



EMC

TEST REPORT

REPORT NO. : ADT-EC960620
MODEL NO. : AMB-513T
DATE OF TEST : April 17 ~ April 18, 1996

MULTIPLE LISTING FOR: ASTECH TECHNOLOGY CO., LTD.
MODEL: PIA-6004, MBC-264

PREPARED FOR: ASTECH TECHNOLOGY CO., LTD.

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2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product	:	INDUSTRIAL PC, 4-SLOT PANEL PC WITH COLOR TFT LCD DISPLAY
Model No.	:	AMB-513T
Power Supply Type	:	Switching
Power Cord	:	Nonshielded
Data Cable	:	Shielded
Protection Class	:	Class I

Note: The EUT includes the following:

- * one PIA-6436 CPU board with DX4-100 CPU
- * one PIA-6004 Back plane
- * one MBC-263 Flat-panel display card module

The EUT would be put into the market with the following models:

- * AMB-513T
- * PIA-6004
- * MBC-264

All the above designation are the identical in all aspects except for their model no.

For more detailed features, please refer to manufacturer's specification.



2.2 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.

FOR EMISSION TEST

Product	Manufacturer	Model No.	Serial No.	I/O Cable
MONITOR	ACER	7134T	M5400233564	Shielded Signal Nonshielded Power
KEYBOARD	FORWARD	FDA-102D	20720	Shielded Signal
PRINTER	HP	2225C	3030S79116	Shielded Signal Nonshielded Power
MODEM	HAYES	231AA	A00531003166	Shielded signal Nonshielded Power
MODEM	DATATRONICS	1200CK	07-503066	Shielded signal Nonshielded Power
MOUSE	LOGITECH	M-S28-6MD	LTC44100490	Shielded Signal

FOR IMMUNITY TEST

Product	Manufacturer	Model No.	Serial No.	I/O Cable
MONITOR	ACER	7156i	N/A	Shielded Signal Nonshielded Power
KEYBOARD	ACER	6512-KW/WIN	N/A	Shielded Signal
PRINTER	PANASONIC	KX-P1080i	8EMAKM36046	N/A
MOUSE	HP	C1413A	N/A	Shielded Signal

2.3 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.	Date of Calibration
HP Spectrum Analyzer	8594A	3144A00308	Aug. 23, 1995
HP Preamplifier	8447D	2944A08119	Jan. 5, 1996
ROHDE & SCHWARZ TEST RECEIVER	ESVP	893496/030	Jan. 17, 1996
SCHWARZBECK Tunable Dipole Antenna	VHA 9103 UHA 9105	E101051 E101055	Dec. 22, 1995
CHASE Bi log Antenna	CBL6111A	1648	Dec. 25, 1995
EMCO Turn Table	1060-04	1195	N/A
EMCO Tower	1051	1263	N/A
Open Field Test Site	Site-2	ADT-R02	Sept. 17, 1995

CONDUCTED EMISSION MEASUREMENT

Description & Manufacturer	Model No.	Serial No.	Date of Calibration
ROHDE & SCHWARZ Test Receiver	ESHS30	828109/007	May 30, 1995
ROHDE & SCHWARZ Artificial Mains Network	ESH3-Z5	839135/006	May 30, 1995
EMCO L.I.S.N.	3825/2	9504-2359	July 3, 1995
Shielding Room	Site 3	ADT-C03	N/A

Note: 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.	Calibration Date
KeyTek, ESD Test System	2000	9105240/41	July 17, 1995
KeyTek, EFT Generator	CE-40	9508257	Aug. 25, 1995
KeyTek, Capacitive Clamp	CE-40-CCL	9508259	Aug. 25, 1995
KeyTek, Control Center	E103	9508347	Aug. 25, 1995
KeyTek, Surge Combination Wave	E501A	9508349	Aug. 25, 1995
KeyTek, Surge Coupler/Decoupler	E551	9508350	Aug. 25, 1995
KeyTek, Control Center	E103	9508354	Aug. 25, 1995
KeyTek, Power Arb Waveform Generator	EP72HF	9508346	Aug. 25, 1995
KIKUSUI AC Power Supply	PCR 4000L	9508355	Aug. 25, 1995
ROHDE & SCHWARZ Signal Generator	SMY01	840490/009	Aug. 18, 1995
KALMUS Power Amplifier	LA1000V	091995-1	Sept. 6, 1995
KALMUS Power Amplifier	757LC	091995-2	Sept. 15, 1995
HOLADAY Field Probe	HI-4422	89915	Aug. 24, 1995
EMCO BiconiLog Antenna	3143	1116	April 28, 1995
FCC Coupling Decoupling Network	FCC-801-M3-25	48	Sep. 11, 1995
FCC Coupling Decoupling Network	FCC-801-M2-25	20	Sep. 11, 1995
FCC Coupling Decoupling Network	FCC-801-M1-25	17	Sep. 11, 1995
COMTEST Compact Full Anechoic Chamber (7x3x3 m)	CFAC	ADT-S01	Nov. 29, 1995
HAEFELY Mains Interference Simulator	PLINE 1610	083690-17	Jan. 31, 1996
HAFEELY Magnetic Field Tester	MAG 100.1	083794-06	Jan. 31, 1996

