



CE EMC TEST REPORT

REPORT NO.: CE910715A01

MODEL NO.: AL512, AL513

RECEIVED: July 15, 2002

TESTED: July 17 ~ 18, 2002

APPLICANT: Acer Incorporated

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Taiwan, R.O.C.

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1 CERTIFICATION

PRODUCT: 15" LCD Monitor
BRAND NAME: acer
MODEL NO: AL512, AL513
TEST ITEM: ENGINEERING SAMPLE
APPLICANT: Acer Incorporated
STANDARDS: **EN 55022:1998, Class B** **EN 55024:1998**
 EN 61000-3-2:1995+A1:1998 IEC 61000-4-2:1995
 +A2:1998, Class A IEC 61000-4-3:1995
 EN 61000-3-3:1995 IEC 61000-4-4:1995
 IEC 61000-4-5:1995
 IEC 61000-4-6:1996
 IEC 61000-4-8:1993
 IEC 61000-4-11:1994

We, **Advance Data Technology Corporation**, hereby certify that one sample (model: AL512) of the designation has been tested in our facility from July 17 ~ 18, 2002. The test record, data evaluation and Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions herein specified.

CHECKED BY: Kathy Tseng , **DATE:** July 22, 2002
(Kathy Tseng)

APPROVED BY: Fred Chen , **DATE:** July 22, 2002
(Fred Chen, Manager)

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

EMISSION			
Standard	Test Type	Result	Remarks
EN 55022:1998, Class B	Conducted Test	PASS	Meets Class B Limit Minimum passing margin is -9.02 dB at 0.198 MHz
	Radiated Test	PASS	Meets Class B Limit Minimum passing margin is -2.70 dB at 859.15 MHz
EN61000-3-2:1995 +A1:1998+A2:1998, Class A	Harmonic current emissions	PASS	Meets Class A Limit
EN61000-3-3:1995	Voltage fluctuations & flicker	PASS	Meets the requirements.

IMMUNITY (EN 55024:1998)			
Standard	Test Type	Result	Remarks
IEC 61000-4-2: 1995	Electrostatic discharge immunity test	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-3: 1995	Radiated, radio- frequency, electromagnetic field immunity test	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-4: 1995	Electrical fast transient / burst immunity test.	PASS	Meets the requirements of Performance Criterion B
IEC 61000-4-5: 1995	Surge immunity test	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-6: 1996	Immunity to conducted disturbances, induced by radio- frequency fields	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-8: 1993	Power frequency magnetic field immunity test.	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-11: 1994	Voltage dips, short interruptions and voltage variations immunity tests	PASS	Meets the requirements of Voltage Dips: 1. >95% reduction - Performance Criterion A 2. 30% reduction - Performance Criterion A Voltage Interruptions: 1. >95% reduction - Performance Criterion B

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	15" LCD MONITOR
MODEL NO.	AL512, AL513
POWER SUPPLY	Switching 100-240V, 50/60Hz Power Cord Non-shielded, AC 3-pin (1.8m)
DATA CABLE	Nonshielded (1.5m) with one ferrite core

NOTE: The EUT is a 15" LCD MONITOR with the panel, brand:CPT model: CLAA150XG. Its resolution is up to 1024 x 768.

The EUT has two model names, which are identical to each other in all aspects except for their outer appearance and with speaker or not as follows:

MODEL	DIFFERENCE
AL512	With speaker
AL513	Without speaker

During the pre-test, the worst emission levels was found using the model: AL512 and therefore only its test data was recorded in this report.

For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

3.2 DESCRIPTION OF TEST MODES

The EUT was pre-tested under the following resolution and horizontal synchronization speed mode:

- ◆ 1024 x 768 (60kHz)
- ◆ 800 x 600 (46.9kHz)
- ◆ 640 x 480 (31.5kHz)

The worst emission level was found when the EUT was tested under 1024 x 768 (60kHz) resolution, therefore the test data of this mode was recorded in the report.

The test mode with worst EMI was chosen for all immunity test items and current harmonic and flicker tests

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a kind of ITE equipment and, according to the specifications of the manufacturers, must comply with the requirements of the following standards:

EN 55022:1998, Class B

EN 61000-3-2:1995+

A1:1998+A2:1998, Class A

EN 61000-3-3:1995

EN 55024:1998

IEC 61000-4-2:1995

IEC 61000-4-3:1995

IEC 61000-4-4:1995

IEC 61000-4-5:1995

IEC 61000-4-6:1996

IEC 61000-4-8:1993

IEC 61000-4-11:1994

All tests have been performed and recorded as per the above standards.

3.4 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 were used to form a representative test configuration during the tests.

3.4.1 FOR EMISSION TEST

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	PERSONAL COMPUTER	HP	Brio BA410	SG12106013	FCC DoC Approved
2	PRINTER	EPSON	LQ-300+	DCGY017070	FCC DoC Approved
3	MODEM	ACEEX	1414	980020517	IFAXDM1414
4	PS/2 KEYBOARD	BTC	5121W	A00800776	E5XKB5121WTH0110
5	PS/2 MOUSE	LOGITECH	M-S61	HCA12014420	JNZ211403
6	VGA DISPLAY CARD	ELSA	ERAZOR III LT	0111011968	FCC DoC Approved
7	SOUND CARD	TOP SOLUTION	SOHO 4CH	019T98000904	LWHA521-T9

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	1.2m braid shielded wire, terminated with DB25 and Centronics connector via metallic frame, w/o core
3	1.2 m braid shielded wire, terminated with DB25 and DB9 connector via metallic frame, w/o core.
4	1.6 m foil shielded wire, terminated with PS/2 connector via metallic frame, w/o core.
5	1.8 m Non shielded wire, terminated with PS/2 connector via drain wire, w/o core.
6	NA
7	NA

NOTE: All power cords of the above support units are non shielded (1.8m).



