3
3	10
X	SPECIAL

Pursuant to EN50082-2:

Required Performance Criteria : A
 Limit : 10V/m

7.4 EUT Operating Condition

Same as section 3.5.

7.5 Test Procedure

The EUT and load are placed on a table which is 0.8 meter above ground. The field sensor is also placed on the same table to monitor field strength from transmitting antenna. EUT is set 3 meter away from the transmitting antenna which is mounted on an antenna each time. The antenna is fixed 1 meter above ground. Both horizontal and vertical polarization of the antenna are set on measurement. In order to judge the EUT performance, a CCD camera is used to monitor EUT screen.

All the scanning conditions are as follows:

Condition of Test	Remarks
A 1. Field Strength	10 V/m Level 3
2. Radiated Signal	1K AM 80% Modulation
3. Scanning Frequency	80MHz-1000MHz
4. Frequency step size Δf :	$\Delta f = f_n - f(n-1) = \frac{1}{Q} f(n-1)$
where:	
Δf	= frequency step size
$f(n-1)$	= previous test frequency
f_n	= next test frequency
Q	= ratio center frequency to bandwidth

- B 1. Test Frequencies : 895 – 905 MHz
 2. Rep. Frequency : 200Hz
 3. 50% Duty cycle
 4. Pulse modulation : Signal 50% modulated by 200Hz pulses of equal mark/space ratio.

7.6 Test Method

According to EN61000-4-3/1995 Basic immunity standard;

Radiated radio-frequency electromagnetic field;
 Immunity test.

7.7 Test Result

Freq. Range (MHz)	Position (Angle)	Polarity (H or V)	Field Strength (V/M)	Performance Criteria Complied to	Results
80-1000	0	H	10	A	PASS
900±5	0	H	10	A	PASS
80-1000	90	H	10	A	PASS
900±5	90	H	10	A	PASS
80-1000	180	H	10	A	PASS
900±5	180	H	10	A	PASS
80-1000	270	H	10	A	PASS
900±5	270	H	10	A	PASS
80-1000	0	V	10	A	PASS
900±5	0	V	10	A	PASS
80-1000	90	V	10	A	PASS
900±5	90	V	10	A	PASS
80-1000	180	V	10	A	PASS
900±5	180	V	10	A	PASS
80-1000	270	V	10	A	PASS
900±5	270	V	10	A	PASS

- Meet criteria A: Operate as intended during and after the test
- Meet criteria B: Operate as intended after the test
- Meet criteria C: Loss/Error of function
- Additional Information
 - There was no observable degradation in performance.
 - EUT stopped operation and could / could not be reset by operator at _____ V/m at frequency _____ MHz.
 - No false alarms or other malfunctions were observed during or after the test. The acceptance criteria were met, and the EUT passed the test.

The total uncertainty for this test is as follows:

• Uncertainty in applied field strength (3m antenna distance): -2.1/+2.9 dB

The uncertainty is calculated in accordance with NAMAS document NIS 81, and is given as 2 standard deviations.

8. Electrical Fast Transient/Burst Measurement

8.1 Test Equipment

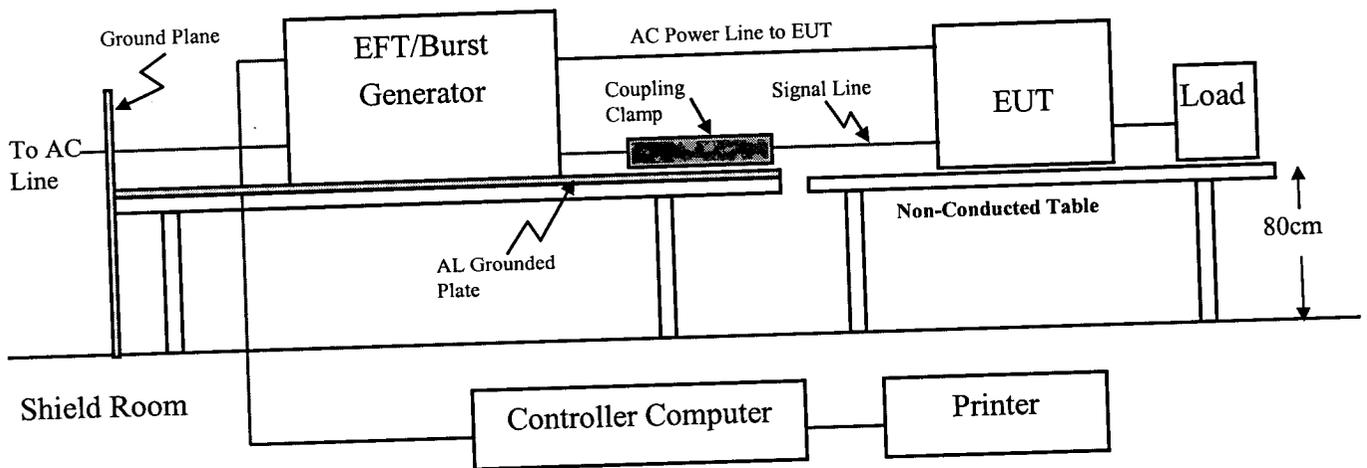
The following test equipments are used during the EFT tests:

Item	Instrument	Manufacturer	Type No.	Last Calibration
1	Fast Transient/Burst Generator	HAEFELY	EFT/Burst Tester PEFT-J	Jul. 16, 1998
2	Dips/Interruptions and Variations	HAEFELY	PLINE1610	Jul. 16, 1998

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

8.2 Block Diagram of Test Setup

Note: This is a representative setup diagram for Table-top EUT.
 For Floor-standing EUT, the table will be removed with all others setup condition remain the same.



8.3 Severity Levels

Open Circuit Output Test Voltage +/- 10%	
Level	On power supply lines
1	0.5KV
2	1KV
3	2KV
4	4KV
X	Special

Pursuant to EN50082-2:

Required Performance Criteria : A

Limit

: ±1KV for Signal Lines and Control Lines

±2KV for Power Lines and protective earth terminal

8.4 EUT Operation Condition

Same as section 3.5.

8.5 Test Procedure

The EUT and its load are placed on a table which is 0.8 meter above a metal ground plane measured 1m*1m min. And 0.65mm thick min. And projected beyond the EUT by at least 0.1m on all sides. The EUT is away from the walls of the test AC power line test is as follows:

For AC Power line test:

The EUT is connected to the power mains through a coupling device that directly couples the EFT interference signal.

Each of the Line and Neutral conductor is impressed with burst noise for 1 min.

For Signal Lines and Control Lines test:

The EFT interference signal is through a coupling clamp device couples to the signal and control lines of the EUT.

8.6 Test Method

According to EN 61000-4-4/1995.

8.7 Test Result

Inject Line	Voltage KV	Inject time (second)	Inject Method	Required Criteria	Complied to Criteria	Result
L	±2	60	DIRECT	B	A	PASS
N	±2	60	DIRECT	B	A	PASS
PE	±2	60	DIRECT	B	A	PASS
L+N	±2	60	DIRECT	B	A	PASS
N+PE	±2	60	DIRECT	B	A	PASS
L+PE	±2	60	DIRECT	B	A	PASS
L+N+PE	±2	60	DIRECT	B	A	PASS

NR: No Requirement

- Meet criteria A : Operate as intended during and after the test
- Meet criteria B : Operate as intended after the test
- Meet criteria C : Loss/Error of function
- Additional Information
 - EUT stopped operation and could / could not be reset by operator at ___ KV of Line _____.
 - No false alarms or other malfunctions were observed during or after the test. The acceptance criteria were met, and the EUT passed the test.

9. Conducted Susceptibility Measurement

9.1 Test Equipment

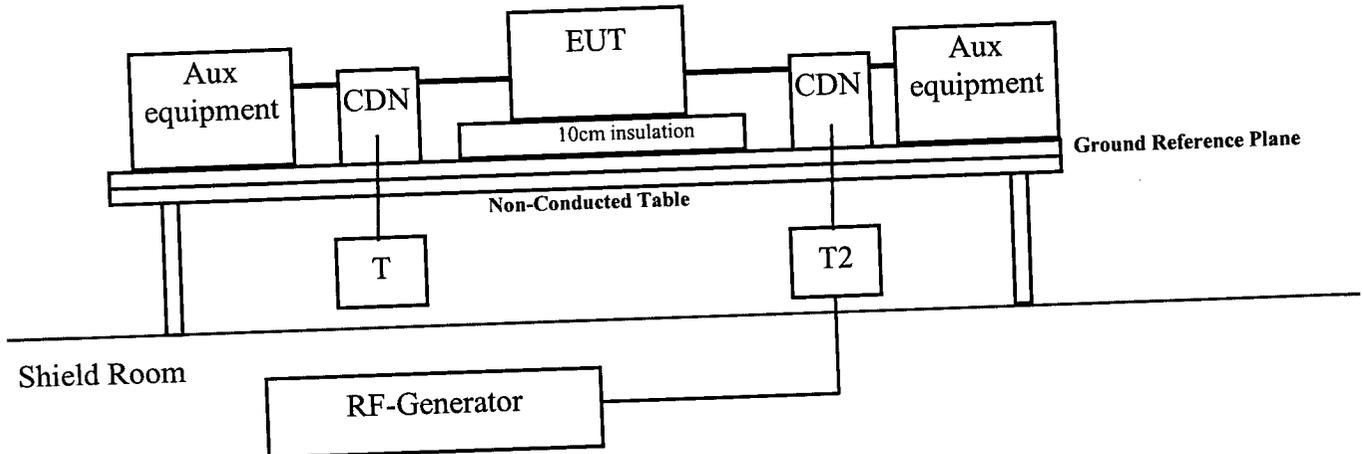
The following test equipments are used during the SURGE tests:

Item	Instrument	Manufacturer	Type No.	Last Calibration
1	Surge Generator	HAEFELY	Psurge 4.1 S/N:083 070-16	Jul, 1998

Note: All equipment upon which need to be calibrated are with calibration period of 1 year.

9.2 Block Diagram of Test Setup

Note: This is a representative setup diagram for Table-top EUT.
For Floor-standing EUT, the table will be removed with all others setup condition remain the same.



9.3 Severity Levels

Frequency Range 0.15kHz - 80MHz		
Level	Voltage Level (e.m.f)	
	U _o [dBμV]	U _o [V]
1	120	1
2	130	3
3	140	10
X	Special	

Pursuant to EN50082-2

Required Performance Criteria : A

Limit : 10V, 80% AM Modulated

9.4 EUT Operation Condition

Same as section 3.5.

9.5 Test Procedure

The EUT are placed on a table which is 0.8 meter height, and a Ground reference plane on the table, EUT are placed upon table and use a 10cm insulation between.

For AC Power line test:

The EUT is connected to the power mains through a coupling and decoupling networks for power supply lines. And directly couples the disturbance signal into EUT.

Used CDN-M1 for single wire, CDN-M2 for two wires, or CDN-M3 for three wires.

For Signal Lines and Control Lines test:

The disturbance signal is through a coupling and decoupling networks(CDN) or EM-clamp device couples to the signal and control lines of the EUT.

9.6 Test Method

According to EN61000-4-6/1995

9.7 Test Result

Inject Line	Field Strength (v)	Inject Method	Required Criteria	Performance Criteria Complied To	Result
AC Line	10	CDN	A	A	PASS

- Meet criteria A: Operate as intended during and after the test
- Meet criteria B: Operate as intended after the test
- Meet criteria C: Loss/Error of function
- Additional Information
 - EUT stopped operation and could / could not be reset by operator at ___ KV of Line _____.
 - No false alarms or other malfunctions were observed during or after the test. The acceptance criteria were met, and the EUT passed the test.