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 55 011, Group I, Class A
Frequency Range	:	0.15 - 30 MHz (Conducted Emission) 30 - 1000 MHz (Radiated Emission)
Input Voltage	:	230 Vac, 50 Hz
Temperature	:	20 °C
Humidity	:	60 %
Atmospheric Pressure	:	1060 mbar

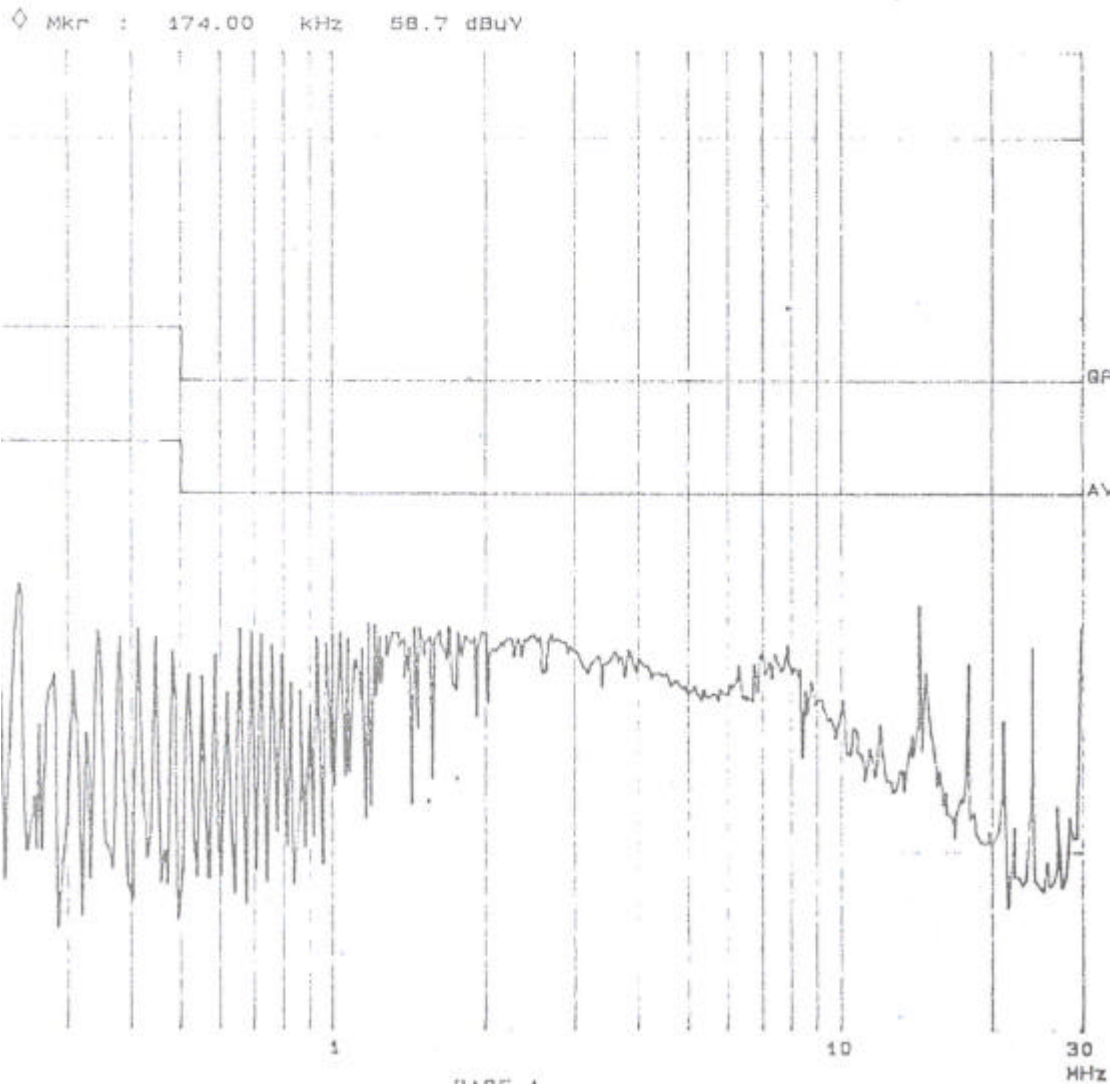
TEST RESULT	Remarks
PASS	The highest Conducted Emission: 0.173 MHz, 18.0 dB Margin The highest Radiated Emission: 215.99 MHz, 2.1 dB Margin