3.4.2 FOR HARMONICS / FLICKER / IMMUNITY TEST

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	PERSONAL COMPUTER	COMPAQ	EXM/P733/15C /9/64V TAI	7045FR4Z0009	FCC DoC Approved
2	PRINTER	HP	2225C	2931S53817	DSI6XU2225
3	MODEM	GVC	F-1114V/R6	853E100	DK4F1114VR6
4	PS/2 KEYBOARD	HP	6511-PK	99P468101CY1W 05S000533	FCC DoC Approved
5	USB MOUSE	Geniusnet	828 U+P	66820011004502	FCC DoC Approved
6	VGA DISPLAY CARD	ATI	RADEON VE	1612102520	FCC DoC Approve

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	1.2m braid shielded wire, terminated with DB25 and Centronics connector via metallic frame, w/o core.
3	1.2 m braid shielded wire, terminated with DB25 and DB9 connector via metallic frame, w/o core.
4	1.8 m foil shielded wire, terminated with PS/2 connector via metallic frame, w/o core
5	1.5 m foil shielded wire, terminated with USB connector via drain wire, w/o core.
6	NA

NOTE: All power cords of the above support units are non shielded (1.8m).

4 EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

- NOTE:**
- (1) The lower limit shall apply at the transition frequencies.
 - (2) The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
 - (3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
ROHDE & SCHWARZ Test Receiver	ESHS 30	838765/002	July 21, 2002
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ESH3-Z5	835239/001	May 09, 2003
ROHDE & SCHWARZ 4-wire ISN	ENY41	935154/007	May 10, 2003
ROHDE & SCHWARZ 2-wire ISN	ENY22	833823/026	May 10, 2003
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	835239/002	May 09, 2003
Software	Cond-V2M1	NA	NA
RF cable (JYEBAO)	5D-FB	Cable-C09.01	June 10, 2003
JYEBAO Terminator (For ROHDE & SCHWARZ LISN)	BNC 3950-0000	E1-01-379	June 11, 2003

- NOTE:**
1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS 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. “*”: These equipment are used for conducted telecom port test only (if tested).
 4. The test was performed in ADT Shielded Room No. 9.
 5. The VCCI Site Registration No. is C-1312.

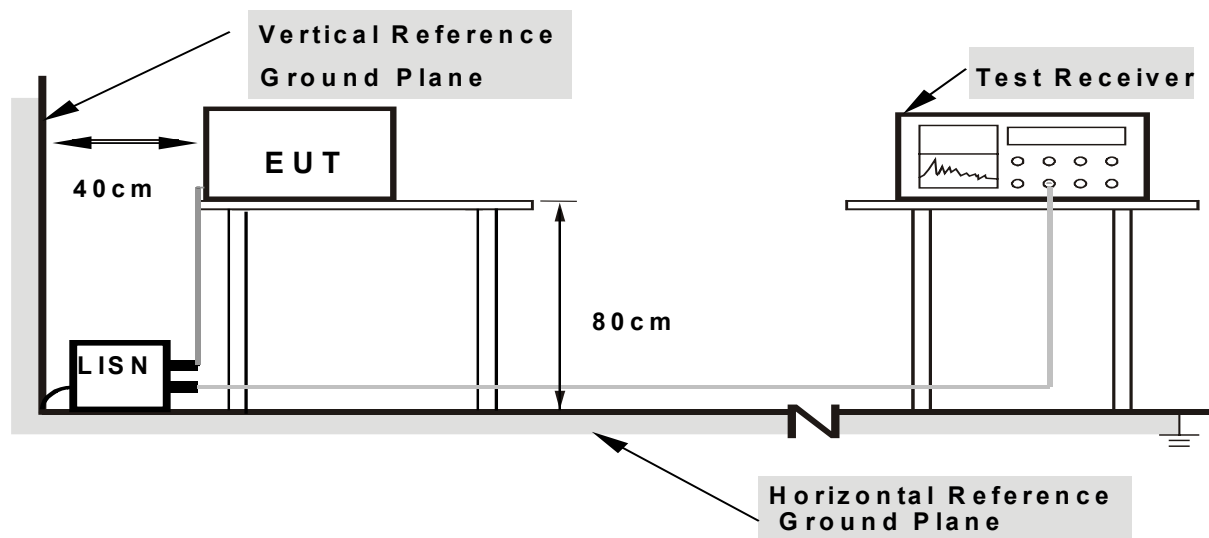
4.1.3 TEST PROCEDURE

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels over 10dB under the prescribed limits could not be reported.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



- Note:**
1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.1.6 EUT OPERATING CONDITIONS