10. Surge Measurement

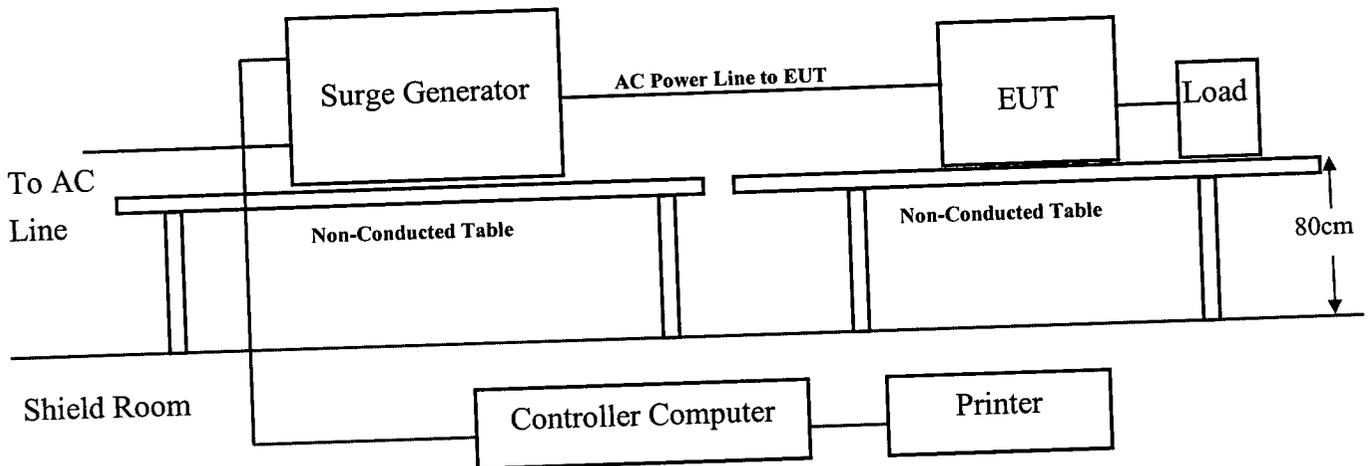
10.1 Test Equipment

The following test equipments are used during the SURGE tests:

Item	Instrument	Manufacturer	Type No.	Last Calibration
1	Surge Generator	HAEFELY	Psurge 4.1 S/N:083 070-16	Jul. 1998

10.2 Block Diagram of Test Setup

Note: This is a representative setup diagram for Table-top EUT.
For Floor-standing EUT, the table will be removed with all others setup condition remain the same.



10.3 Severity Levels

Open Circuit Output Test Voltage +/- 10%	
Level	On power supply lines
1	0.5KV
2	1KV
3	2KV
4	4KV
X	Special

Pursuant to EN50082-2:1995

Required Performance Criteria : A

Limit : ±2.0KV for Signal Lines and Control Lines
±4.0KV for Power Lines and protective earth terminal

10.4 EUT Operation Condition

Same as section 3.5

10.5 Test Procedure

The EUT and its load are placed on a table which is 0.8 meter above a metal ground plane measured 1m*1m min. And 0.65mm thick min. And projected beyond the EUT by at least 0.1m on all sides. The EUT is away from the walls of the test AC power line test is as follows:

For AC Power line test:

The EUT is connected to the power mains through a coupling device that directly couples the EFT interference signal.

Each of the Line and Neutral conductor is impressed with burst noise for 1 min.

For Signal Lines and Control Lines test:

The EFT interference signal is through a coupling clamp device couples to the signal and control lines of the EUT.

10.6 Test Method

According to EN61000-4-5/1995.

10.7 Test Result

Inject Line	Voltage KV	Inject time (second)	Inject Method	Required Criteria	Complied to Criteria	Result
L-N	+2, -2	60	DIRECT	B	A	PASS
L-PE	+4, -4	60	DIRECT	B	A	PASS
N-PE	+4, -4	60	DIRECT	B	A	PASS

- Meet criteria A: Operate as intended during and after the test.
- Meet criteria B: Operate as intended after the test.
- Meet criteria C: Loss/Error of function.
- Additional Information.
- EUT stopped operation and could / could not be reset by operator at ___ KV of Line _____.
- No false alarms or other malfunctions were observed during or after the test. The acceptance criteria were met, and the EUT passed the test.

11. Voltage Dips and Interruption Measurement

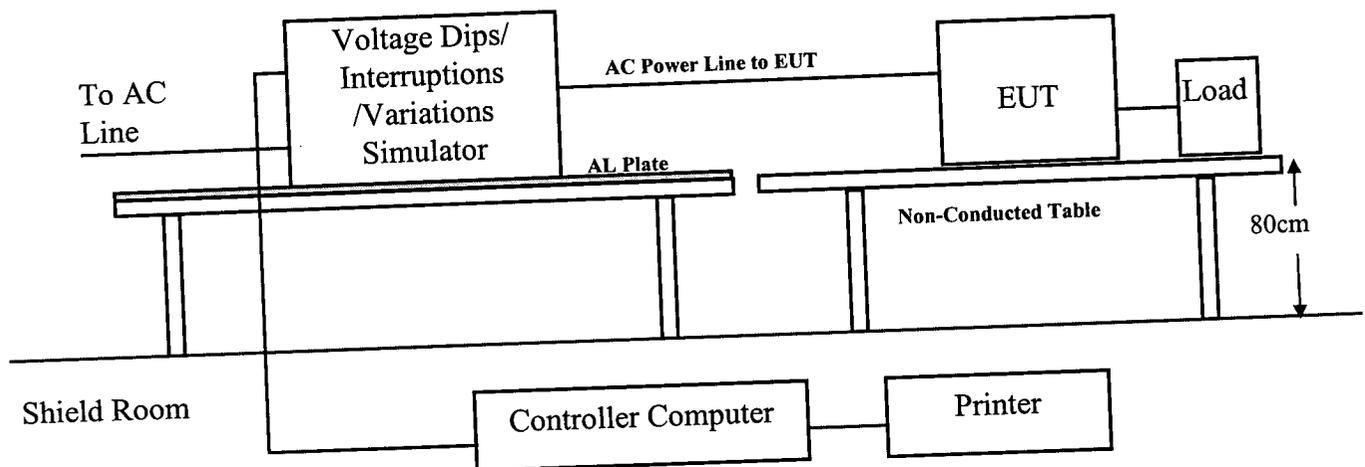
11.1 Test Equipment

The following test equipments are used during the Dips/Interruptions tests:

Item	Instrument	Manufacturer	Type No.	Last Calibration
1	Dips/Interruptions/ Variations Simulator	HAEFELY	PLINE 1610 S/N: 083 690-07	Oct, 1998

11.2 Block Diagram of Test Setup

Note: This is a representative setup diagram for Table-top EUT.
For Floor-standing EUT, the table will be removed with all others setup condition remain the same.



11.3 Severity Levels

Voltage Dips and Interruption Reduction(%)	Required Performance Criteria	Test Duration (ms)
>30	B	10
>50	C	100
>95	C	500

Pursuant to EN50082-2 : 1995

11.4 EUT Operation Condition

Same as section 3.5.

11.5 Test Procedure

The EUT and its load are placed on a table which is 0.8 meter above a metal ground plane measured 1m*1m min. And 0.65mm thick min. And projected beyond the EUT by at least 0.1m on all sides. The EUT is away from the walls of the test AC power line test is as follows:

For AC Power line test:

The EUT is connected to the power mains through a coupling device that directly couples to the Voltage Dips and Interruption Generator.

Each of the Line and Neutral conductor is impressed with supplied voltage for interval of 10 Sec. By the sequence of 3 dips/interruption. Voltage phase shifting are base on 45 degrees increase.

11.6 Test Method

According to EN61000-4-11/1995

11.7 Test Result

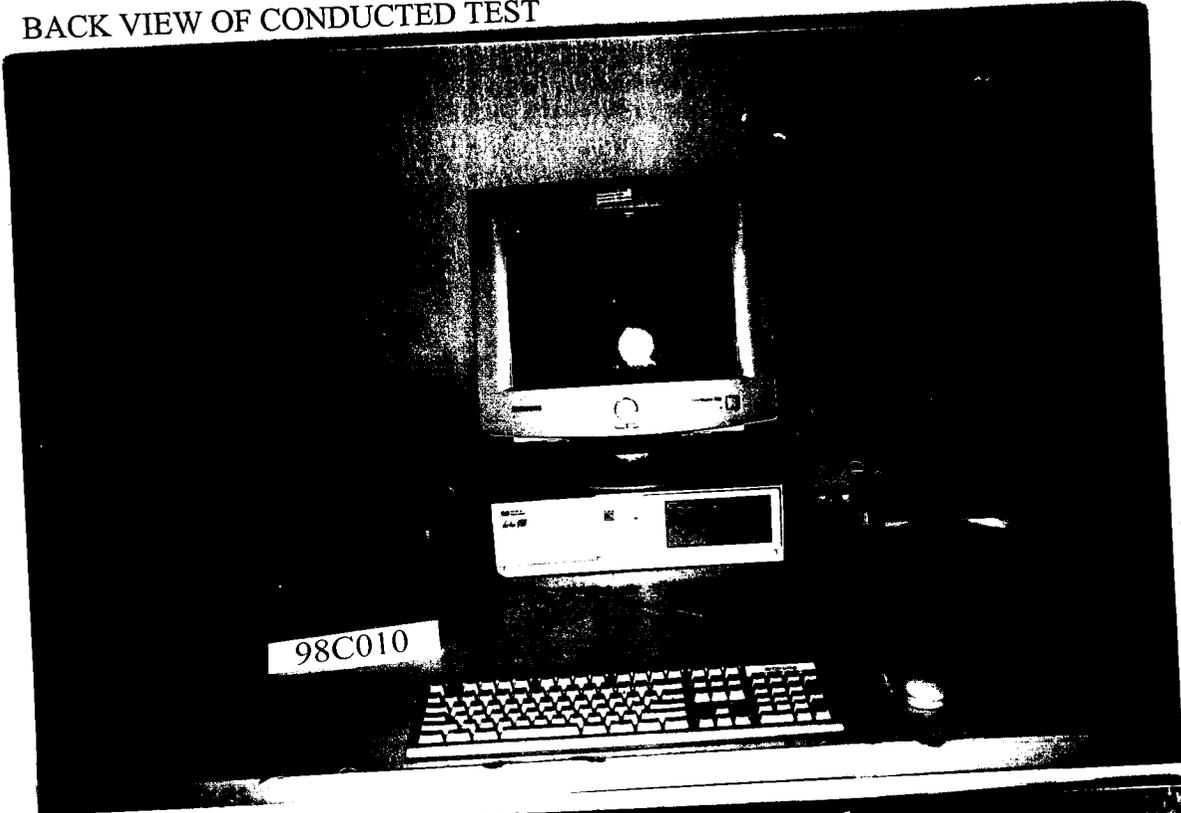
Voltage Dips and Interruption Reduction(%)	Test Duration (ms)	Required Performance Criteria	Performance Criteria Complied To	Test Result
30	10	B	A	PASS
50	100	C	C	PASS
>95	500	C	C	PASS

- Meet criteria A: Operate as intended during and after the test
- Meet criteria B: Operate as intended after the test
- Meet criteria C: Loss/Error of function
- Additional Information
 - EUT stopped operation and could / could not be reset by operator at ___ KV of Line _____.
 - No false alarms or other malfunctions were observed during or after the test. The acceptance criteria were met, and the EUT passed the test.

