



# EMC

## TEST REPORT

REPORT NO. : CE87072210  
MODEL NO. : PCA-6154, PCA-6154L  
DATE OF TEST : July 24 ~ July 30, 1998

PREPARED FOR : ADVANTECH CO., LTD.

ADDRESS : FL. 4, NO. 108-3, MING-CHUAN ROAD,  
SHING-TIEN CITY TAIPEI HSIEN, TAIWAN

PREPARED BY: ADVANCE DATA TECHNOLOGY CORPORATION



Accredited Laboratory

12F, NO.1, SEC.4, NAN-KING EAST RD.,  
TAIPEI, TAIWAN, R.O.C.

This test report consists of 26 pages in total. It may be duplicated completely for legal use with the allowance of the applicant. It shall not be reproduced except in full, without the written approval of our laboratory. It should not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. government. The test result in the report only applies to the tested sample.



## TABLE OF CONTENTS

1. CERTIFICATION.....	3
2. GENERAL INFORMATION .....	4
2.1 GENERAL DESCRIPTION OF EUT .....	4
2.2 GENERAL DESCRIPTION OF APPLIED STANDARD.....	4
2.3 DESCRIPTION OF SUPPORT UNITS .....	5
2.4 TEST SETUP .....	6
3. TEST INSTRUMENTS .....	7
3.1 TEST INSTRUMENTS (EMISSION).....	7
3.2 TEST INSTRUMENTS (IMMUNITY).....	8
4. TEST RESULTS (EMISSION) .....	9
4.1 RADIO DISTURBANCE .....	9
4.1.1 EUT OPERATION CONDITION .....	9
4.1.2 TEST DATA OF CONDUCTED EMISSION .....	10
4.1.3 TEST DATA OF RADIATED EMISSION.....	11
5. TEST RESULTS (IMMUNITY) .....	13
5.1 GENERAL DESCRIPTION .....	13
5.2 PERFORMANCE CRITERIA DESCRIPTION.....	13
5.3 EUT OPERATION CONDITION .....	13
5.4 TEST RESULT OF ELECTROSTATIC DISCHARGE (ESD).....	14
5.5 TEST RESULT OF RADIATED ELECTROMAGNETIC FIELDS (RS) .....	15
5.6 TEST RESULT OF ELECTRICAL FAST TRANSIENT (EFT).....	16
5.7 TEST RESULT OF CONDUCTED RADIO FREQUENCY DISTURBANCES (CS) .....	17
5.8 TEST RESULT OF POWER FREQUENCY MAGNETIC FIELD.....	18
5.9 TEST RESULT OF RADIO-FREQUENCY ELECTROMAGNETIC FIELD, PULSE MODULATED .....	19
6. PHOTOGRAPHS OF THE TEST CONFIGURATION .....	20



1.

## CERTIFICATION

Issue date: Aug. 5, 1998

Product : CPU BOARD  
Trade Name : ADVANTECH  
Model No. : PCA-6154, PCA-6154L  
Applicant : ADVANTECH CO., LTD.  
Standard : EN 55022:1994+A1:1995+A2:1997, Class A EN 50082-2:1995  
EN 61000-4-2:1995  
EN 61000-4-3:1996  
EN 61000-4-4:1995  
EN 61000-4-6:1996  
EN 61000-4-8:1993  
ENV 50204:1995

We hereby certify that one sample of the designation has been tested in our facility from July 24 to July 30, 1998. The test record, data evaluation and Equipment Under Test (EUT) configurations represent herein are true and accurate representation of the measurements of the sample's EMC characteristics under the conditions herein specified.

CHECKED BY: Sharon Hsiung, DATE: 8/5/98  
( Sharon Hsiung )

APPROVED BY: Mike Su, DATE: 8/5/98  
( Mike Su )

ADVANCE DATA TECHNOLOGY CORPORATION

**NVLAQ<sup>®</sup>**

Accredited Laboratory



## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

Product : CPU BOARD  
Model No. : PCA-6154, PCA-6154L  
Power Supply Type : DC 5V (from PC)  
Power Cord : N/A

Note: The EUT was tested with the following configuration:

- CHASSIS: ADVANTECH, model: IPC-610
- CPU: Pentium Intel 200-MMX, 200MHz
- HDD: MAXTOR, model: 7850AT
- FDD: TEAC, model: FD-235HF
- POWER SUPPLY: SKYNET, model: ADT 925C
- VGA CARD: SIS, model: Sis 5598
- BACKPLANE: ADVANTECH, 6113-C101 chassis

The EUT has two model names, which are identical to each other in all aspects except for the following:

- Model: PCA-6154 ( With LAN function )
- Model: PCA-6154L ( Without LAN function )

From the above models, model: PCA-6154 was chosen as the representative model for the test and therefore only the data of this model is recorded in this report.

The video resolution of 1280x1024 was used during the test.

### 2.2 GENERAL DESCRIPTION OF APPLIED STANDARD

According to the manufacturer's request, the EUT was tested with the requirements of the following standards:

EN 55022:1994+A1:1995+A2:1997, Class A

**EN 50082-2:1995**

EN 61000-4-2:1995

EN 61000-4-3:1996

EN 61000-4-4:1995

EN 61000-4-6:1996

EN 61000-4-8:1993

ENV 50204:1995

All tests are performed and recorded as per above standards.



## 2.3 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories are used to form representative test configuration during the tests.

### EMISSION TEST

No	Product	Brand	Model No.	Serial No.	I/O Cable
1	MONITOR	ADI	PD-959	730020U00100274	Shielded Signal (1.5m) Nonshielded Power (1.8m)
2	USB KEYBOARD	BTC	7932	D7A140019	Shielded Signal (1.8m)
3	PRINTER	EPSON	P911A	IZ17000508	Nonshielded Signal (1.2m) Nonshielded Power (1.8m)
4	MODEM	ACEEX	1414	980020509	Nonshielded Signal (1.5m) Nonshielded Power (1.8m)
5	MOUSE	LOGITECH	M-M30	LTR53500777	Shielded Signal (1.8m)
6	PERSONAL COMPUTER	IBM	6560-T7T	9983708	Nonshielded Power (1.8m)
7	KEYBOARD	HP	C3758A	K101085	Nonshielded Signal (1.8m)
8	MONITOR	ADI	PV-448	604012V00100245A	Nonshielded Signal (1.5m) Nonshielded Power (1.8m)
9	MOUSE	HP	M-S34	LZA72033314	Nonshielded Signal (1.8m)
10	LAN CARD	INTEL	S82555	00A0C9A6CB5252713	N/A
11	HUB	ACCTON	EN2040	FCC Approved	Nonshielded Signal (10m) Nonshielded Power (1.8m)

Note: 1. EUT system acted as SERVER PC and communicated with support unit 6-10 which acted as WORKSTATION PC and system of communication partner via support unit 11. Support units 6-10 were kept in remote place far away from the test table.