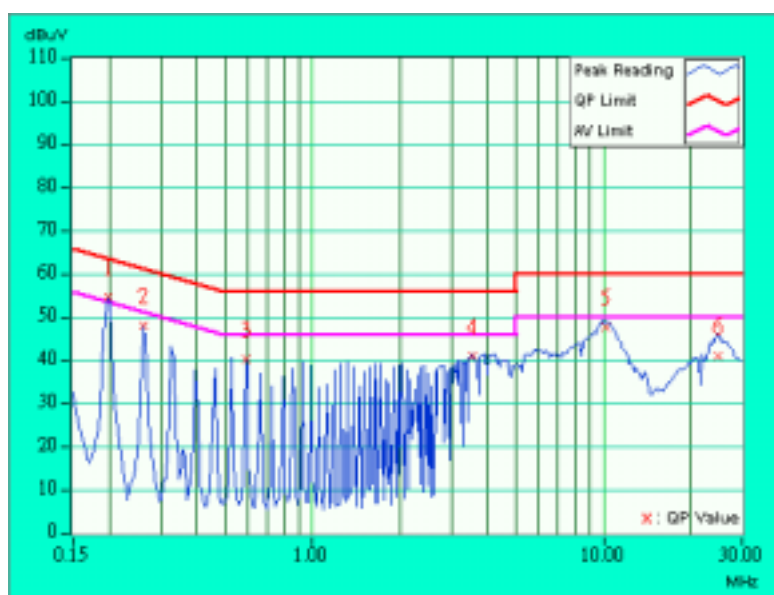
- a. Turned on the power of all equipment.
- b. PC ran a test program to enable all functions.
- c. PC read and wrote messages from FDD and HDD.
- d. PC sent "H" messages to 15" LCD MONITOR (EUT) and 15" LCD MONITOR displayed "H" patterns on screen.
- e. PC sent "H" messages to modem.
- f. PC sent "H" messages to printer, and the printer printed them on paper.
- g. PC sent audio message to EUT's internal speaker.
- h. Steps c-h were repeated.

4.1.7 TEST RESULTS

EUT	15" LCD MONITOR	MODEL	AL512
MODE	1024x768 (60 kHz)	6dB BANDWIDTH	9 kHz
INPUT POWER	230Vac, 50 Hz	PHASE	Line (L)
ENVIRONMENTAL CONDITIONS	28 deg. C, 50 % RH, 1005 hPa	TESTED BY: ARTHUR LIN	

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.198	0.10	53.89	41.89	53.99	41.99	63.69	53.69	-9.70	-11.70
2	0.264	0.10	46.97	-	47.07	-	61.30	51.30	-14.23	-
3	0.592	0.13	39.56	-	39.69	-	56.00	46.00	-16.31	-
4	3.553	0.28	40.27	-	40.55	-	56.00	46.00	-15.45	-
5	10.138	0.61	46.68	-	47.29	-	60.00	50.00	-12.71	-
6	24.748	0.99	40.26	-	41.25	-	60.00	50.00	-18.75	-

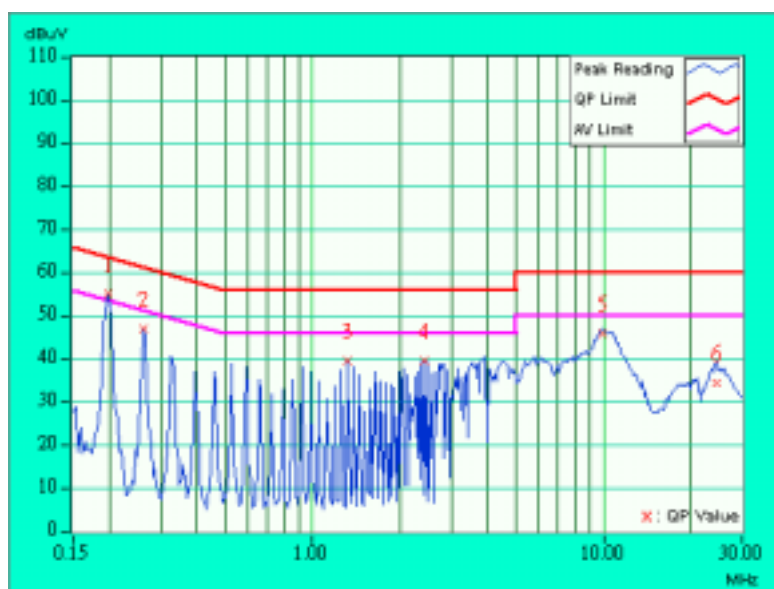
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.



EUT	15" LCD MONITOR	MODEL	AL512
MODE	1024x768 (60 kHz)	6dB BANDWIDTH	9 kHz
INPUT POWER	230Vac, 50 Hz	PHASE	Neutral (N)
ENVIRONMENTAL CONDITIONS	28 deg. C, 50 % RH, 1005 hPa	TESTED BY: ARTHUR LIN	

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.198	0.10	54.57	44.15	54.67	44.25	63.69	53.69	-9.02	-9.44
2	0.264	0.10	46.11	-	46.21	-	61.30	51.30	-15.09	-
3	1.316	0.23	38.88	-	39.11	-	56.00	46.00	-16.89	-
4	2.434	0.30	38.72	-	39.02	-	56.00	46.00	-16.98	-
5	9.873	0.50	44.95	-	45.45	-	60.00	50.00	-14.55	-
6	24.613	0.79	33.65	-	34.44	-	60.00	50.00	-25.56	-

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.