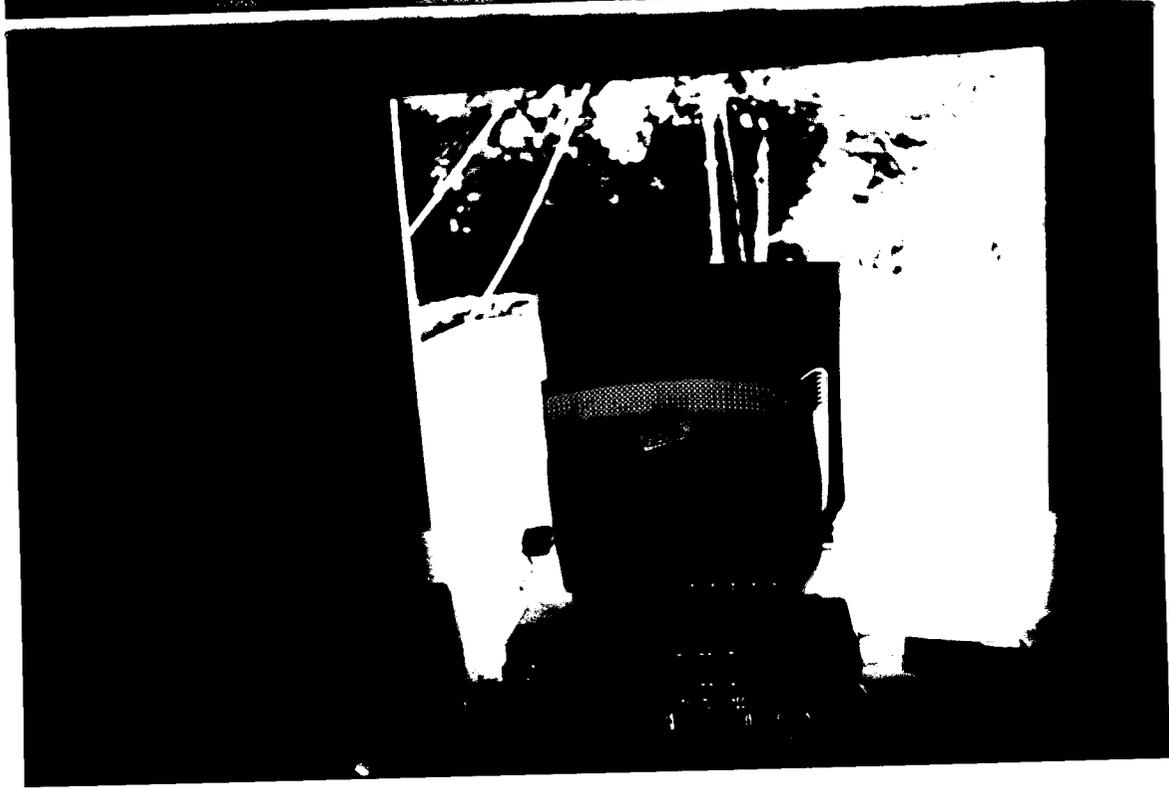
The following test photographs shown maximum emission configuration condition for each test mode.

12. Photographs

1. FRONT VIEW OF CONDUCTED TEST
2. BACK VIEW OF CONDUCTED TEST



- 3. FRONT VIEW OF RADIATED TEST
- 4. BACK VIEW OF RADIATED TEST

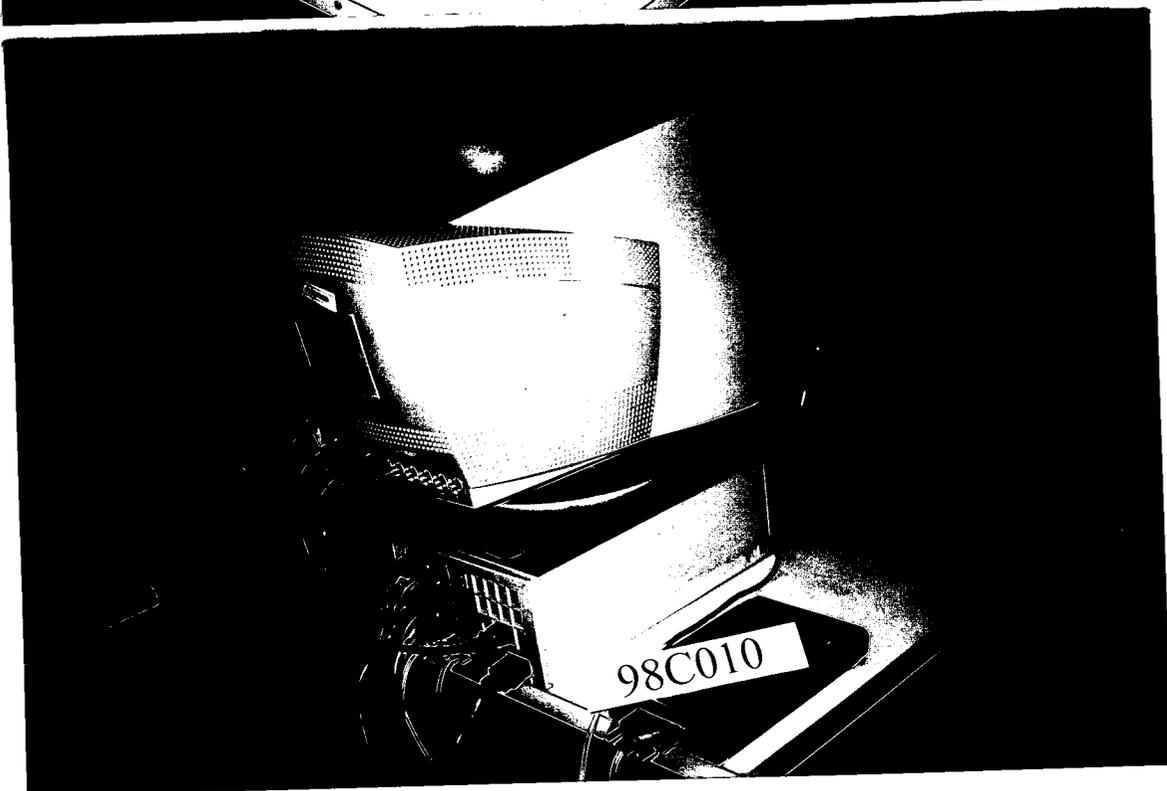
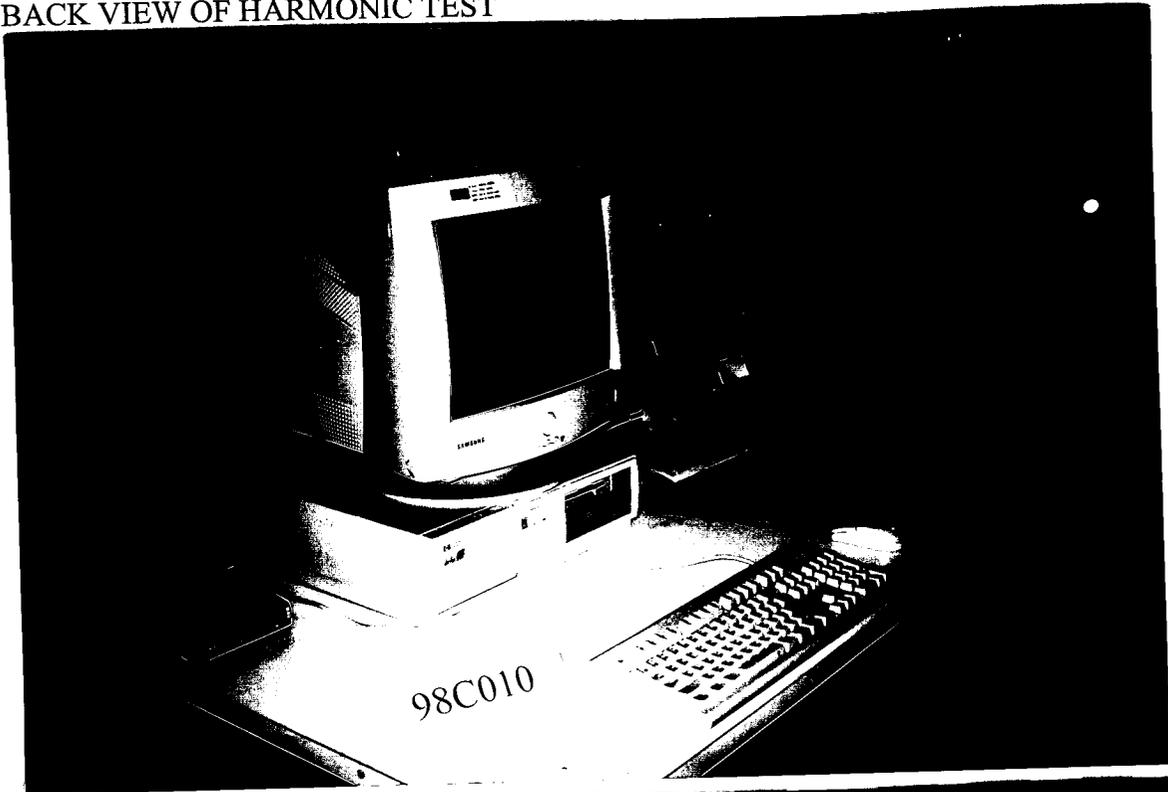