4.1.1 EUT OPERATION CONDITION

1. EUT reads a test program and runs it.
2. EUT sends "H" messages to monitor and monitor display "H" patterns on screen.
3. EUT sends "H" messages to each modem.
4. EUT sends "H" messages to printer, and the printer prints them on paper.
5. Repeat steps 2-5.

AMB-513T
THOMAS TUNG
LISN : L1
230V AC / 50Hz

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Tested by *Thomas Tung*





4.1.2 TEST DATA OF CONDUCTED EMISSION (A)

EUT: INDUSTRIAL PC, 4-SLOT PANEL PC WITH COLOR TFT LCD DISPLAY

MODEL: AMB-513T

6 dB Band Width: 10 KHz

TEST PERSONNEL: Thomas Zeng

METER READING (dBuV)

Frequency (MHz)	Line One (Live)		Line Two (Neutral)		Limits	
	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.173	58.60	-	61.00	-	79.00	66.00
0.240	49.00	-	50.30	-	79.00	66.00
14.321	46.80	-	46.50	-	73.00	60.00
18.001	40.60	-	37.40	-	73.00	60.00
21.001	34.30	-	35.20	-	73.00	60.00
24.002	42.00	-	42.90	-	73.00	60.00
30.000	43.10	-	42.80	-	73.00	60.00

- 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.