4.2 RADIATED EMISSION MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

FREQUENCY (MHz)	Class A (at 10m)	Class B (at 10m)
	dBuV/m	dBuV/m
30 – 230	40	30
230 - 1000	47	37

- NOTE:**
- (1) The lower limit shall apply at the transition frequencies.
 - (2) Emission level (dBuV/m) = 20 log Emission level (uV/m).
 - (3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
HP Spectrum Analyzer	8591E	3230A00704	Nov. 10, 2002
CHASE Preamplifier	CPA9231A	3230	Nov. 15, 2002
* HP Preamplifier	8449B	3008A01201	Dec. 06, 2002
* HP Preamplifier	8449B	3008A01292	Aug. 21, 2002
* ROHDE & SCHWARZ TEST RECEIVER	ESI7	836697/012	Nov. 23, 2002
SCHWARZBECK Tunable Dipole Antenna	VHA 9103 UHA 9105	E101051 E101055	Nov. 23, 2002
* ROHDE & SCHWARZ TEST RECEIVER	ESMI	839013/007 839379/002	Jan. 27, 2003
* CHASE BILOG Antenna	CBL6112B	2695	Feb. 08, 2003
* SCHWARZBECK Horn Antenna	BBHA9120-D1	D130	July 3, 2003
* EMCO Horn Antenna	3115	9312-4192	April 9, 2003
* CHANCE Turn Table	CM-TT15	CM-T009	NA
* CHANCE Tower	CM-AT40	CM-A009	NA
* Software	AS61D4	NA	NA
* ANRITSU RF Switches	MP59B	M63079	Apr. 12, 2003
* TIMES RF cable	LMR-600	CABLE-ST9-01	Apr. 12, 2003

- NOTE:**
1. The measurement uncertainty is less than +/- 3.0dB, which is calculated as per the NAMAS 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. "*" = These equipment are used for the final measurement.
 4. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 5. The test was performed in ADT Open Site No. 9.
 6. The VCCI Site Registration No. is R-1248.

4.2.3 TEST PROCEDURE

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

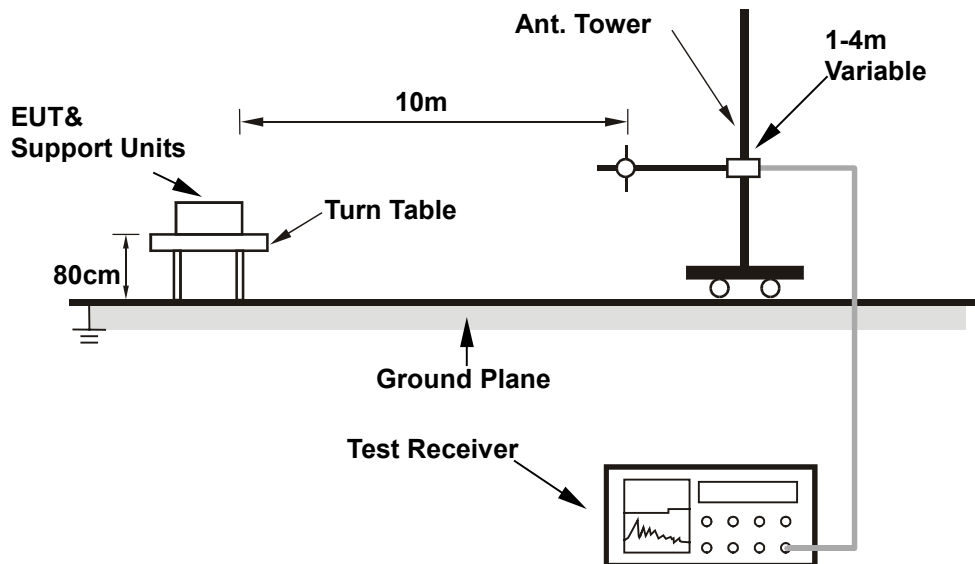
NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation

4.2.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.2.6 EUT OPERATING CONDITIONS