GESTEK

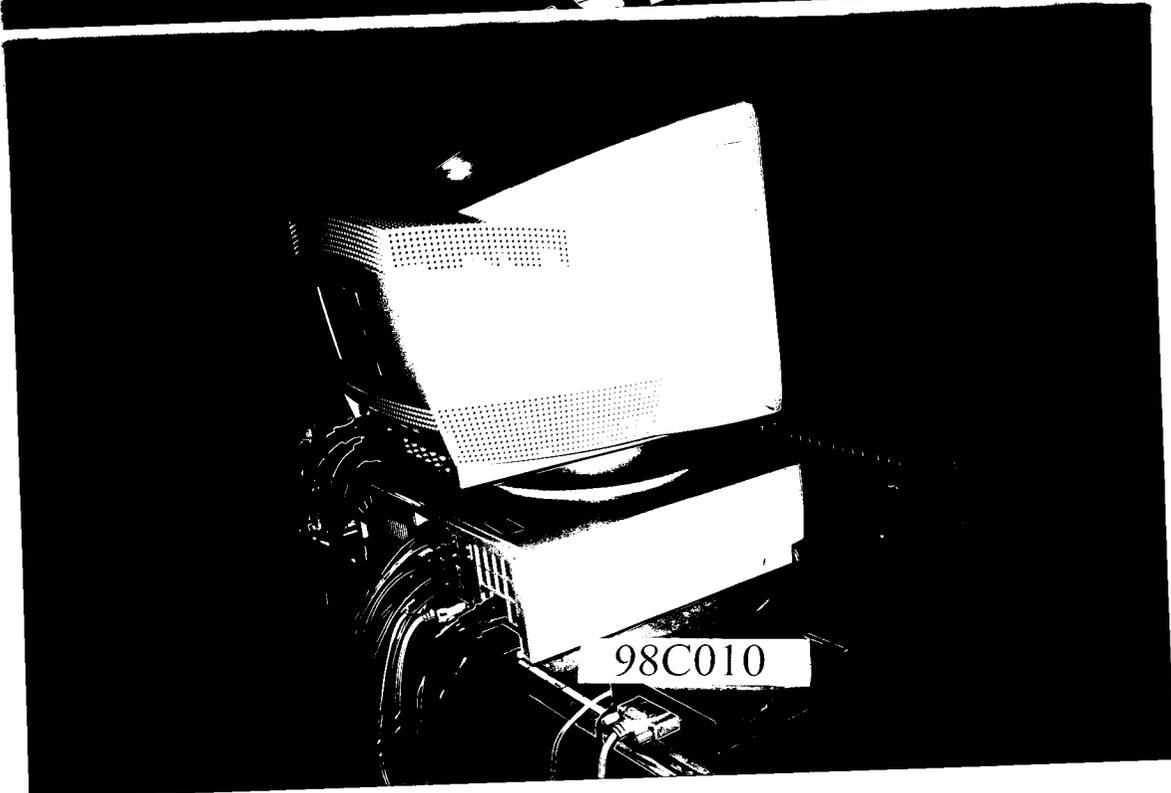
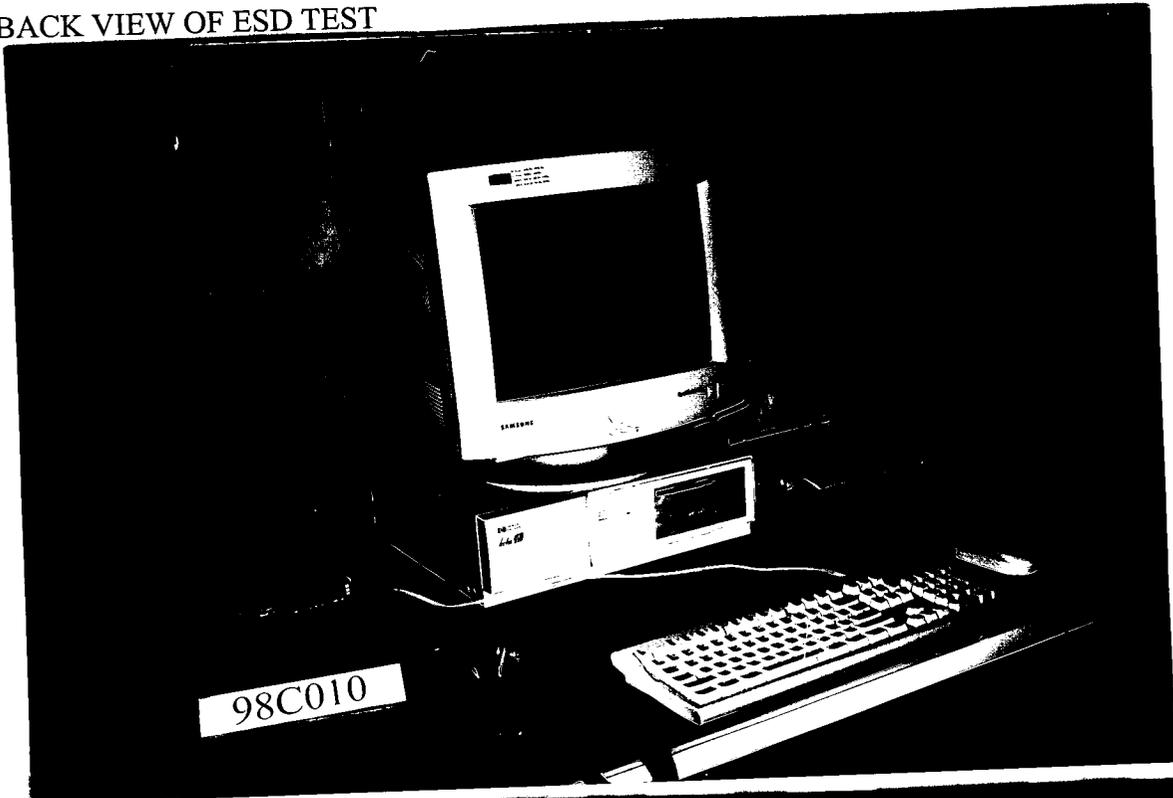
Report #: 98C010E

NO 3, Pau-Tou-Tsuo Valley, Chia-Pau Tsuen, Lin Kou Hsiang, Taipei County, Taiwan, R.O.C. Tel:886-2-2603-5321 Fax:886-2-2603-5325

5. FRONT VIEW OF HARMONIC TEST
6. BACK VIEW OF HARMONIC TEST

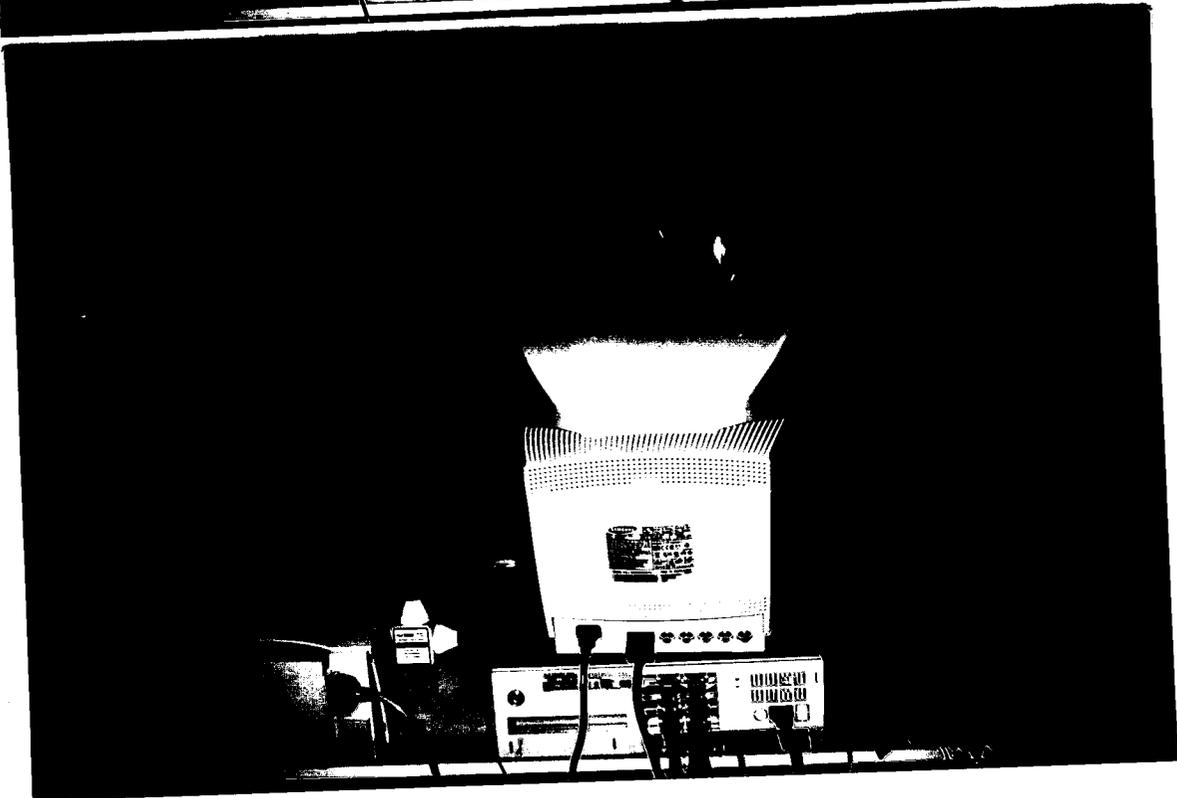
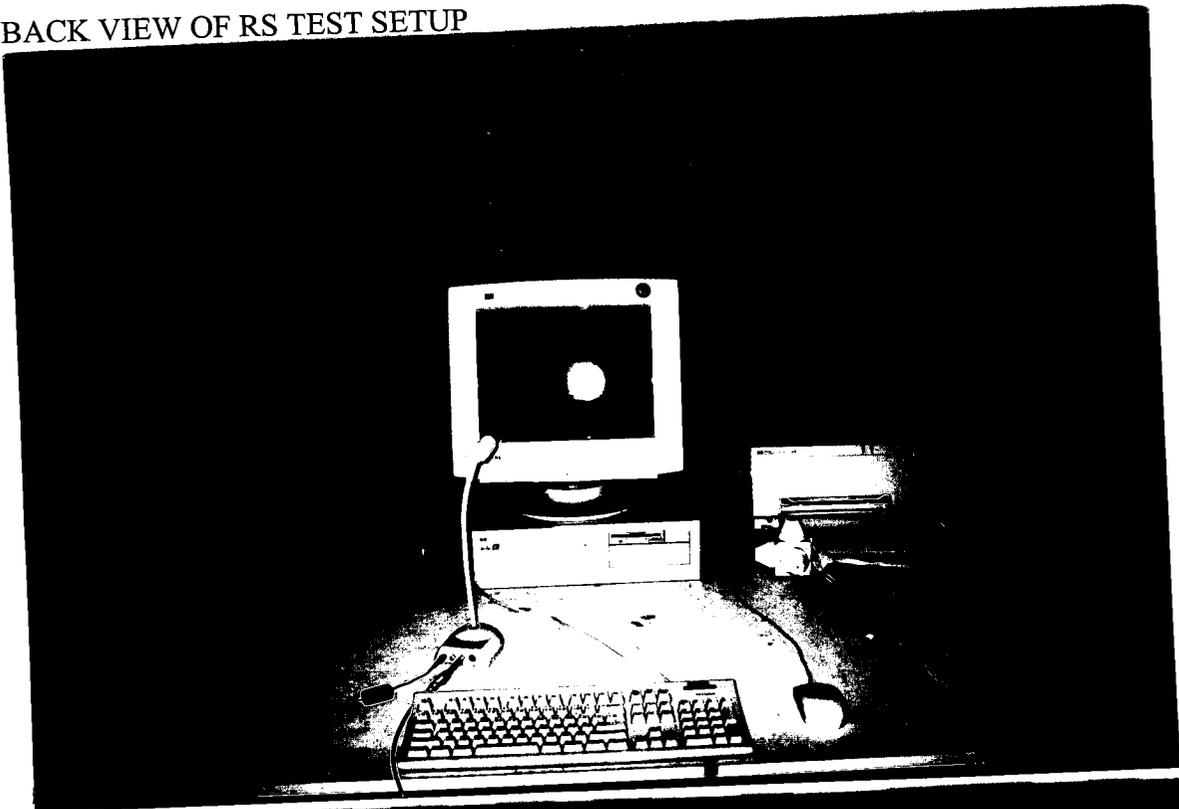