2. An USB cable (1.8m) was connected to the USB port of PC to form an open loop cable.

3. One RJ45 cable (3m) was connected to the COM port of PC to form an open loop cable.



## IMMUNITY TEST

No	Product	Brand	Model No.	Serial No.	I/O Cable
1	COLOR MONITOR	ACTION	MV-0951	N/A	Shielded Signal (1.35m) Nonshielded Power (1.8m)
2	KEYBOARD	HP	C3753A	C3753-60223	Shielded Signal (1.8m)
3	PRINTER	HP	C2145A	SG5N160GY	Shielded Signal (1.4m) Nonshielded Power (1.8m)
4	USD KEYBOARD	BTC	7932	D7A140017	Shielded Signal (1.2m)
5	MODEM	GVC	F-1128V1R6	96-191-113004	Shielded Signal (1.2m) Nonshielded Power (1.7m)
6	MOUSE	LOGITECH	M-M30-9F	LTR53500789	Shielded Signal (1.8m)
7	PERSONAL COMPUTER	IBM	6560-T7T	9983708	Nonshielded Power (1.8m)
8	KEYBOARD	HP	C3758A	K101085	Nonshielded Signal (1.8m)
9	MONITOR	ADI	PV-448	604012V0010024 5A	Nonshielded Signal (1.5m) Nonshielded Power (1.8m)
10	MOUSE	HP	M-S34	LZA72033314	Nonshielded Signal (1.8m)
11	LAN CARD	INTEL	S82555	00A0C9A6CB525 2713	N/A
12	HUB	ACCTON	EN2040	FCC Approved	Nonshielded Signal (10m) Nonshielded Power (1.8m)

Note: 1. EUT system acted as SERVER PC and communicated with support unit 7-11 which acted as WORKSTATION PC and system of communication partner via support unit 12. Support units 6-10 were kept in remote place far away from the test table.

2. One RJ45 cable (3m) was connected to the COM port of PC to form an open loop cable.

## 2.4 TEST SETUP

Please refer to the photos of test configuration in Item 6.



### 3. TEST INSTRUMENTS

#### 3.1 TEST INSTRUMENTS (EMISSION)

##### RADIATED EMISSION MEASUREMENT

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
HP Spectrum Analyzer	8594E	3520A01861	Feb. 12, 1999
HP Preamplifier	8447D	2944A08118	Dec. 31, 1998
ROHDE & SCHWARZ TEST RECEIVER	ESVS 10	840241/010	Sept. 9, 1998
SCHWARZBECK Tunable Dipole Antenna	VHA 9103 UHA 9105	E101051 E101055	Nov. 28, 1998
CHASE BILOG Antenna	CBL6111A	1079	July 17, 1999
CHANCE Turn Table	U200	9701	N/A
CHANCE Tower	AT-100	CM-A003	N/A
Open Field Test Site	Site 3	ADT-R03	July 16, 1999

Note: 1. The measurement uncertainty is less than +/- 3dB, which is calculated as per NAMA's document NIS81.

2. The calibration interval of the above test instruments is 12 months.  
And the calibrations are traceable to NML/ROC and NIST/USA.

##### CONDUCTED EMISSION MEASUREMENT

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
ROHDE & SCHWARZ Test Receiver	ESHS30	828765/002	July 29, 1999
ROHDE & SCHWARZ Artificial Mains Network	ESH2-Z5	828075/003	July 27, 1999
EMCO-L.I.S.N.	3825/2	90031627	July 27, 1999
Shielded Room	Site 5	ADT-C05	N/A

Note: 1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per NAMA's document NIS81.

2. The calibration interval of the above test instruments is 12 months.  
And the calibrations are traceable to NML/ROC and NIST/USA.



### 3.2 TEST INSTRUMENTS (IMMUNITY)

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
KeyTek, ESD Test System	2000	9105240/41	Aug. 10, 1998
KeyTek, ESD Simulator	MZ-15/EC	9507277	April 15, 1999
KeyTek, EFT Generator	CE-40	9508257	Sept. 9, 1998
KeyTek, Capacitive Clamp	CE-40-CCL	9508259	Sept. 9, 1998
ROHDE & SCHWARZ Signal Generator	SMY01	840490/009	Sept. 29, 1998
KALMUS Power Amplifier	LA1000V	091995-1	N/A
KALMUS Power Amplifier	757LC	091995-2	N/A
HOLADAY Field Probe	HI-4422	89915	Oct. 12, 1998
EMCO BiconiLog Antenna	3141	1001	N/A
COMTEST Compact Full Anechoic Chamber (7x3x3 m)	CFAC	ADT-S01	Aug. 4, 1998

Note: The calibration interval of the above test instruments is 12 months.  
And the calibrations are traceable to NML/ROC and NIST/USA.



## 4. TEST RESULTS (EMISSION)

### 4.1 RADIO DISTURBANCE

Product Family Standard : EN 55022+A1:1995+A2:1997, Class A  
Frequency Range : 0.15 - 30 MHz (Conducted Emission)  
30 - 1000 MHz (Radiated Emission)  
Input Voltage : 230 Vac, 50 Hz  
Temperature : 25 °C  
Humidity : 63 %  
Atmospheric Pressure : 998 mbar

TEST RESULT	Remarks
PASS	Minimum passing margin of conducted emission: -31.1 dB at 0.168 MHz Minimum passing margin of radiated emission: -4.2 dB at 400.50 MHz

#### 4.1.1 EUT OPERATION CONDITION

1. Turn on the power of all equipments.
2. Industrial PC runs a test program to enable all functions.
3. Industrial PC reads and writes messages from HDD.
4. Industrial PC sends messages to and received messages from WORKSTATION PC via a Hub.
5. Industrial PC sends "H" messages to monitor and monitor displays "H" patterns on screen.
6. Industrial PC sends "H" messages to modem.
7. Industrial PC sends "H" messages to printer, and the printer prints them on paper.
8. Repeat steps 3-8.