ADT CO.SITE-2
EN55011 Group 1 Class A

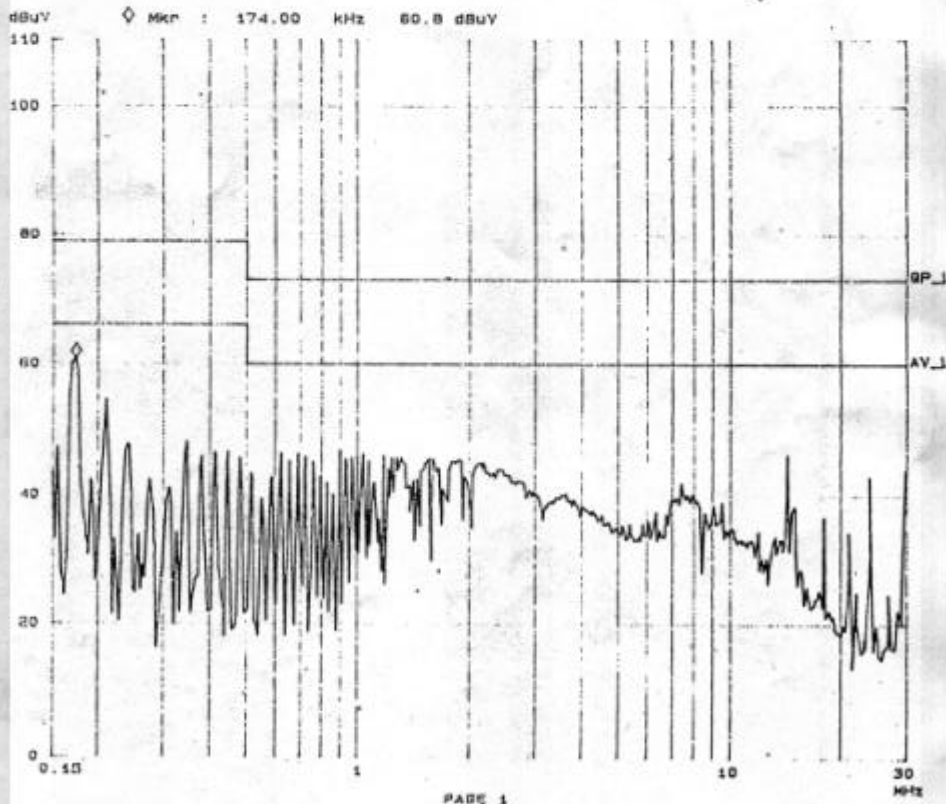
16. Apr 98 11:16

EUT: AMB-S13T
Operator: THOMAS TUNG
Test Spec: LISN : N
Comment: 230V AC / 50Hz

File No. ADT-EC940620

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Tested by *Thomas Tung*





4.1.2 TEST DATA OF RADIATED EMISSION (A1)

EUT: INDUSTRIAL PC. 4-SLOT PANEL PC WITH COLOR TFT LCD DISPLAY

MODEL: AMB-513T

ANTENNA: CHASE BILOG CBL6111

POLARITY: HORIZONTAL

DETECTOR FUNCTION: CISPR, Quasi-peak

6 dB BAND WIDTH: 120 KHz

FREQUENCY RANGE: 30-1000 MHz

MEASURED DISTANCE: 10 M

TEST PERSONNEL: Thomas Tung

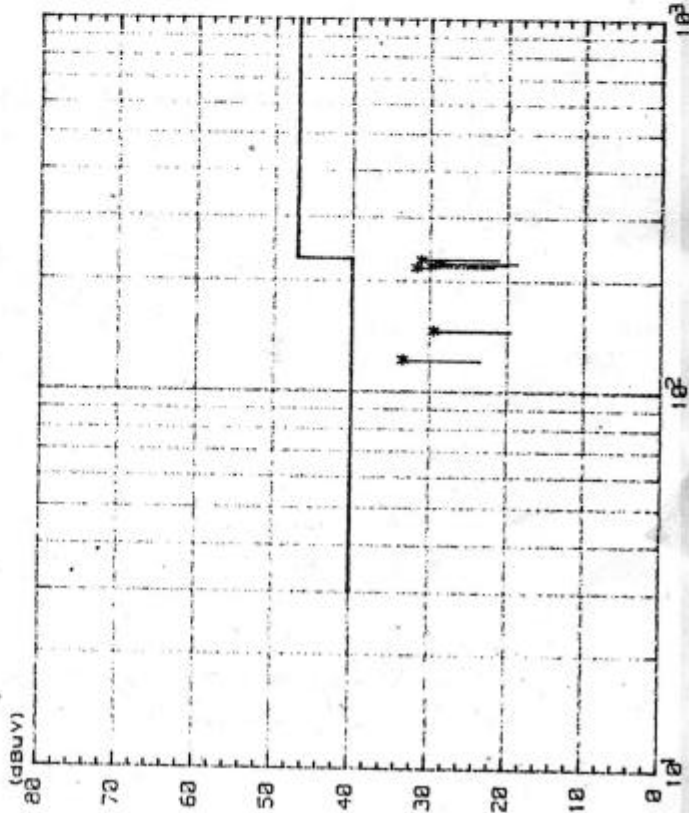
Frequency (MHz)	Correction Factor (dB)	Reading Data (dBuV/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dBuV/m)
119.99	14.4	19.0	33.4	40.0	-6.6
144.02	14.0	15.5	29.5	40.0	-10.5
215.99	13.4	18.3	31.7	40.0	-8.3
218.99	13.5	16.4	29.9	40.0	-10.1
222.01	13.9	14.9	28.8	40.0	-11.2
227.97	14.4	16.7	31.1	40.0	-8.9

- REMARKS :
1. Emission level (dBuV/m) = $20\log$ Emission level (uV/m).
 2. Emission level (dBuV/m) = Ant. Factor(dB)+Cable loss(dB)
+Meter Reading (dBuV/m).
 3. The other emission levels were very low against the limit.

ADT Co. Open Site Test Report

Model: AMB-513T Mode:
 Test Date: 16 APR 1996
 SMI Type: EN55022 Class A
 Detector: QUASI_Peak
 Distance: 10 Meters
 Frequency Range: 30-1000 MHz
 Antenna: Biconical & Log-periodic
 Polarization: HORIZONTAL
 Remark:

MFreq.*	MEmission*	MMargin*
(MHz)	(dBuV/m)	(dBuV/m)
119.99	33.44	-6.56
144.02	29.53	-18.47
215.99	31.73	-8.27
218.99	29.94	-18.86
222.81	28.75	-11.25
227.97	31.13	-8.87



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TEST DATA OF RADIATED EMISSION (A2)