- 7. FRONT VIEW OF ESD TEST
- 8. BACK VIEW OF ESD TEST



9. FRONT VIEW OF RS TEST SETUP

10. BACK VIEW OF RS TEST SETUP

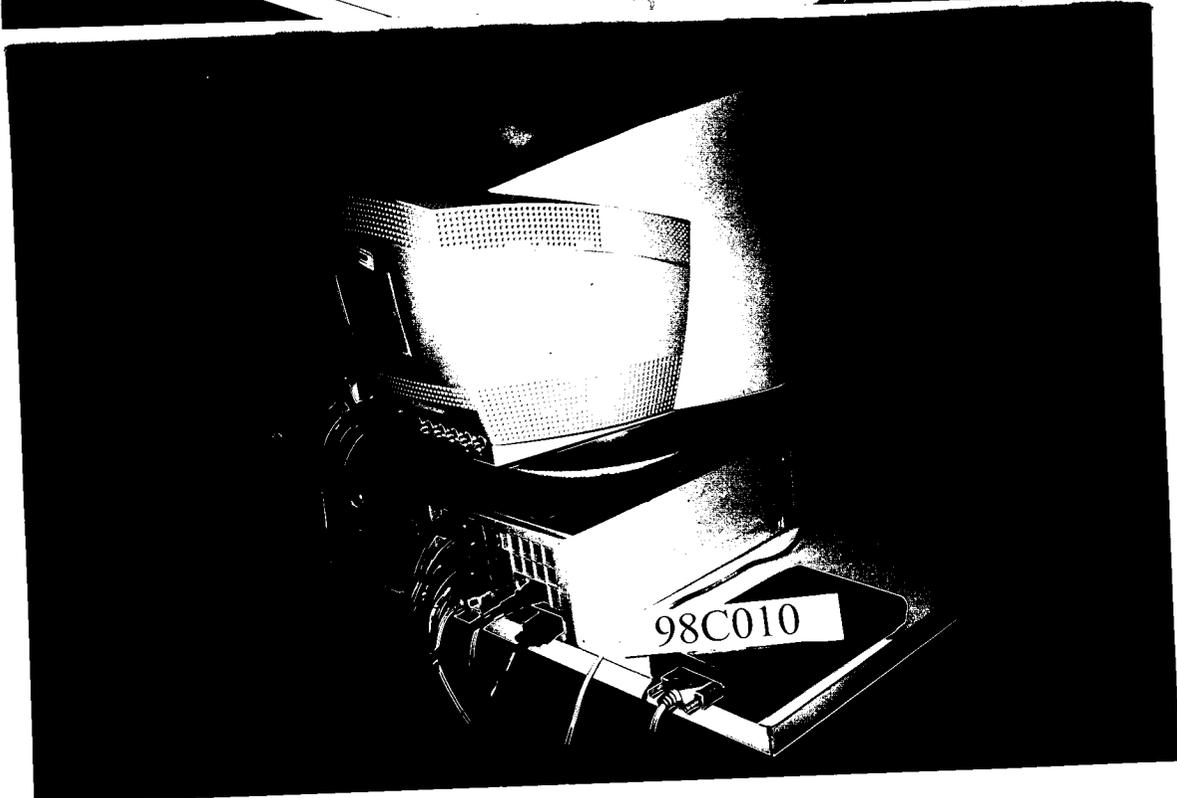
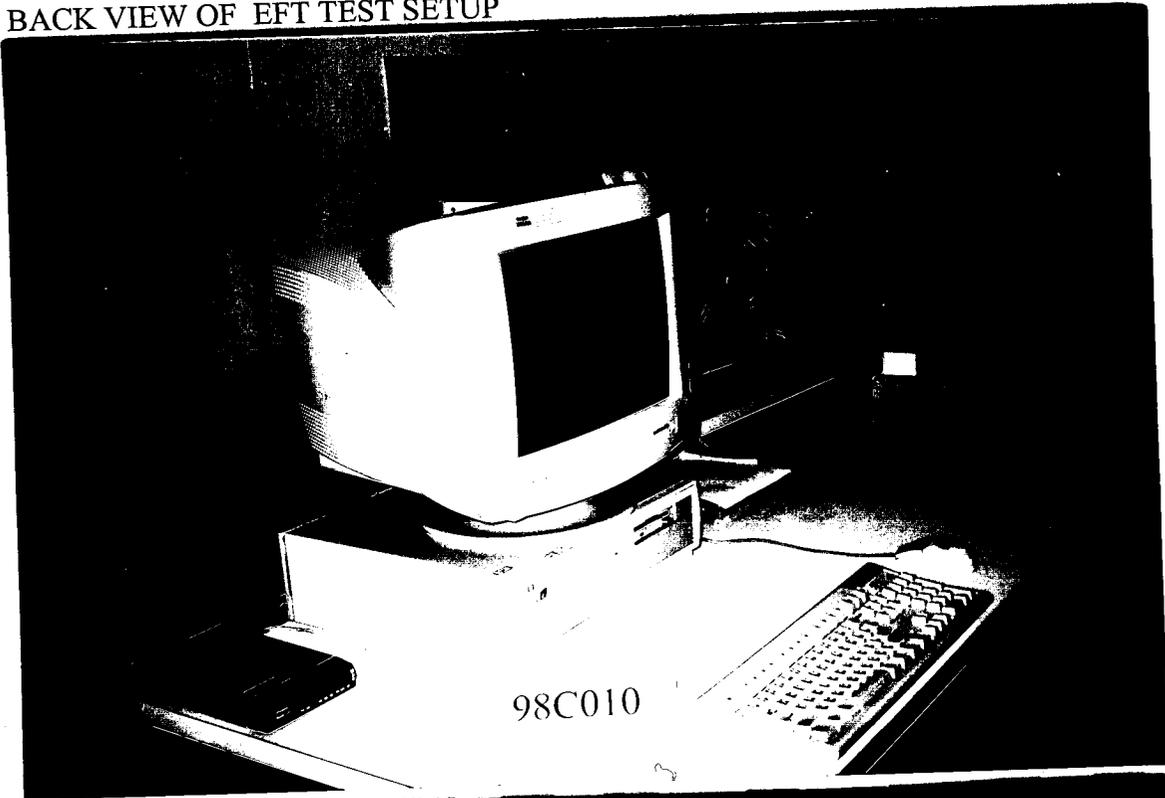


GESTEK

NO 3, Pau-Tou-Tsuo Valley, Chia-Pau Tsuen, Lin Kou Hsiang, Taipei County, Taiwan, R.O.C. Tel:886-2-2603-5321 Fax:886-2-2603-5325

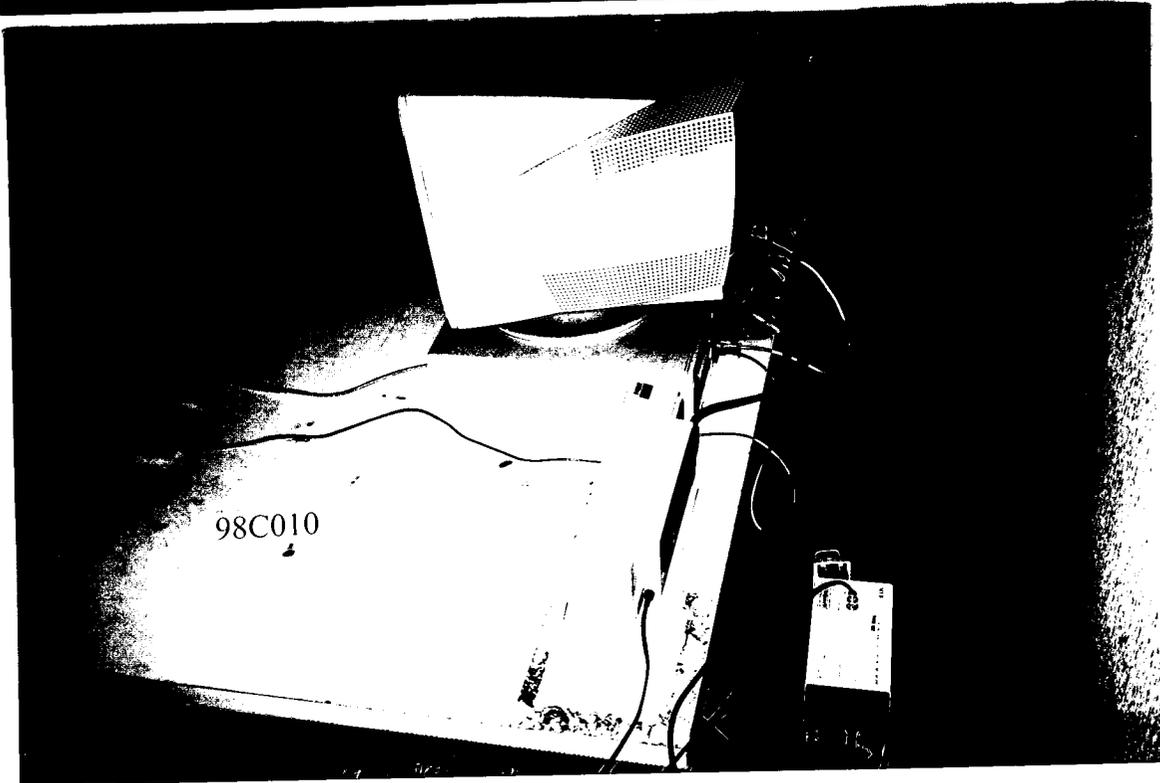
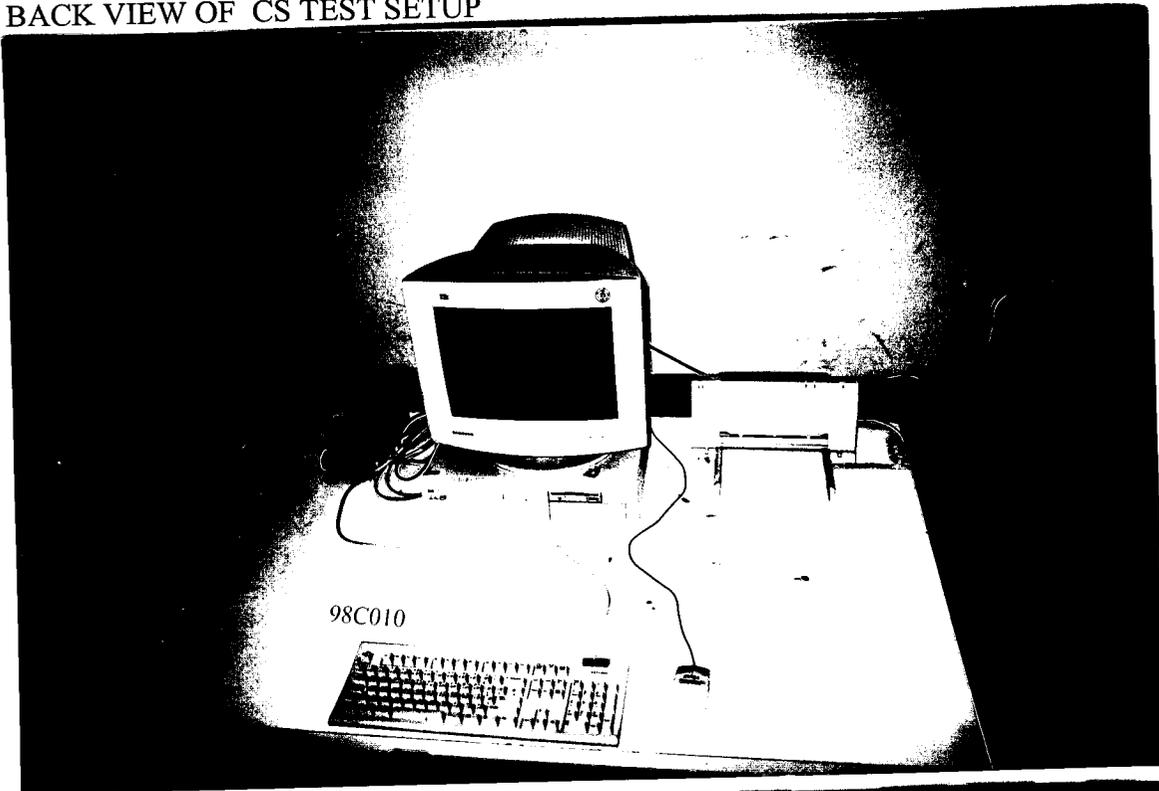
Report #: 98C010E