#### 4.1.2 TEST DATA OF CONDUCTED EMISSION

EUT: CPU BOARD

MODEL: PCA-6154

6 dB Bandwidth: 10 kHz

TEST PERSONNEL: Jackey Chang

Freq. [MHz]	L Level [dB (μV)]		N Level [dB (μV)]		Limit [dB (μV)]		Margin [dB (μV)]			
	QP	AV	QP	AV	QP	AV	L		N	
0.168	44.90	-	47.90	-	79.00	66.00	-34.1	-	-31.1	-
0.375	31.60	-	34.20	-	79.00	66.00	-47.4	-	-44.8	-
0.684	32.70	-	34.90	-	73.00	60.00	-40.3	-	-38.1	-
1.239	33.00	-	35.30	-	73.00	60.00	-40.0	-	-37.7	-
5.822	37.80	-	41.30	-	73.00	60.00	-35.2	-	-31.7	-
18.842	30.10	-	38.90	-	73.00	60.00	-42.9	-	-34.1	-

- Remarks:
1. "\*": Undetectable
  2. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  3. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  4. The emission level of other frequencies were very low against the limit.
  5. Margin value = Emission level - Limit value

ADT CO. Shielded Room 5  
 EN55022 CLASS A

24. Jul 98 23:10

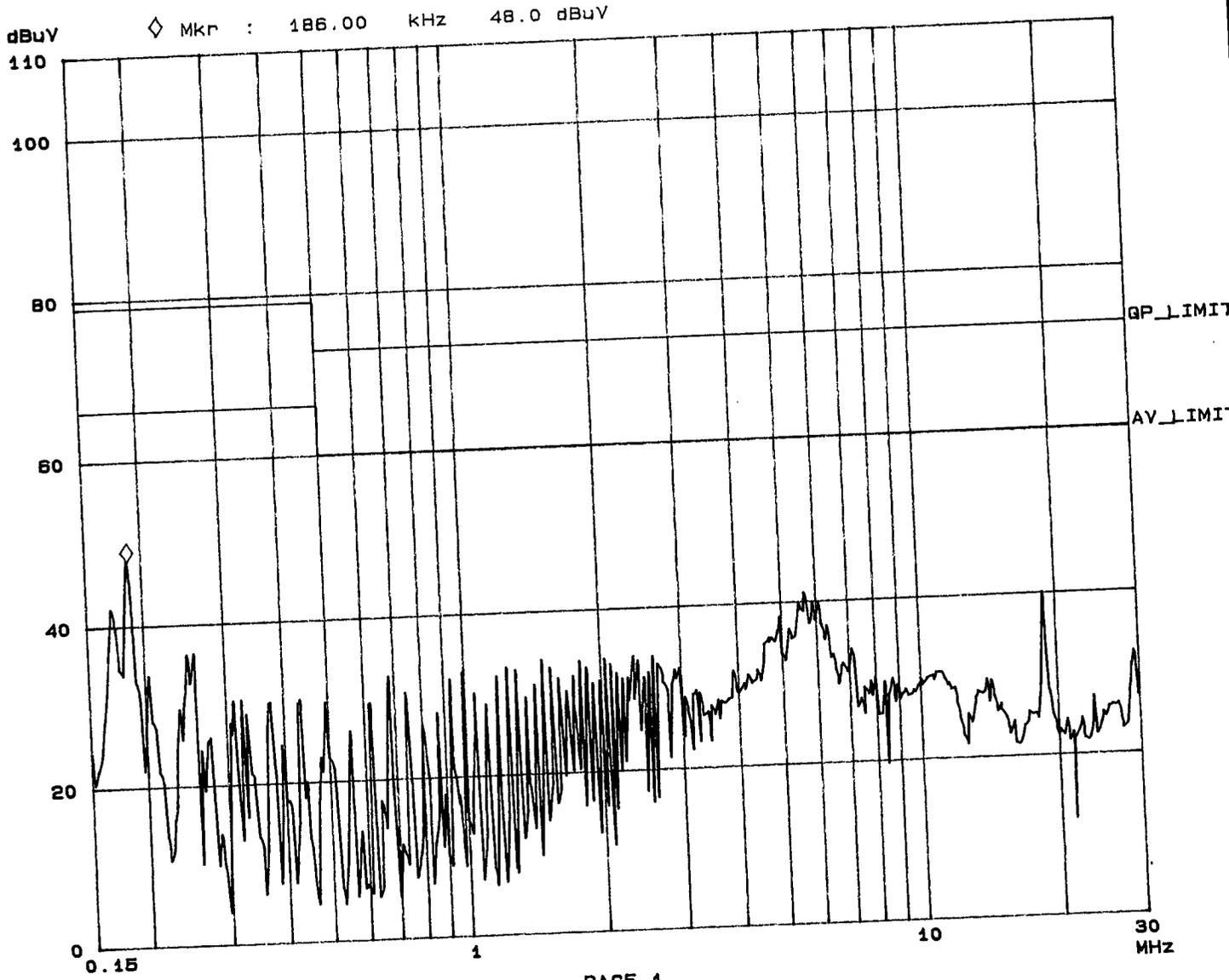
EUT: PCA-6154  
 Operator: JACKEY\_CHANG  
 Test Spec: LISN : L  
 Comment: FULL SYSTEM

Report No. CE87072210

Page 10-1

Tested by Jackey Chang

Fast Scan Settings (3 Ranges)			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	450k	3k	10k	PK	0.05ms	10dBLN	OFF	60dB
450k	5M	3k	10k	PK	0.05ms	10dBLN	OFF	60dB
5M	30M	3k	10k	PK	0.05ms	10dBLN	OFF	60dB



ADT CO. Shielded Room 5  
 EN55022 CLASS A

24. Jul 98 23:04

EUT: PCA-6154  
 Operator: JACKY\_CHANG  
 Test Spec: LISN : N  
 Comment: FULL SYSTEM