EUT: INDUSTRIAL PC, 4-SLOT PANEL PC WITH COLOR TFT LCD DISPLAY

MODEL: AMB-513T

ANTENNA: CHASE BILOG CBL6111

POLARITY: VERTICAL

DETECTOR FUNCTION: CISPR, Quasi-peak

6 dB BAND WIDTH: 120 KHz

FREQUENCY RANGE: 30-1000 MHz

MEASURED DISTANCE: 10 M

TEST PERSONNEL: Thomas Tung

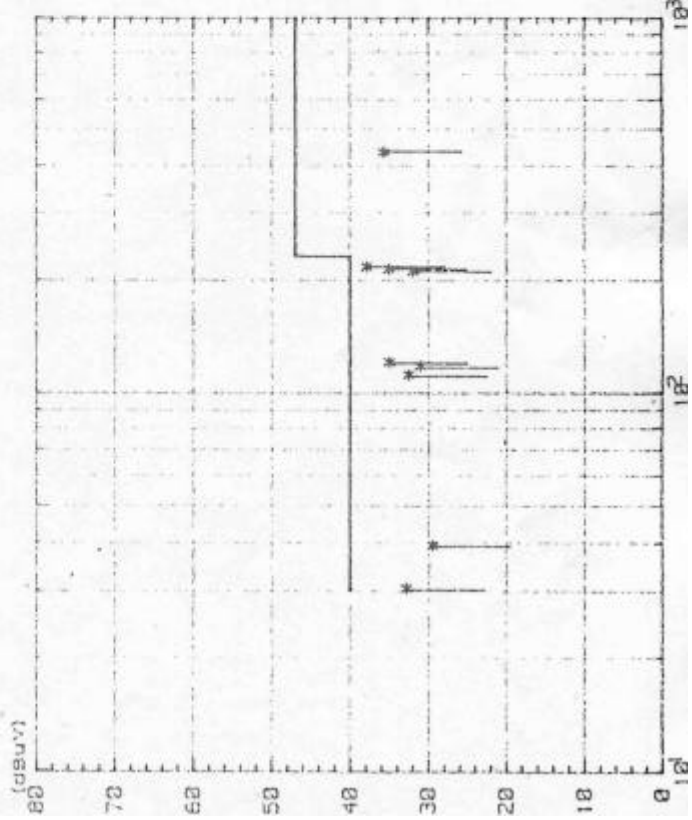
Frequency (MHz)	Correction Factor (dB)	Reading Data (dBuV/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dBuV/m)
30.01	18.2	14.7	32.9	40.0	-7.1
39.00	14.7	14.8	29.5	40.0	-10.5
111.10	12.7	19.8	32.5	40.0	-7.5
117.06	13.9	17.2	31.1	40.0	-8.9
120.00	14.2	20.8	35.0	40.0	-5.0
210.00	13.5	18.5	32.0	40.0	-8.0
213.00	13.6	21.5	35.1	40.0	-4.9
215.99	13.9	24.0	37.9	40.0	-2.1
433.98	21.8	14.0	35.8	47.0	-11.2

- REMARKS :
1. Emission level (dBuV/m) = $20\log$ Emission level (uV/m).
 2. Emission level (dBuV/m) = Ant. Factor(dB)+Cable loss(dB)
+Meter Reading (dBuV/m).
 3. The other emission levels were very low against the limit.

ADT Co. Open Site Test Report

Model: AMB-513T Mode:
 Test Date: 16 APR 1996
 EMI Type: EN55022 Class A
 Detector: QUASI_Peak
 Distance: 10 Meters
 Frequency Range: 30-1000 MHz
 Antenna: Biconical & Log-periodic
 Polarization: VERTICAL
 Remark:

#Freq.#	#Emission#	#Margin#
(MHz)	(dBuV/m)	(dBuV/m)
38.81	32.85	-7.15
39.80	29.52	-10.48
111.18	32.54	-7.46
117.06	31.07	-8.93
120.00	35.03	-4.97
218.00	32.03	-7.97
213.00	35.10	-4.90
215.99	37.89	-2.11
433.98	35.76	-11.24



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4.2 Disturbance in Supply System

Product Family Standard: EN 60 555-2 (Harmonic Current)
EN 61000-3-3 (Voltage Flunctuation)

Input Voltage : 230VAC, 50Hz
Temperature : 20 °C
Humidity : 55 %
Atmospheric Pressure : 1060 mbar

TEST RESULT	Remarks
PASS	—

4.2.1 EUT OPERATION CONDITION

The EUT run a test program to access FDD/HDD/MODEM/PRINTER sequentially and show the result on monitor screen. If an error occurs, the system would halt down automatically.

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



4.2.2 MEASUREMENT DATA OF HARMONICS TEST

EUT: INDUSTRIAL PC, 4-SLOT PANEL PC WITH COLOR TFT LCD DISPLAY

MODEL: AMB-513T

Input Voltage : 230.348 Vrms

Input Amperes : 0.281 Arms

Power Factor : 0.467

Power Frequency: 50 Hz

Test Personnel :

Sandy Lim

Harm. Order	Measured Values (A)	Max. Permissible Harm. Current (A)
1	-	-
3	0.13	2.30
5	0.12	1.14
7	0.11	0.77
9	0.10	0.40
11	0.08	0.33
13	0.06	0.21
15	0.04	0.15
17	0.03	0.13
19	0.02	0.12
21	0.01	0.11
23	0.01	0.10
25	0.01	0.09
27	0.01	0.08
29	0.01	0.08
31	0.01	0.07
33	0.01	0.07
35	0.01	0.06
37	0.00	0.06
39	0.00	0.06