- 11. FRONT VIEW OF EFT TEST SETUP
- 12. BACK VIEW OF EFT TEST SETUP



13. FRONT VIEW OF CS TEST SETUP

14. BACK VIEW OF CS TEST SETUP



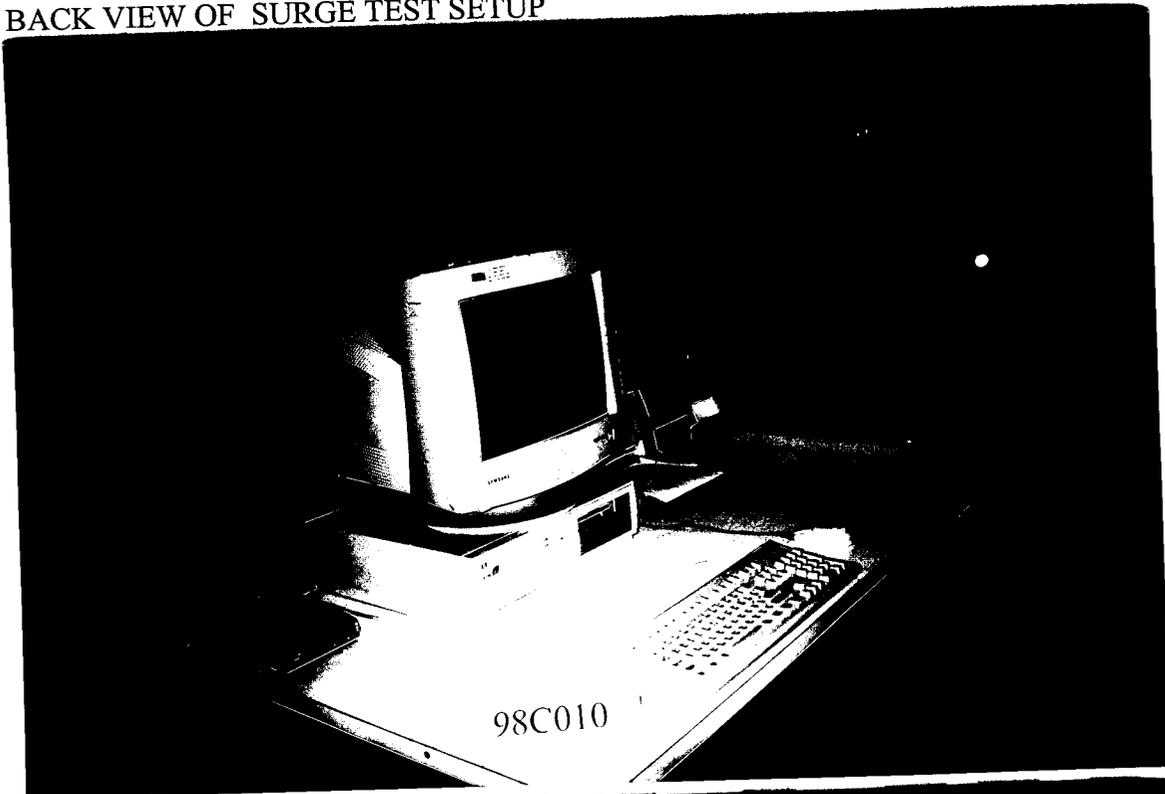
GESTEK

Report #: 98C010E

NO 3, Pau-Tou-Tsuo Valley, Chia-Pau Tsuen, Lin Kou Hsiang, Taipei County, Taiwan, R.O.C. Tel:886-2-2603-5321 Fax:886-2-2603-5325

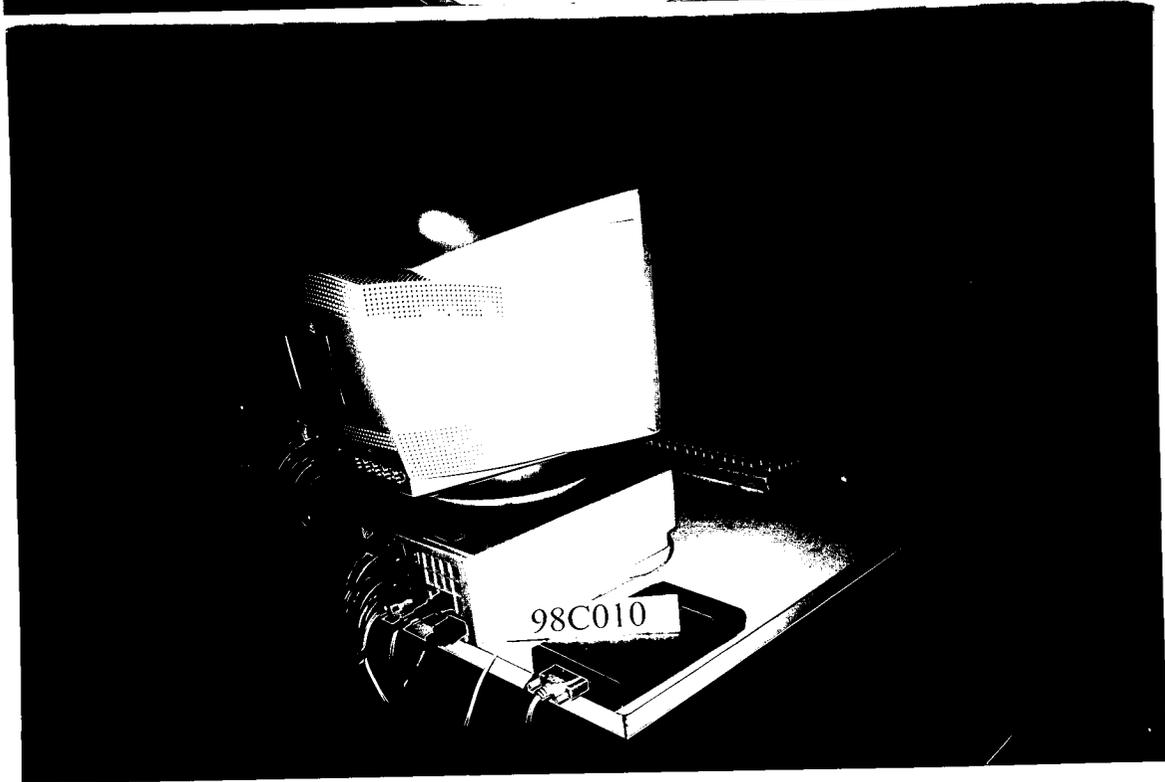
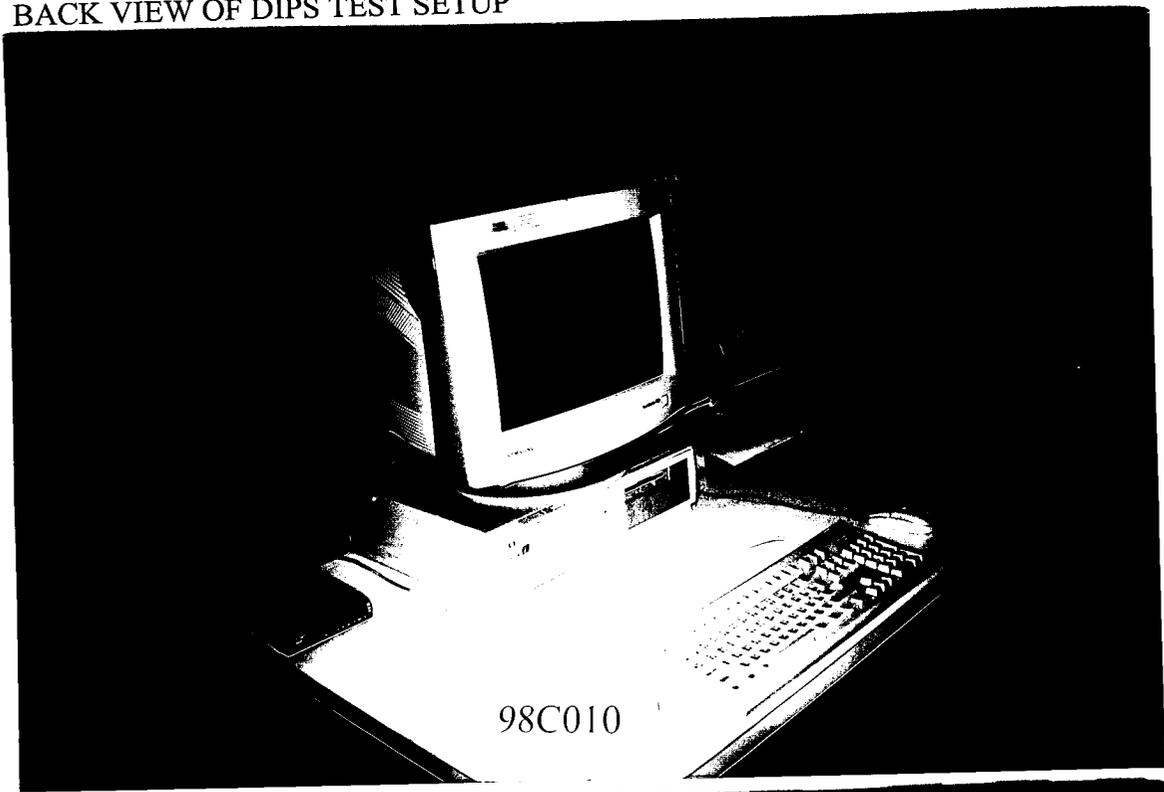
15. FRONT VIEW OF SURGE TEST SETUP