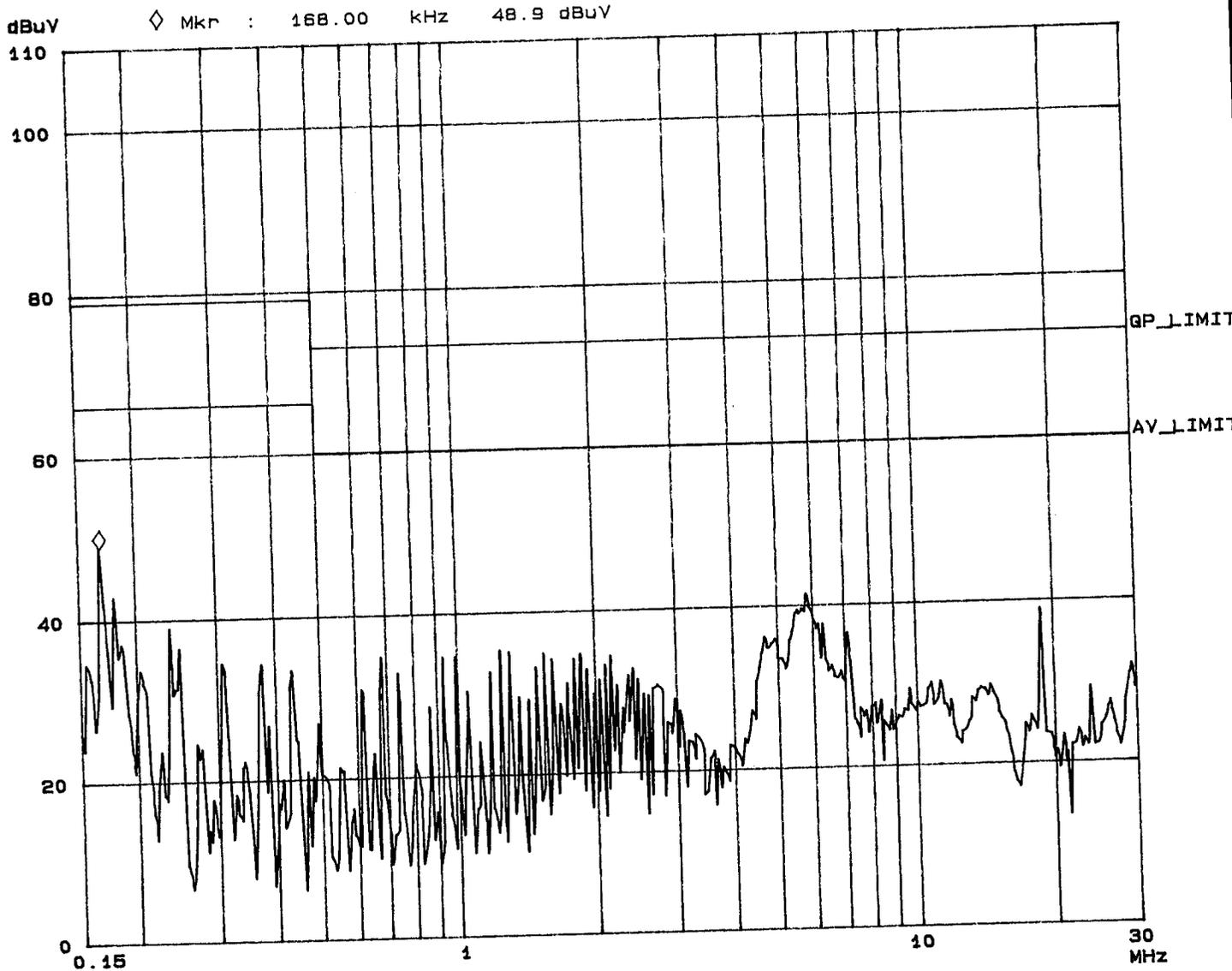
Report No. CE87072210

Page 10-2

Tested by Jackey Chang

Fast Scan Settings (3 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	450k	3k	10k	PK	0.05ms	10dBLN	OFF	60dB
450k	5M	3k	10k	PK	0.05ms	10dBLN	OFF	60dB
5M	30M	3k	10k	PK	0.05ms	10dBLN	OFF	60dB





### 4.1.3 TEST DATA OF RADIATED EMISSION

EUT: CPU BOARD

MODEL: PCA-6154

ANTENNA: CHASE BILOG CBL6111A

POLARITY: Horizontal

DETECTOR FUNCTION: Quasi-peak

6 dB BANDWIDTH: 120 kHz

FREQUENCY RANGE: 30-1000 MHz

MEASURED DISTANCE: 10 M

TEST PERSONNEL: Jackey Chang

Frequency (MHz)	Correction Factor (dB/m)	Reading Data (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
67.48	7.3	24.4	31.7	40.0	-8.3
133.60	14.1	7.5	21.6	40.0	-18.4
200.10	13.0	17.7	30.7	40.0	-9.3
225.10	14.2	10.6	24.8	40.0	-15.2
232.45	14.6	12.1	26.7	47.0	-20.3
266.58	15.7	10.1	25.8	47.0	-21.2
334.10	18.0	16.7	34.7	47.0	-12.3
399.90	21.0	13.8	34.8	47.0	-12.2

- REMARKS :
1. Emission level (dBuV/m) = Correction Factor(dB/m) + Meter Reading (dBuV).
  2. Correction Factor(dB/m) = Ant. Factor(dB/m)+Cable loss(dB)
  3. The other emission levels were very low against the limit.
  4. Margin value = Emission level - Limit value



## TEST DATA OF RADIATED EMISSION

EUT: CPU BOARD

MODEL: PCA-6154

ANTENNA: CHASE BILOG CBL6111A

POLARITY: Vertical

DETECTOR FUNCTION: Quasi-peak

6 dB BANDWIDTH: 120 kHz

FREQUENCY RANGE: 30-1000 MHz

MEASURED DISTANCE: 10 M

TEST PERSONNEL: Jockey Chang

Frequency (MHz)	Correction Factor (dB/m)	Reading Data (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
44.68	13.2	15.4	28.6	40.0	-11.4
60.78	7.0	17.2	24.2	40.0	-15.8
132.10	13.9	14.7	28.6	40.0	-11.4
166.90	11.8	22.9	34.7	40.0	-5.3
200.10	12.8	21.1	33.9	40.0	-6.1
262.80	16.0	13.3	29.3	47.0	-17.7
365.60	19.7	13.6	33.3	47.0	-13.7
400.50	20.4	22.4	42.8	47.0	-4.2

- REMARKS :
1. Emission level (dBuV/m) = Correction Factor(dB/m) + Meter Reading (dBuV).
  2. Correction Factor(dB/m) = Ant. Factor(dB/m) + Cable loss(dB)
  3. The other emission levels were very low against the limit.
  4. Margin value = Emission level - Limit value



## 5. TEST RESULTS (IMMUNITY)

### 5.1 GENERAL DESCRIPTION

Basic Standard	:	EN 61000-4-2	(Electrostatic Discharge Test, ESD)
		EN 61000-4-3	(Radiated Radio-Frequency Disturbance Test, RS)
		EN 61000-4-4	(Electrical Fast Transient/Burst Test, EFT)
		EN 61000-4-6	(Conducted Radio Frequency Disturbances Test, CS)
		EN 61000-4-8	(Power Frequency Magnetic Field Test)
		ENV 50204	(Radio-Frequency Electromagnetic Field, Pulse modulated)
Generic Standard	:	EN 50 082-2	
Input Voltage	:	230 Vac, 50 Hz	
Temperature	:	20 °C	
Humidity	:	58 %	
Atmospheric Pressure	:	998 mbar	

### 5.2 PERFORMANCE CRITERIA DESCRIPTION

- Criterion A - The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.
- Criterion B - The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.
- Criterion C - Temporary loss of function is allowed, provided the function is self recoverable or can be restored by the operation of the controls.

### 5.3 EUT OPERATION CONDITION

Same as item 4.1.1.





## 5.5 TEST RESULT OF RADIATED ELECTROMAGNETIC FIELDS (RS)

Basic Standard : EN 61000-4-3  
Frequency range : 80 MHz -1000 MHz  
Field strength : 10 V/m  
Modulation : 1kHz Sine Wave, 80%, AM Modulation  
Frequency step : 1 % of fundamental  
Polarity of Antenna : Horizontal and Vertical  
Test distance : 3 m

Test Personnel :

*Tom June*

Test Result		Remarks
Criterion A	PASS	Model: PCA-6154

Note: Four sides of EUT are verified separately.

### Description of test result:

There was no change compared with initial operation during the test.