Harm. Order	Measured Values (A)	Max. Permissible Harm. Current (A)
2	0.00	1.08
4	0.00	0.43
6	0.00	0.30
8	0.00	0.23
10	0.00	0.18
12	0.00	0.15
14	0.00	0.13
16	0.00	0.11
18	0.00	0.10
20	0.00	0.09
22	0.00	0.08
24	0.00	0.08
26	0.00	0.07
28	0.00	0.07
30	0.00	0.06
32	0.00	0.06
34	0.00	0.05
36	0.00	0.05
38	0.00	0.05
40	0.00	0.05

Note: Steady state values on AC mains are recorded in the table.



5.2.3 MEASUREMENT DATA OF VOLTAGE FLUCTUATION TEST

EUT: INDUSTRIAL PC, 4-SLOT PANEL PC WITH COLOR TFT LCD DISPLAY

MODEL: AMB-513T

Input Voltage : 230.00 Vrms

Input Amperes : 0.281 Arms

Power Factor : 0.467

Power Frequency: 50 Hz

Observation period (Tp): 2 hour

Test Personnel: Sandy Lim

Test Parameter	Measurement Value	Limitation	Remark
Pst	0.103	1.0	pass
Plt	0.100	0.65	pass
dc (%)	0.109	4%	pass
Tdt (ms)	0	200	pass
dmax (%)	0	4%	pass
dt (%)	0	3%	pass

- Note:** (1) Plt means long-term flicker indicator
(2) Pst means short-term flicker indicator
(3) dc means relative steady-state voltage change
(4) dmax means maximum relative voltage change
(5) d(t) means relative voltage change characteristic
(6) Tdt means maximum time that dt exceeds 3 %



5. TEST RESULTS (IMMUNITY)

5.1 GENERAL DESCRIPTION

Basic Standard	:	EN61000-4-2	(Electrostatic Discharge Test, ESD)
		ENV50140	(Radiated Radio-Frequency Disturbance Test, RS)
		EN61000-4-4	(Electrical Fast Transient/Burst Test, EFT)
		ENV50141	(Conducted Radio Frequency Disturbances Test, CS)
		EN61000-4-8	(Power Frequency Magnetic Field Test)
		EN61000-4-11	(Voltage Dip, Short Interruptions and Voltage Variations Test)
		ENV50204	(Radio-Frequency Electromagnetic Field, Pulse modulated)
Generic Standard	:	EN 50 082-2	
Input Voltage	:	230 Vac, 50 Hz	
Temperature	:	20 °C	
Humidity	:	55 %	
Atmospheric Pressure	:	1060 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

The EUT run a test program to access FDD/HDD/MODEM/PRINTER sequentially and show the result on monitor screen. If an error occurs, the system would halt down automatically.



5.4 TEST RESULT OF ELECTROSTATIC DISCHARGE (ESD)

Basic Standard : EN61000-4-2
 Generic Standard : EN 50 082-2
 Discharge Impedance : 330 ohm / 150 pF
 Discharge Voltage : Air Discharge - 8 KV (Direct/Indirect)
 (Direct/Indirect) : Contact Discharge - 4 KV
 Polarity : Positive/Negative
 Number of Discharge : Minimum 10 times at all test point
 Discharge Mode : Single Discharge
 Discharge Period : 1 second minimum

Test Personnel : Sandy Lim

Test Result		Remarks
Criterion A	PASS	Model: AMB-513T

OBSERVATION DESCRIPTION

Direct Application			Test Result	
Discharge Level (KV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge
4	+	1~4	Note 1	N/A
8	+	1~4	N/A	Note 1

Description of test point:

- | | |
|--|--|
| 1. Ground Reference Plane | 2. Metal Enclosure |
| 3. Surrounding of all Input/Output ports | 4. Clearance between LCD panel and enclosure |

Indirect Application			Test Result	
Discharge Level (KV)	Polarity (+/-)	Test Point	Horizontal Coupling	Vertical Coupling
4	+/-	1 ~ 4	Note 1	Note 1

Description of test point:

- | | |
|---------------|---------------|
| 1. Front side | 2. Right side |
| 3. Left side | 4. Rear side |

Description of test result:

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



5.5 TEST RESULT OF RADIATED RADIO FREQUENCY DISTURBANCES (RS)

Basic Standard : ENV50140
Generic Standard : EN 50 082-2
Frequency range : 80 MHz - 1000 MHz
Field strength : 10 V/m
Modulation : 1KHz Sine Wave, 80%, AM Modulation
Frequency step : 1 % of fundamental
Dewell Time : 1 second
Polarity of Antenna : Horizontal and Vertical
Test distance : 3 m

Test Personnel :

Sandy Lim

Test Result		Remarks
Criterion A	PASS	Model: AMB-513T

Note: Four sides of EUT are verified separately.