Same as 4.1.6

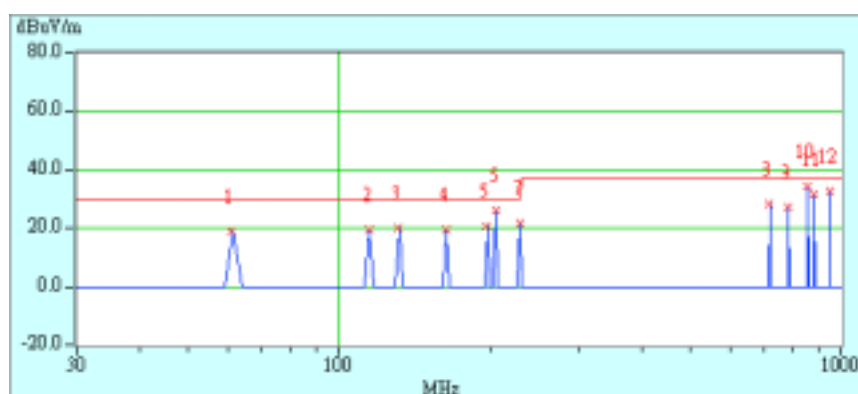
4.2.7 TEST RESULTS

EUT	15" LCD Monitor	MODEL	AL512
MODE	1024x768 (60kHz)	FREQUENCY RANGE	30-1000 MHz
INPUT POWER	230Vac, 50 Hz	DETECTOR FUNCTION & BANDWIDTH	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	30 deg. C, 50 % RH, 1005 hPa	TESTED BY:ARTHUR LIN	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 10 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-Amp. Gain (dB)	Correction Factor (dB/m)
1	60.93	19.2 QP	30.00	-10.80	4.00H	174	13.04	5.40	0.75	0.00	-6.16
2	114.56	19.7 QP	30.00	-10.30	4.00H	39	7.15	11.48	1.07	0.00	-12.55
3	130.85	20.2 QP	30.00	-9.80	4.00H	251	8.22	10.87	1.11	0.00	-11.98
4	163.60	19.4 QP	30.00	-10.60	4.00H	6	8.69	9.49	1.22	0.00	-10.72
5	196.50	20.4 QP	30.00	-9.60	4.00H	241	10.13	8.97	1.30	0.00	-10.27
6	205.27	26.2 QP	30.00	-3.80	4.00H	215	15.55	9.33	1.32	0.00	-10.65
7	229.30	22.0 QP	30.00	-8.00	4.00H	102	9.85	10.76	1.39	0.00	-12.15
8	720.08	28.3 QP	37.00	-8.70	1.23H	42	6.47	19.28	2.59	0.00	-21.88
9	785.54	27.0 QP	37.00	-10.00	1.18H	37	4.48	19.77	2.75	0.00	-22.52
10	859.15	34.3 QP	37.00	-2.70	1.09H	222	11.31	20.08	2.91	0.00	-22.99
11	883.74	31.8 QP	37.00	-5.20	2.63H	63	8.70	20.17	2.96	0.00	-23.15
12	949.20	32.5 QP	37.00	-4.50	1.03H	44	8.72	20.70	3.08	0.00	-23.79

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) – Correction Factor(dB)
 2. Correction Factor(dB/m) = Pre-Amplifier Gain (dB) - Antenna Factor (dB/m) - Cable Factor (dB)
 3. Pre-Amplifier Gain (dB) = 0, when the test receiver is used to read the value and because it did not use the Pre-Amplifier.
 4. The other emission levels were very low against the limit.
 5. Margin value = Emission level – Limit value.

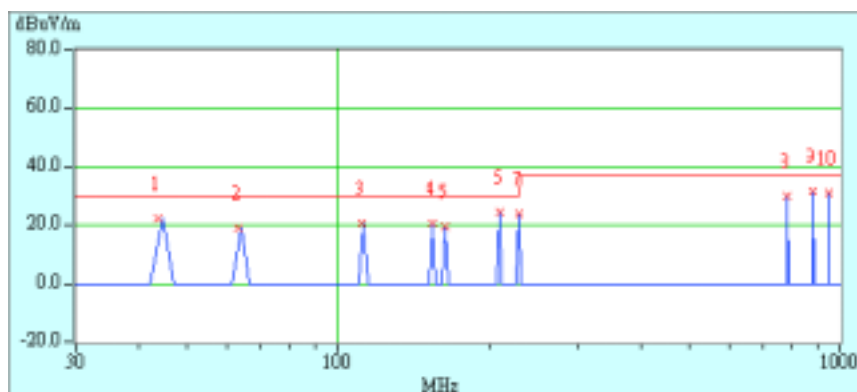


EUT	15" LCD Monitor	MODEL	AL512
MODE	1024x768 (60kHz)	FREQUENCY RANGE	30-1000 MHz
INPUT POWER	230Vac, 50 Hz	DETECTOR FUNCTION & BANDWIDTH	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	30 deg. C, 50 % RH, 1005 hPa	TESTED BY: ARTHUR LIN	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 10 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-Amp. Gain (dB)	Correction Factor (dB/m)
1	43.61	22.3 QP	30.00	-7.70	1.00V	214	11.21	10.39	0.70	0.00	-11.09
2	62.98	18.9 QP	30.00	-11.10	1.42V	226	12.86	5.27	0.78	0.00	-6.05
3	111.31	20.6 QP	30.00	-9.40	1.00V	152	8.26	11.29	1.05	0.00	-12.35
4	153.91	20.8 QP	30.00	-9.20	1.00V	73	9.70	9.86	1.19	0.00	-11.05
5	163.62	19.6 QP	30.00	-10.40	1.00V	294	8.89	9.49	1.22	0.00	-10.72
6	209.53	24.5 QP	30.00	-5.50	1.00V	336	13.55	9.62	1.34	0.00	-10.96
7	229.25	24.0 QP	30.00	-6.00	1.00V	276	11.84	10.76	1.39	0.00	-12.15
8	785.54	30.0 QP	37.00	-7.00	2.46V	0	7.44	19.77	2.75	0.00	-22.52
9	883.74	31.5 QP	37.00	-5.50	1.92V	6	8.40	20.17	2.96	0.00	-23.14
10	949.20	31.1 QP	37.00	-5.90	1.94V	8	7.27	20.70	3.08	0.00	-23.78

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) – Correction Factor(dB)
 2. Correction Factor(dB/m) = Pre-Amplifier Gain (dB) - Antenna Factor (dB/m) - Cable Factor (dB)
 3. Pre-Amplifier Gain (dB) = 0, when the test receiver is used to read the value and because it did not use the Pre-Amplifier.
 4. The other emission levels were very low against the limit.
 5. Margin value = Emission level – Limit value.