## 5.6 TEST RESULT OF ELECTRICAL FAST TRANSIENT (EFT)

Basic Standard : EN 61000-4-4  
Test Voltage : Power Line - 2 kV  
Signal/Control Line - 1 kV  
Polarity : Positive/Negative  
Impulse Frequency : 5 kHz  
Tr / Tn : 5/50 ns  
Burst Duration : 15 ms  
Burst Period : 300 ms  
Test Duration : Not less than 1 min.  
Test Personnel : Tim Murny

Test Result		Remarks
Criterion A	PASS	Model: PCA-6154

### OBSERVATION DESCRIPTION

Test Point	Polarity	Test Level (kV)	Result
L1	+/-	2	Note 1
L2	+/-	2	Note 1
GND	+/-	2	Note 1
Signal/Control Line	+/-	1	Note 1

#### Description of test result:

Note 1: There was no change compared with initial operation during the test.



## 5.7 TEST RESULT OF CONDUCTED RADIO FREQUENCY DISTURBANCES (CS)

Basic Standard : EN 61000-4-6  
Frequency range : 0.15 MHz - 80 MHz  
Field strength : 10 V/m  
Modulation : 1kHz Sine Wave, 80%, AM Modulation  
Frequency step : 1 % of fundamental  
Coupled cable : Power Mains, Unshielded  
Coupling device : CDN-M3 (3 wires)

Test Personnel : Tom Keung

Test Result		Remarks
Criterion A	PASS	Model: PCA-6154

### OBSERVATION DESCRIPTION

There was no change compared with initial operation during the test.



## 5.8 TEST RESULT OF POWER FREQUENCY MAGNETIC FIELD

Basic Standard : EN 61000-4-8  
Frequency range : 50Hz  
Field strength : 50 A/m  
Observation Time : 1 minute  
Inductance coil : Rectangular type, 1mx1m  
Test Personnel : Tom Neune

Test Result		Remarks
Criterion A	PASS	Model: PCA-6154

### OBSERVATION DESCRIPTION

There was no change compared with initial operation during the test.



## 5.9 TEST RESULT OF RADIO-FREQUENCY ELECTROMAGNETIC FIELD, PULSE MODULATED

Basic Standard : ENV 50204  
Frequency range : 900 +/- 5 MHz  
Field strength : 10 V/m  
Modulation : 200Hz, Square Wave, 50% Duty Cycle  
Dwell Time : 30 second  
Polarity of Antenna : Horizontal and Vertical  
Test distance : 3 m

Test Personnel :

*Tom Quigg*

Test Result		Remarks
Criterion A	PASS	Model: PCA-6154

Note: Four sides of PC system are verified separately.

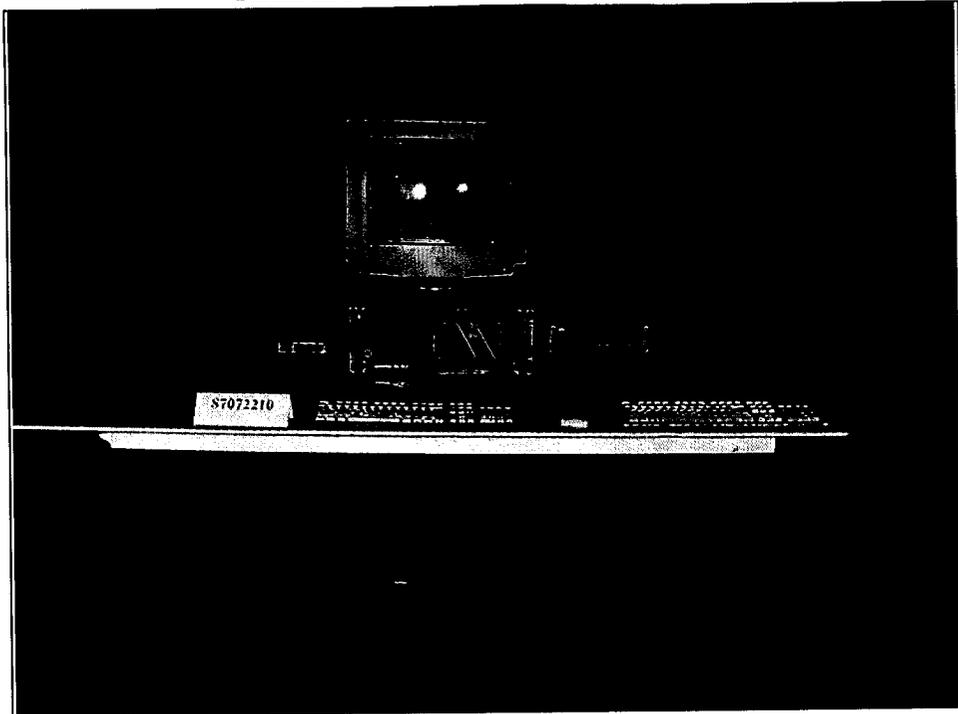
### OBSERVATION DESCRIPTION

There was no change compared with initial operation during the test.