OBSERVATION DESCRIPTION

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



5.6 TEST RESULT OF ELECTRICAL FAST TRANSIENT/BURST (EFT/BURST)

Basic Standard : EN61000-4-4
Generic Standard : EN 50 082-2
Test Voltage : Power Line - 2 KV (Direct Coupled)
Signal/Control Line - N/A (Length of all cable less than 3 M)
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 : Sandy Lim

Test Result		Remarks
Criterion A	PASS	Model: AMB-513T

OBSERVATION DESCRIPTION

Test Point	Polarity	Test Level (KV)	Result
L1	+/-	2	Note 1
L2	+/-	2	Note 1
GND	+/-	2	Note 1

Description of test result:

Note1: There is no change compared with initial operation during the test.



6.7 TEST RESULT OF CONDUCTED RADIO FREQUENCY DISTURBANCES (CS)

Basic Standard : ENV50141
Generic Standard : EN 50 082-2
Frequency range : 0.15 MHz - 80 MHz
Field strength : 10 V/m
Modulation : 1KHz Sine Wave, 80%, AM Modulation
Frequency step : 1 % of fundamental
Dewell Time : 1 second
Coupled cable : Power Mains, Unshielded
Coupling device : CDN-M3 (3 wires)
Test Personnel : Sandy Lim

Test Result		Remarks
Criterion A	PASS	Model: AMB-513T

OBSERVATION DESCRIPTION

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



6.8 TEST RESULT OF POWER FREQUENCY MAGNETIC FIELD

Basic Standard : EN61000-4-8
Generic Standard : EN 50 082-2
Frequency range : 50Hz
Field strength : 30 A/m
Observation Time : 1 minute
Inductance coil : Rectangular type, 1mx1m
Test Personnel : *Sandy Sun*

Test Result		Remarks
Criterion A	PASS	Model: AMB-513T

OBSERVATION DESCRIPTION

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



6.9 TEST RESULT OF VOLTAGE DIPS / SHORT INTERRUPTION / VARIATIONS

Basic Standard : EN61000-4-11
Generic Standard : EN 50 082-2
Test duration time : Minimum three test events in sequence
Interval between event : Minimum ten seconds
Phase Angle : Zero crossing
Test Personnel : Sandy Lim

Test Result		Remarks
Criterion A	PASS	Voltage Dip
Criterion C	PASS	Interruption

OBSERVATION DESCRIPTION

Voltage Dip / Interruption			
Voltage (% Ut)	Event duration (ms)	Description	Remark
70	10	No change compared with initial operation condition	3 cycle
40	100	No change compared with initial operation condition	3 cycle
0	5000	The system reseted itself when interruption occurred	3 cycle

Note: A test voltage level from 0% to 20% of rated voltage may considered as total interruption.

The EUT was tested for each selected test level and duration with a sequence of three cycles with intervals of 10 seconds minimum (between each test event).



6.10 TEST RESULT OF RADIO-FREQUENCY ELECTROMAGNETIC FIELD, PULSE MODULATED

Basic Standard : ENV50204
Generic Standard : EN 50 082-2
Frequency range : 900 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 : Sandy Lim

Test Result		Remarks
Criterion A	PASS	Model: AMB-513T

Note: Four sides of EUT are verified separately.