16. BACK VIEW OF SURGE TEST SETUP



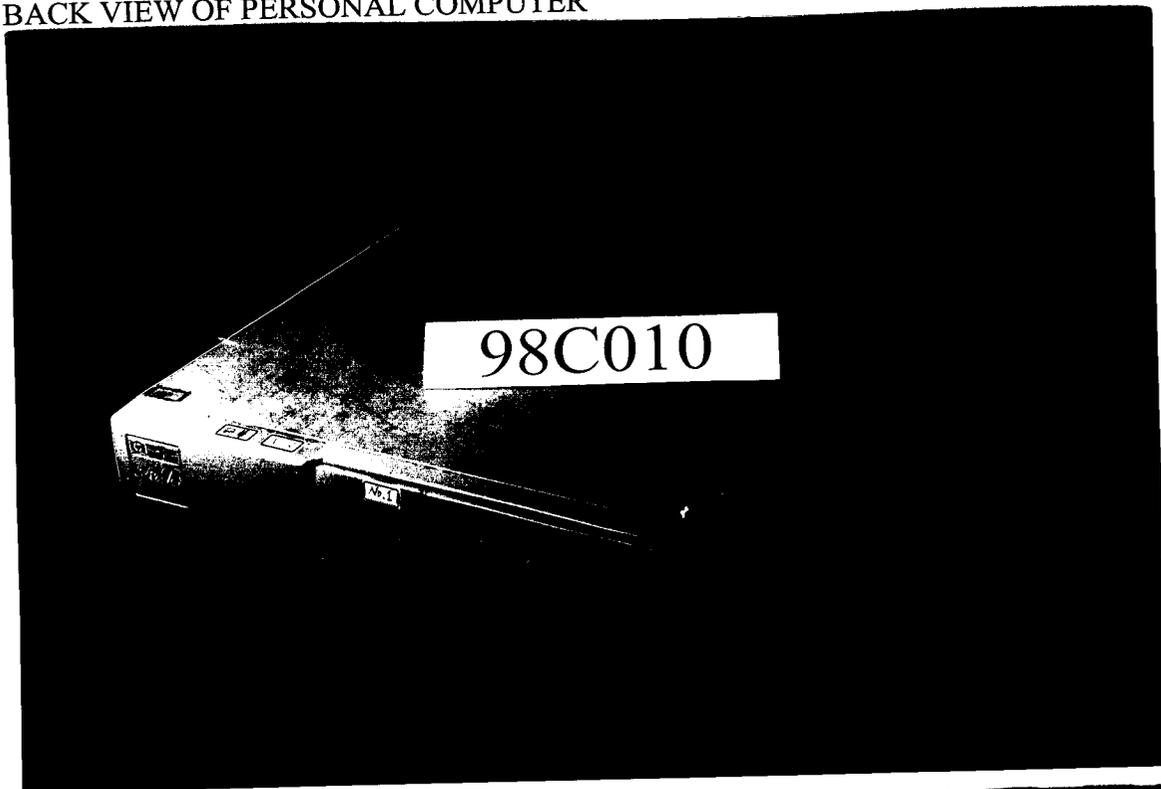
17. FRONT VIEW OF DIPS TEST SETUP

18. BACK VIEW OF DIPS TEST SETUP



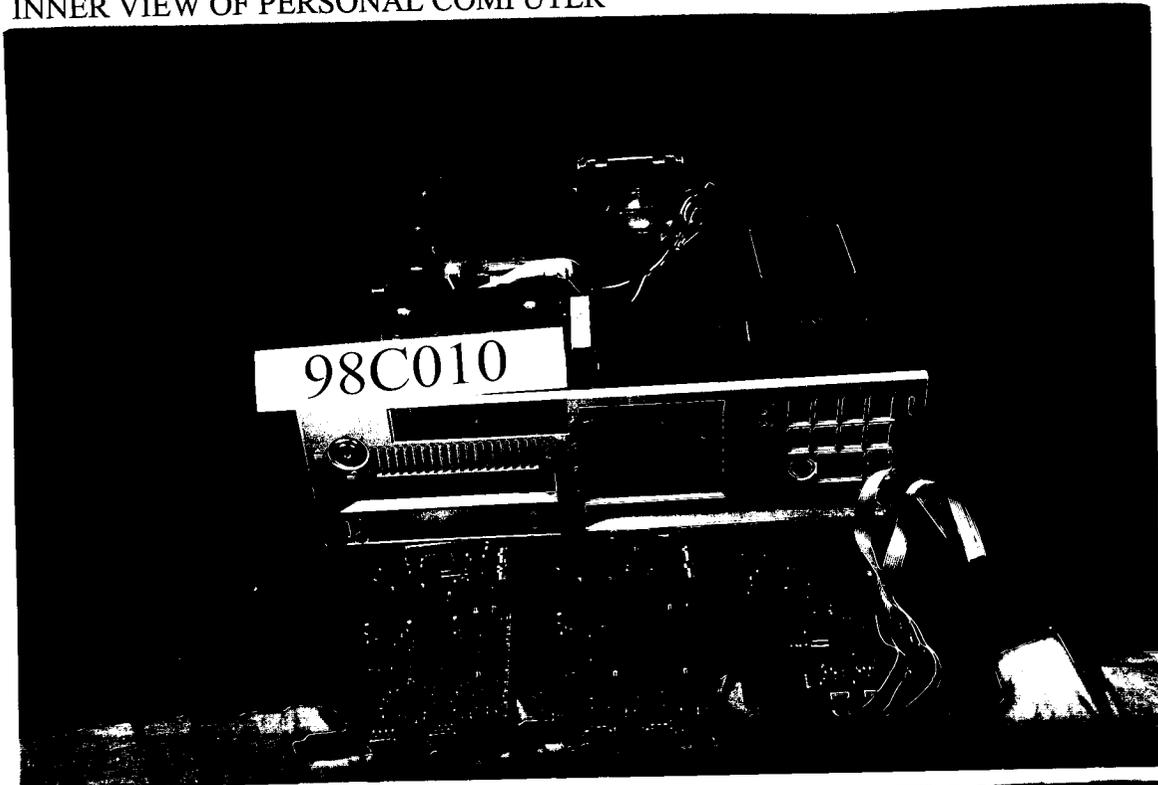
19. FRONT VIEW OF PERSONAL COMPUTER

20. BACK VIEW OF PERSONAL COMPUTER



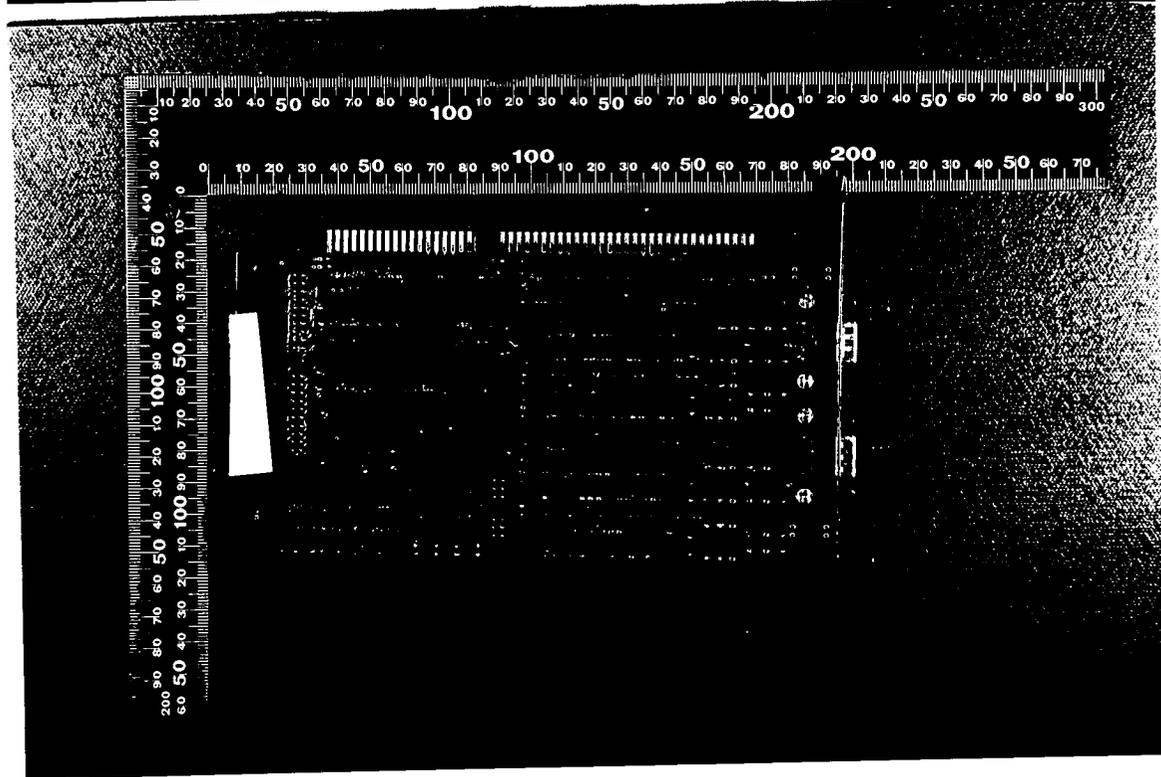
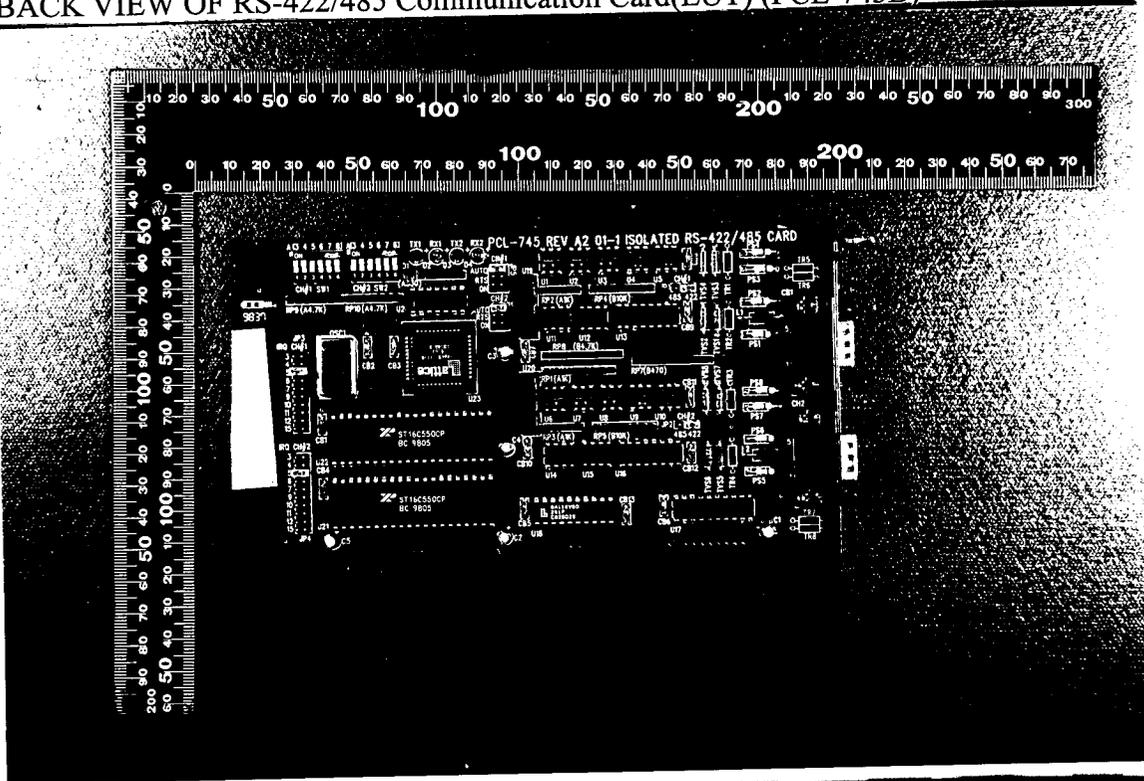
21. INNER VIEW OF PERSONAL COMPUTER