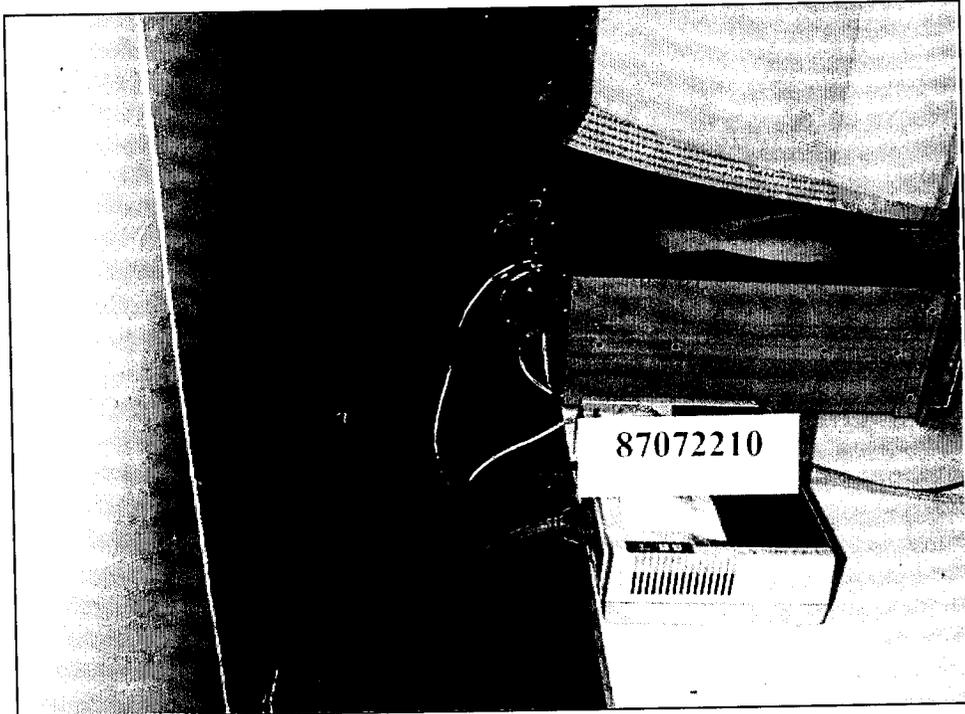
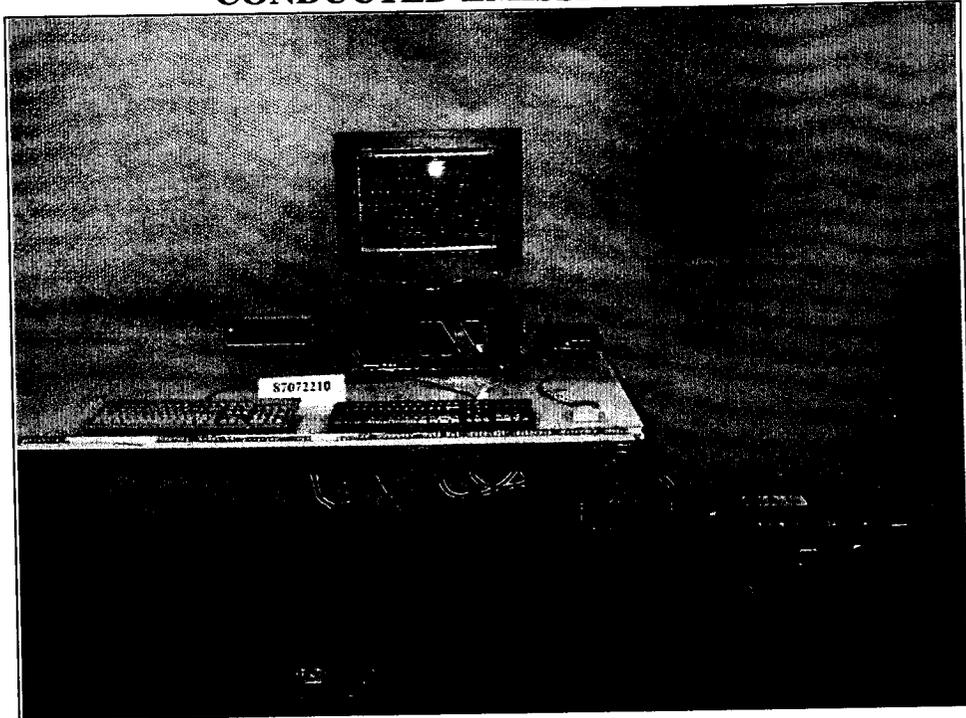
## 6. PHOTOGRAPHS OF THE TEST CONFIGURATION

### RADIATED EMISSION TEST



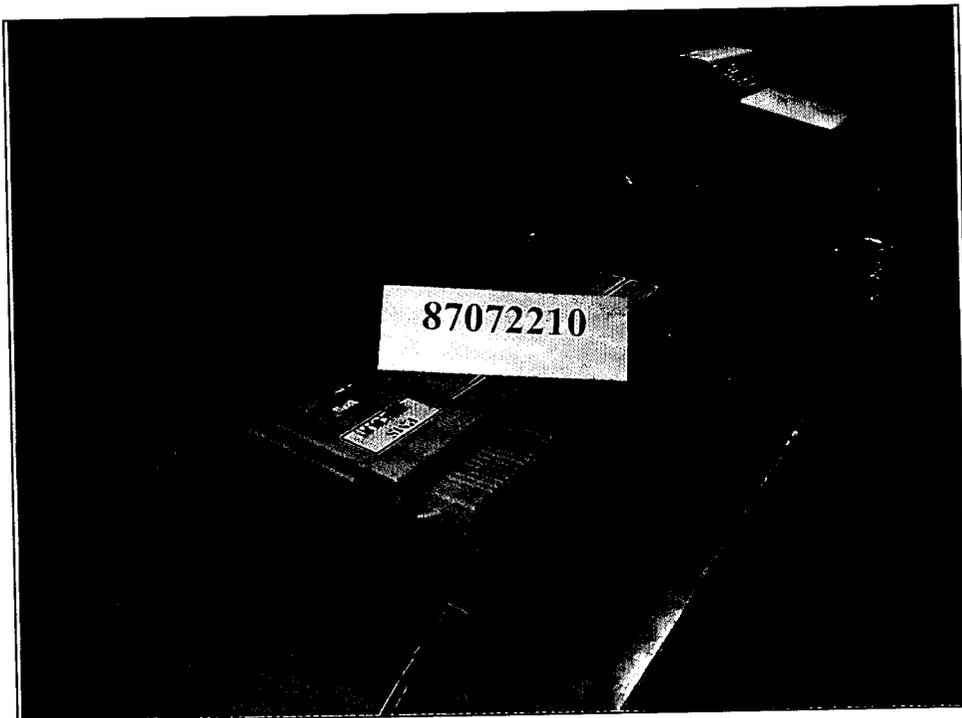
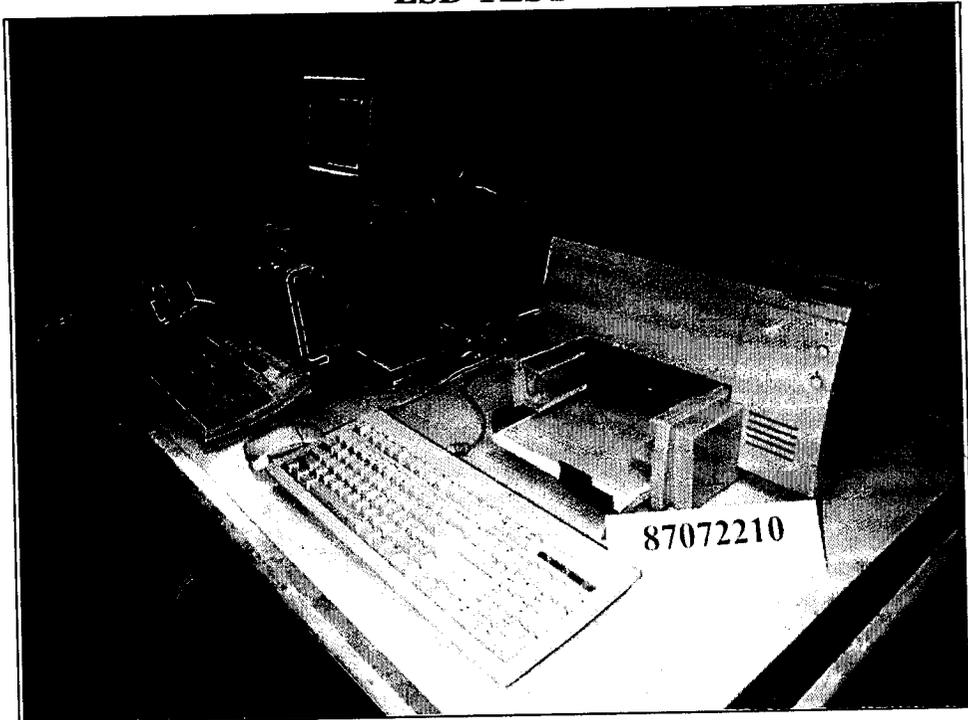