4.3 HARMONICS CURRENT MEASUREMENT

4.3.1 LIMITS OF HARMONICS CURRENT MEASUREMENT

Limits for Class A equipment	
Harmonics Order n	Max. permissible harmonics current A
Odd harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
15<=n<=39	0.15x15/n
Even harmonics	
2	1.08
4	0.43
6	0.30
8<=n<=40	0.23x8/n

Limits for Class D equipment		
Harmonics Order n	Max. permissible harmonics current per watt mA/W	Max. permissible harmonics current A
Odd Harmonics only		
3	3.4	2.30
5	1.9	1.14
7	1.0	0.77
9	0.5	0.40
11	0.35	0.33
13	0.30	0.21
15<=n<=39	3.85/n	0.15x15/n

- NOTE:** 1. Class A and Class D are judged by test equipment automatically as per Section 5 of EN 61000-3-2:1995.
2. The above limits for Class D equipment are for all applications having an active input power > 75 W. No limits apply for equipment with an active input power up to and including 75 W.

4.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
KeyTek, Power Arb Waveform Generator	EP72HF	9508346	March 27, 2003
KIKUSUI AC SWITCHING POWER SUPPLY	PCR 4000L	9508355	March 27, 2003

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

4.3.3 TEST PROCEDURE

- a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn.
- b. The classification of EUT is according to section 5 of EN 61000-3-2:1995.

The EUT is classified as follows:

Class A: Balanced three-phase equipment and all other equipment, except that stated in one of the following classes.

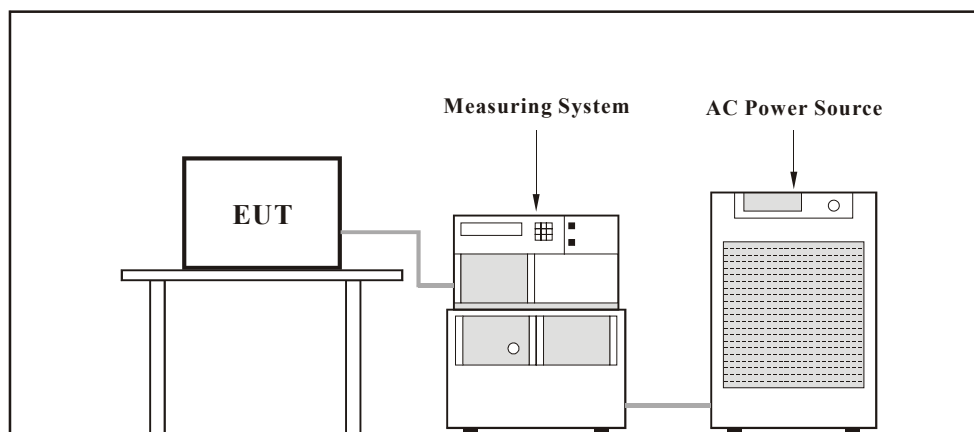
Class B: Portable tools.

Class C: Lighting equipment, including dimming devices.

Class D: Equipment having an input current with “special wave shape” and an active input power, $P \leq 600 \text{ W}$

- c. The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.

4.3.4 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.3.5 EUT OPERATING CONDITIONS

PC sends “full white screen pattern” message to EUT to make EUT have maximum power consumption. Besides that, “full black screen pattern” is also verified to try to find maximum harmonic value caused.

4.3.6 TEST RESULTS

EUT	15" LCD MONITOR	MODEL	AL512
MODE	1024x768 (60 kHz)		
FUNDAMENTAL VOLTAGE/AMPERE	229.255 Vrms/ 0.229 Arms	POWER FREQUENCY	50.001 Hz
RATED POWER CONSUMPTION	22.972 W	POWER FACTOR	0.437
ENVIRONMENTAL CONDITIONS	27 deg. C, 40 % RH, 1005 hPa	TESTED BY: WIN CHING LIN	

Steady State Data

Harm. Order	Reading Data (A)	Limit (A)	Harm. Order	Reading Data (A)	Limit (A)
1	-	-	2	0.00	1.08
3	0.09	2.30	4	0.00	0.43
5	0.09	1.14	6	0.00	0.30
7	0.08	0.77	8	0.00	0.23
9	0.07	0.40	10	0.00	0.18
11	0.06	0.33	12	0.00	0.15
13	0.05	0.21	14	0.00	0.13
15	0.04	0.15	16	0.00	0.12
17	0.03	0.13	18	0.00	0.10
19	0.02	0.12	20	0.00	0.09
21	0.01	0.11	22	0.00	0.08
23	0.01	0.10	24	0.00	0.08
25	0.01	0.09	26	0.00	0.07
27	0.01	0.08	28	0.00	0.07
29	0.01	0.08	30	0.00	0.06
31	0.01	0.07	32	0.00	0.06
33	0.01	0.07	34	0.00	0.05
35	0.01	0.06	36	0.00	0.05
37	0.01	0.06	38	0.01	0.05
39	0.00	0.06	40	0.00	0.05