22. INNER VIEW OF PERSONAL COMPUTER



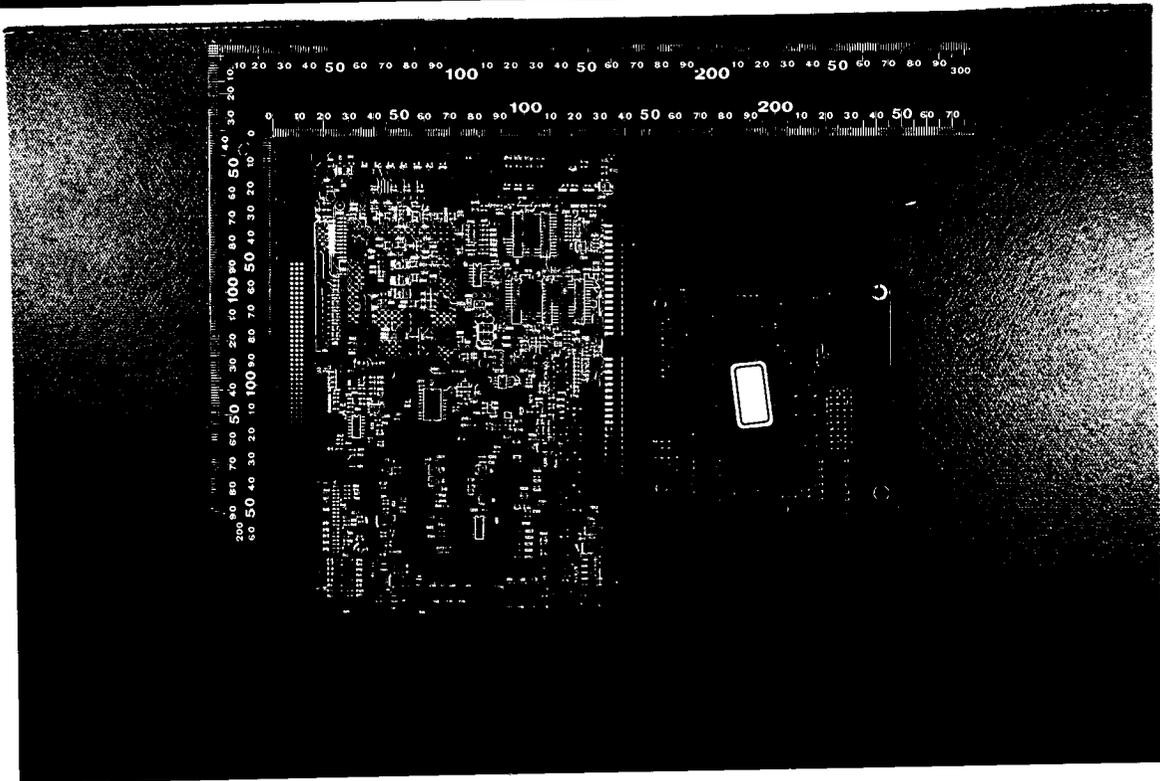
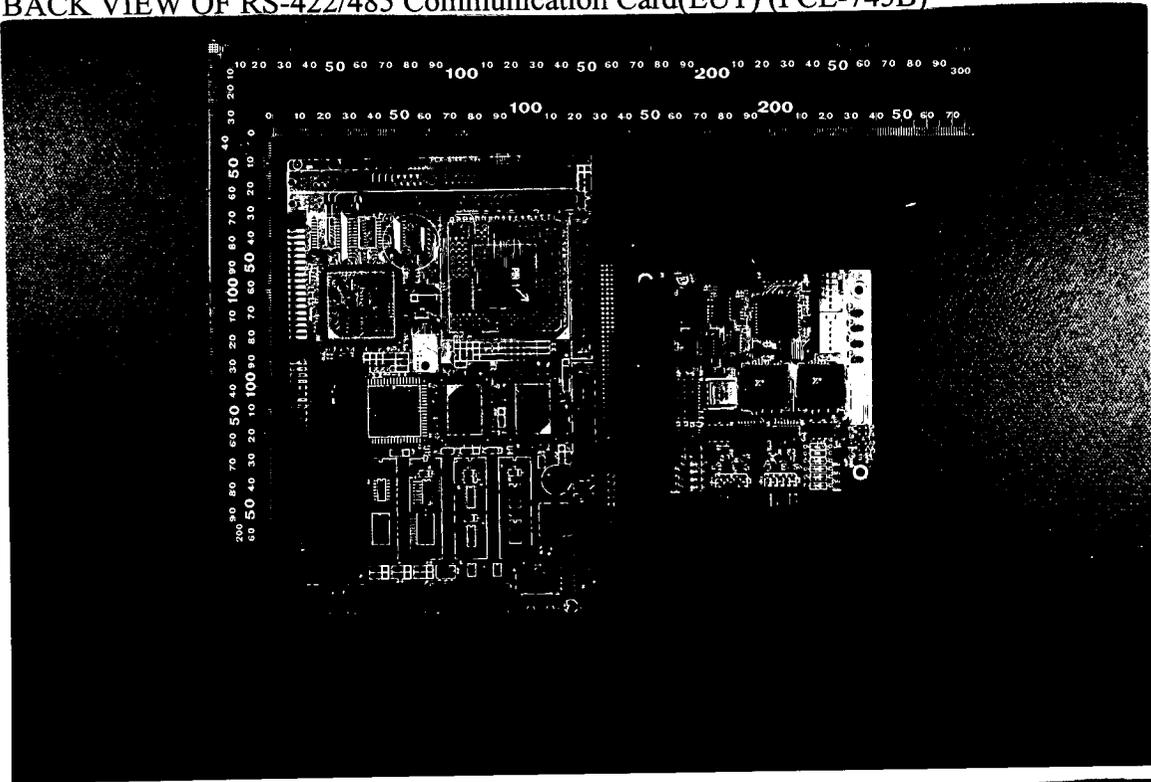
23. FRONT VIEW OF RS-422/485 Communication Card(EUT)(PCL-743B)

24. BACK VIEW OF RS-422/485 Communication Card(EUT) (PCL-743B)



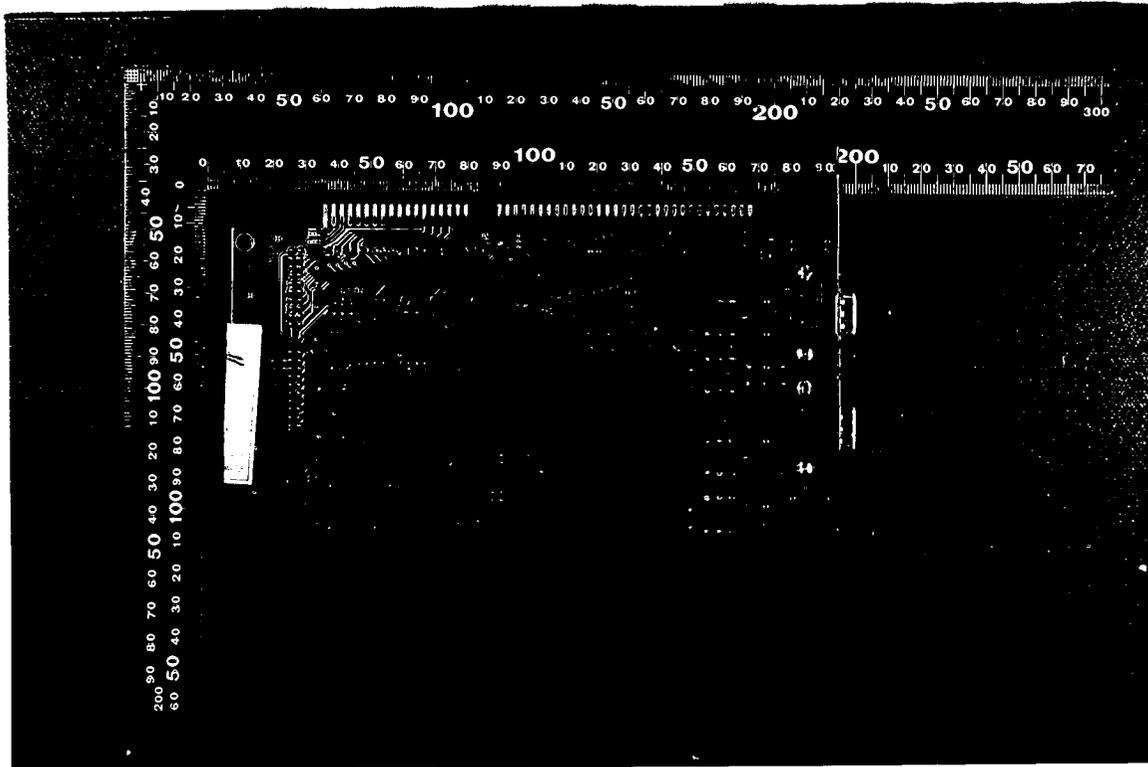
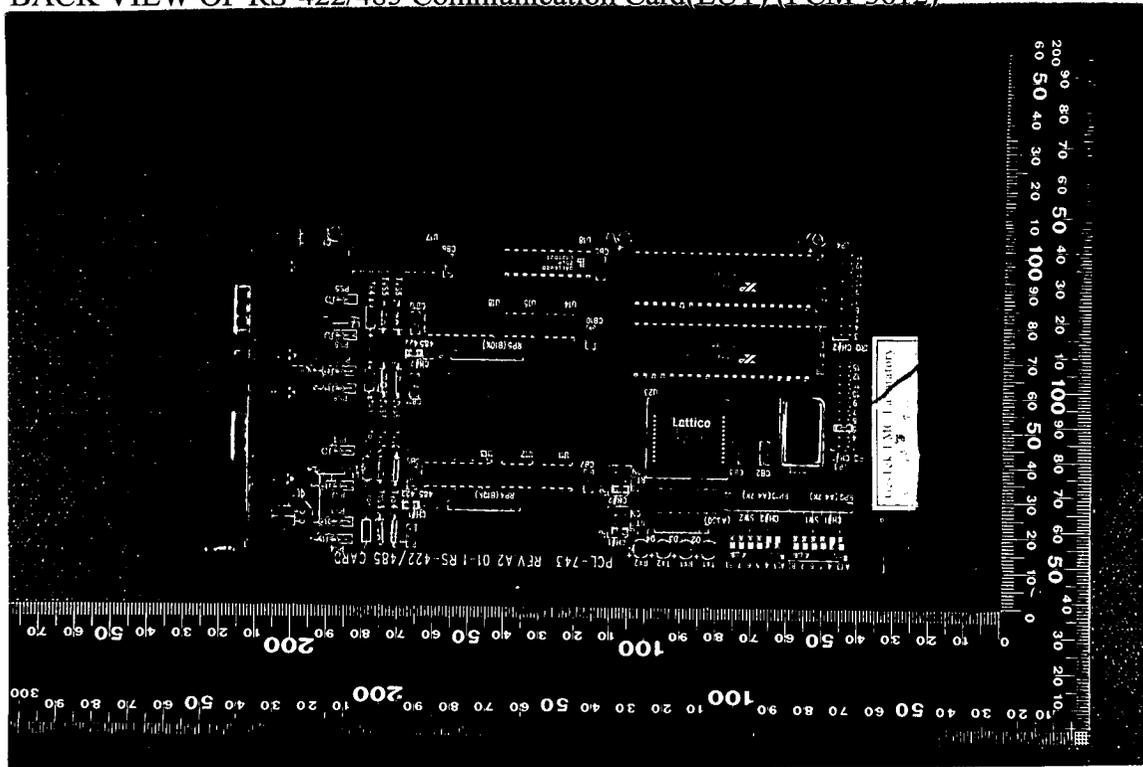
25. FRONT VIEW OF RS-422/485 Communication Card(EUT)(PCL-745B)

26. BACK VIEW OF RS-422/485 Communication Card(EUT) (PCL-745B)



27. FRONT VIEW OF RS-422/485 Communication Card(EUT)(PCM-3612)

28. BACK VIEW OF RS-422/485 Communication Card(EUT) (PCM-3612)



13. EMI/EMS Reduction Method During Compliance Testing

No modification was made during testing.