# CONDUCTED EMISSION TEST



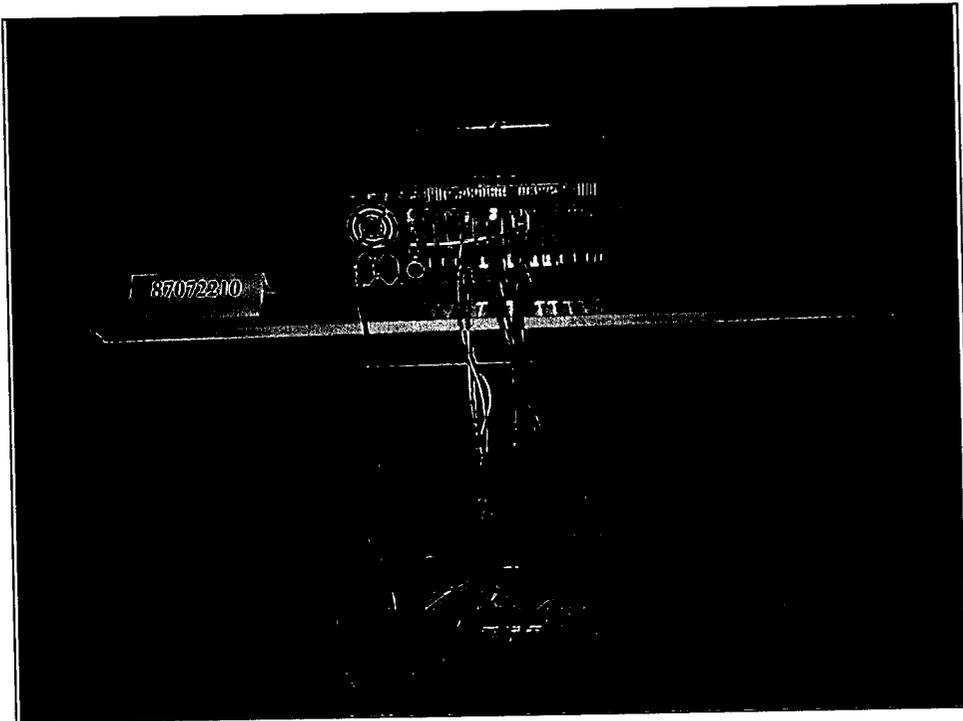
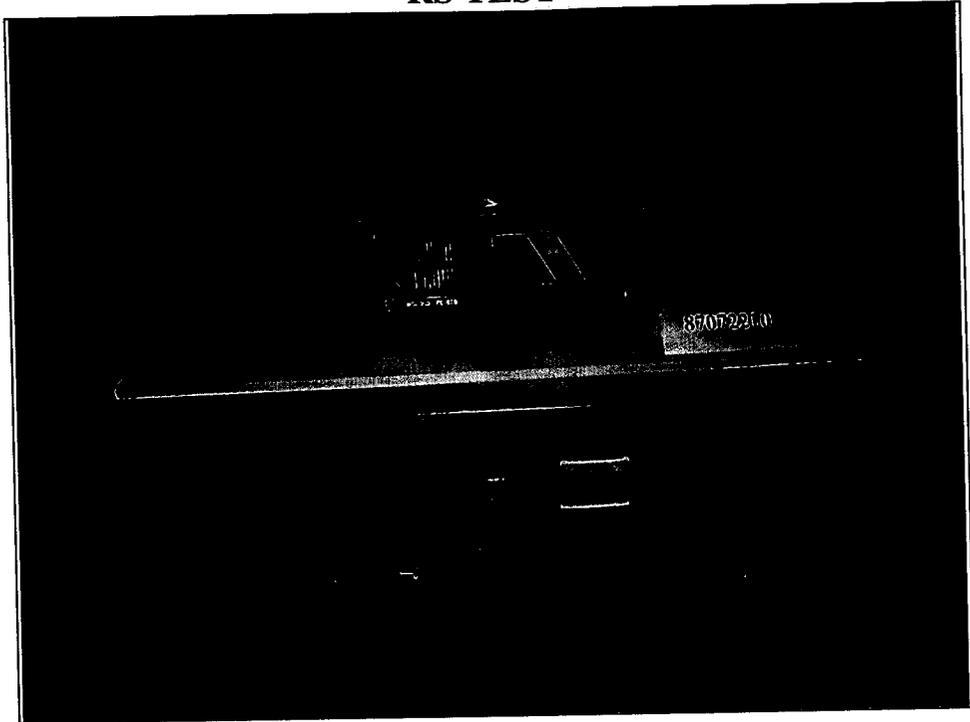