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

4.4 VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT

4.5 LIMITS OF VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT

TEST ITEM	LIMIT	NOTE
P_{st}	1.0	P_{st} means short-term flicker indicator.
P_{lt}	0.65	P_{lt} means long-term flicker indicator.
T_{dt} (ms)	200	T_{dt} means maximum time that dt exceeds 3 %.
d_{max} (%)	4%	d_{max} means maximum relative voltage change.
dc (%)	3%	dc means relative steady-state voltage change

4.5.1 TEST INSTRUMENTS

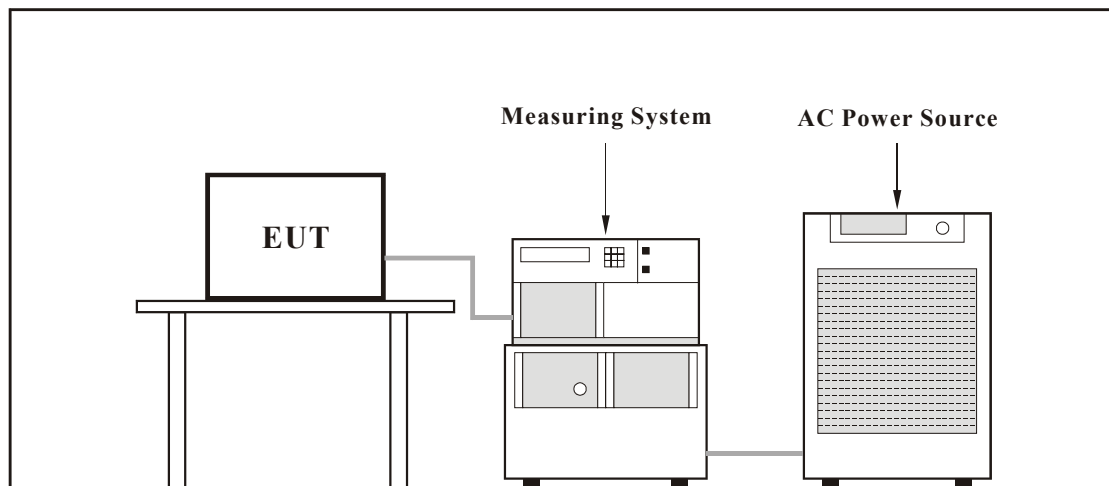
DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
KeyTek, Power Arb Waveform Generator	EP72HF	9508346	March 27, 2003
KIKUSUI AC SWITCHING POWER SUPPLY	PCR 4000L	9508355	March 27, 2003

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

4.5.2 TEST PROCEDURE

- a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the most unfavorable sequence of voltage changes under normal operating conditions.
- b. During the flick measurement, the measure time shall include that part of whole operation cycle in which the EUT produce the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.

4.5.3 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.5.4 EUT OPERATING CONDITIONS

Same as 4.3.5

4.5.5 TEST RESULTS

EUT	15" LCD MONITOR	MODEL	AL512
MODE	1024x768 (60 kHz)		
INPUT VOLTAGE/AMPERE	229.255 Vrms / 0.229 Arms	POWER FREQUENCY	50.001 Hz
OBSERVATION PERIOD (Tp)	2 hours	POWER FACTOR	0.437
ENVIRONMENTAL CONDITIONS	27 deg. C, 40 % RH, 1005 hPa	TESTED BY: WIN CHING LIN	

TEST PARAMETER	MEASUREMENT VALUE	LIMIT	REMARKS
P_{st}	0.093	1.0	Pass
P_{lt}	0.088	0.65	Pass
T_{dt} (ms)	0	200	Pass
d_{max} (%)	0	4%	Pass
dc (%)	0	3%	Pass

- NOTE:**
- (1) P_{st} means short-term flicker indicator.
 - (2) P_{lt} means long-term flicker indicator.
 - (3) T_{dt} means maximum time that dt exceeds 3 %.
 - (4) d_{max} means maximum relative voltage change.
 - (5) dc means relative steady-state voltage change.

5 IMMUNITY TEST

5.1 GENERAL DESCRIPTION

Product Standard:	EN 55024: 1998	
Basic Standard, specification requirement, and Performance Criteria:	IEC 61000-4-2	Electrostatic Discharge – ESD: 8kV air discharge, 4kV Contact discharge, Performance Criterion B
	IEC 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80-1000 MHz, 3V/m, 80% AM (1kHz), Performance Criterion A
	IEC 61000-4-4	Electrical Fast Transient/Burst - EFT, Power line: 1kV, Signal line: 0.5kV, Performance Criterion B
	IEC 61000-4-5	Surge Immunity Test: 1.2/50 us Open Circuit Voltage, 8 /20 us Short Circuit Current, Power Line - 1 kV, line to earth - 2kV, Performance Criterion B
	IEC 61000-4-6	Conducted Radio Frequency Disturbances Test – CS: 0.15-80 MHz, 3V, 80% AM, 1kHz, Performance Criterion A
	IEC 61000-4-8	Power Frequency Magnetic Field Test, 50 Hz, 1A/m, Performance Criterion A
	IEC 61000-4-11	Voltage Dips: i) >95% reduction -0.5 period, Performance Criterion B ii) 30% reduction – 25 period, Performance Criterion C Voltage Interruptions: i) >95% reduction – 250 period, Performance Criterion C

5.2 GENERAL PERFORMANCE CRITERIA DESCRIPTION

According to Clause 7.1 of EN 55024: 1998 standard, the following describes the general performance criteria.