OBSERVATION DESCRIPTION

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



6. PHOTOGRAPHS OF THE TEST CONFIGURATION

RADIATED EMISSION TEST





CONDUCTED EMISSION TEST





HARMONICS EMISSION TEST

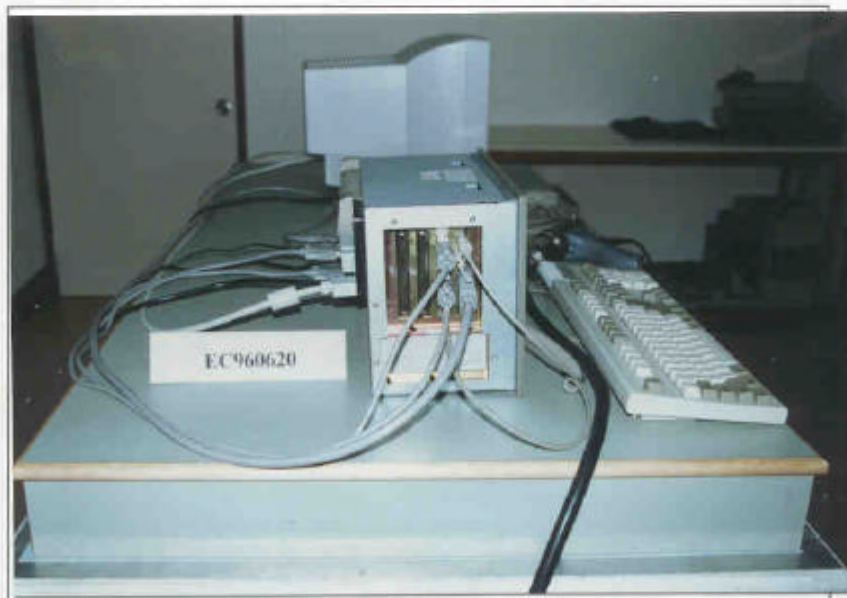


VOLTAGE FLUCTUATION AND FLICKER TEST





ESD TEST





RS TEST (AM MODULATION AND PULSE MODULATION)





EFT TEST





CONDUCTED SUSCEPTIBILITY TEST

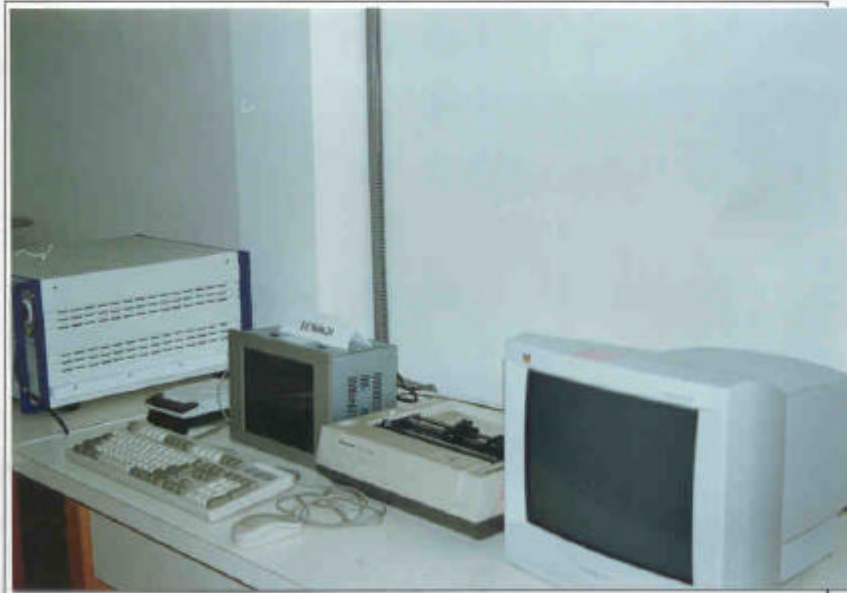




MAGNETIC TEST



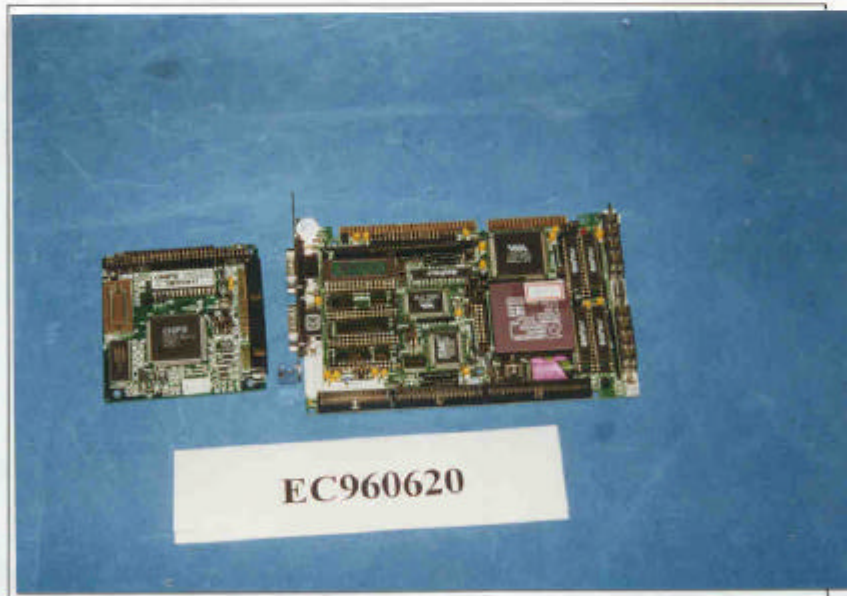
VOLTAGE DIP TEST





6. CONSTRUCTIVE PHOTOS OF EUT







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