# ESD TEST



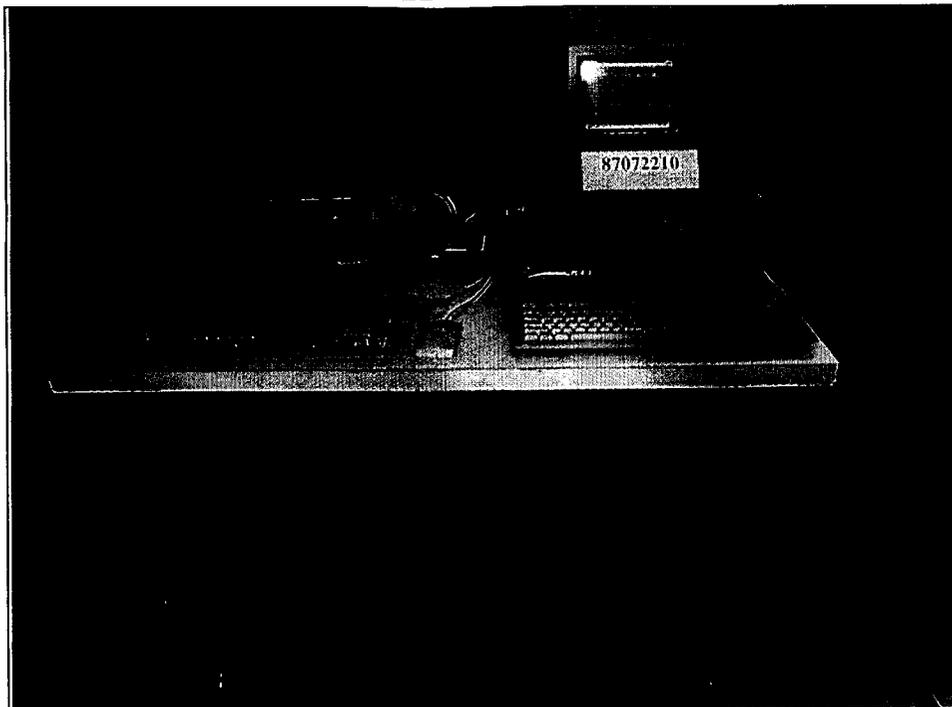


**RS TEST**

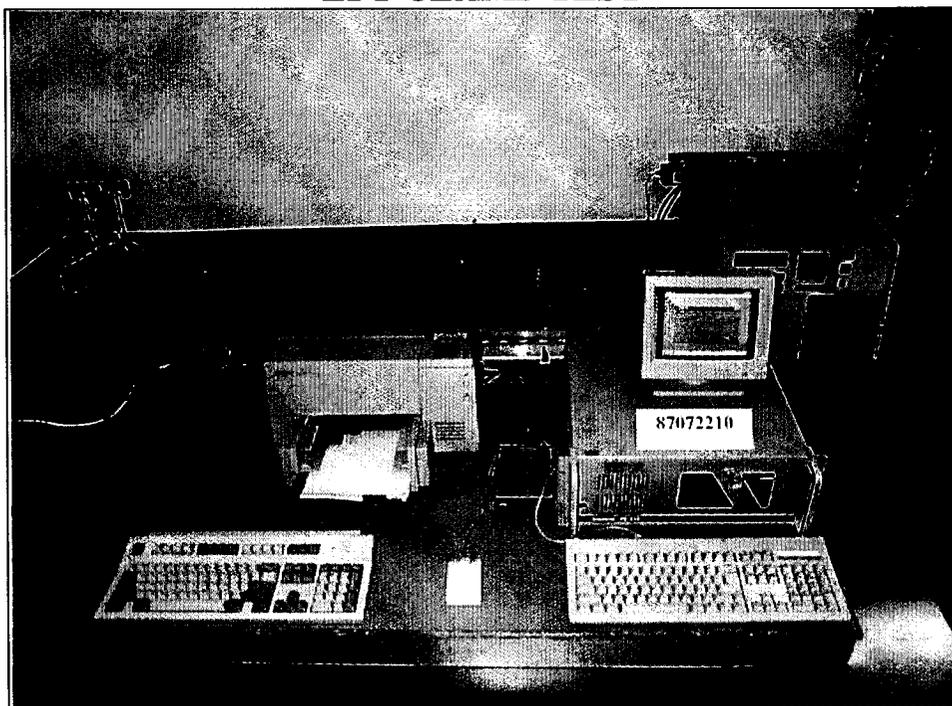




### EFT TEST

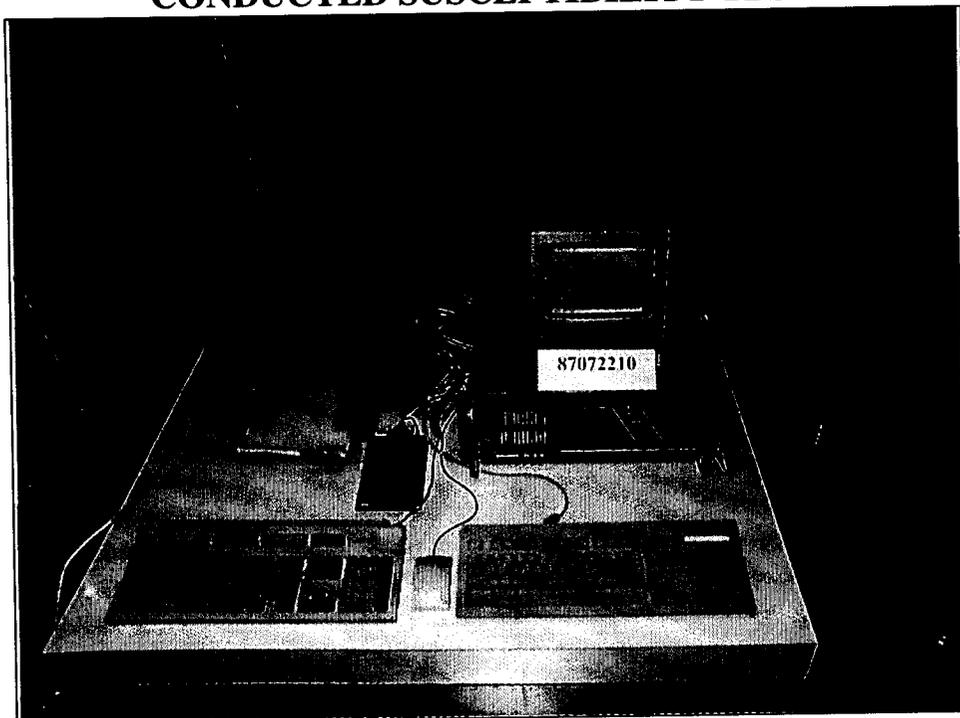


### EFT CLAMP TEST

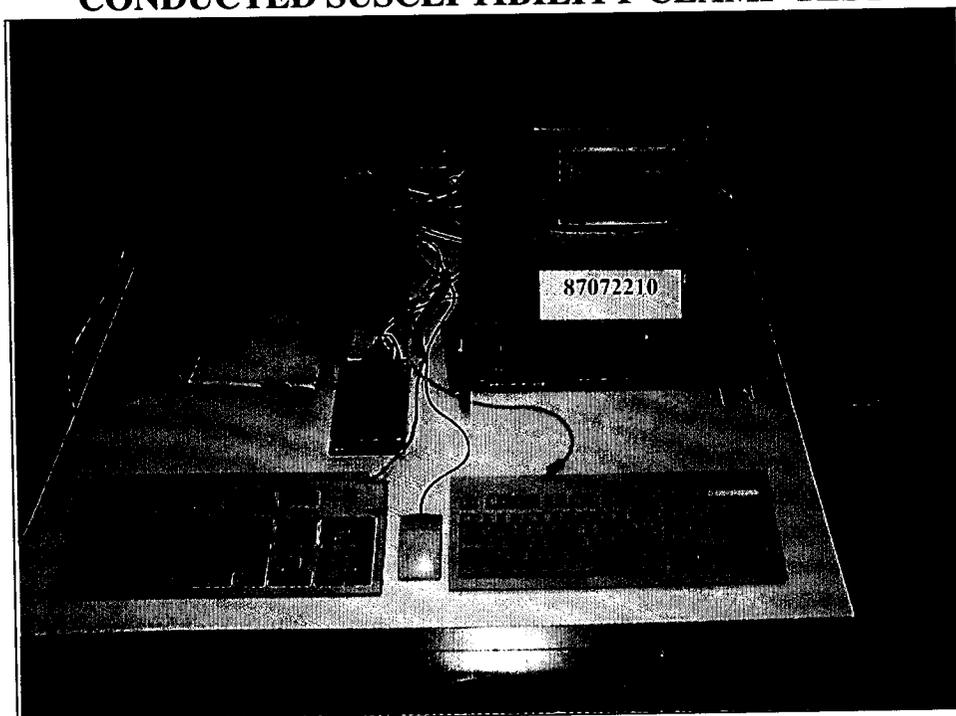




### CONDUCTED SUSCEPTIBILITY TEST



### CONDUCTED SUSCEPTIBILITY CLAMP TEST





## MAGNETIC TEST