<p>CRITERION A</p>	<p>The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.</p>
<p>CRITERION B</p>	<p>After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomenon below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance.</p> <p>During the test, degradation of performance is allowed. However, no change of operating state if stored data is allowed to persist after the test. If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.</p>
<p>CRITERION C</p>	<p>Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions.</p> <p>Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.</p>

5.3 PARTICULAR PERFORMANCE CRITERIA DESCRIPTION

5.3.1 PARTICULAR PERFORMANCE CRITERIA DESCRIPTION FOR DATA DISPLAY FUNCTION OF EUT

<p>CRITERION A</p>	<p>When seen from normal viewing distance, the EUT shall operate with no change beyond the manufacturer's specification, in flicker, color, focus and jitter (except for the power magnetic field test).</p> <p>Power frequency magnetic field test, the following also applies: The jitter (in mm) $\leq (\text{character height in mm} + 0.3) \times 2.5 / 33.3$</p>
<p>CRITERION B</p>	<p>Screen disturbances during the application of the test are permissible.</p>
<p>CRITERION C</p>	<p>Failures which are not self-recovered after removal of the external disturbance, but which can be recovered to normal operation by reset or reboot are permissible.</p>

5.4 EUT OPERATING CONDITION

Same as item 4.1.6.

5.5 ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD)

5.5.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Discharge Voltage:	Air Discharge – 2,4,8 kV (Direct) Contact Discharge – 2,4kV (Direct/Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Minimum 50 times at each test point
Discharge Mode:	Single Discharge
Discharge Period:	1 second minimum

5.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
KeyTek, ESD Simulator	MZ-15/EC	9902287	Feb. 26, 2003
EM Test ESD Simulator	ESD 30C	0201-28	Aug. 9, 2002
SCHAFFNER Coupling Decoupling Network	CDN T400	16902	July 22, 2002
SCHAFFNER Coupling Decoupling Network	CDN T002	19007	Oct.16, 2002
EM Test ESD Discharge Unit	P30C	0201-28	Aug. 9, 2002
EM Test ESD Discharge Unit	P30C-RFCI	0601-07	Aug. 9, 2002

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

5.5.3 TEST PROCEDURE

The discharges shall be applied in two ways:

a. Contact discharges to the conductive surfaces and coupling planes:

The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the horizontal coupling plane. The remaining three test points shall each receive at least 50 direct contact discharges. If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

b. Air discharges at slots and apertures and insulating surfaces:

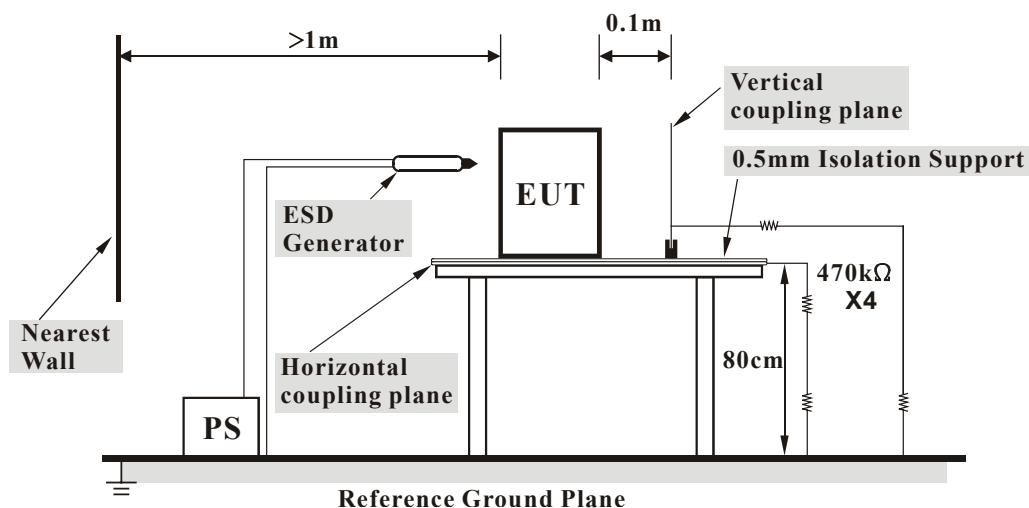
On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points

where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area normally handled by the user. A minimum of 10 single air discharges shall be applied to the selected test point for each such area.

The basic test procedure was in accordance with IEC 61000-4-2:

- a. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.
- b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.
- c. The time interval between two successive single discharges was at least 1 second.
- d. The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.
- e. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- f. Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.
- g. At least ten single discharges (in the most sensitive polarity) were applied to the **Horizontal Coupling Plane** at points on each side of the EUT. The ESD generator was positioned vertically at a distance of 0.1 meters from the EUT with the discharge electrode touching the **HCP**.
- h. At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the **Vertical Coupling Plane** in sufficiently different positions that the four faces of the EUT were completely illuminated. The **VCP** (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.

5.5.4 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the **Ground Reference Plane**. The **GRP** consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A **Horizontal Coupling Plane** (1.6m x 0.8m) was placed on the table and attached to the **GRP** by means of a cable with 940kΩ total impedance. The equipment under test, was installed in a representative system as described in section 7 of IEC 61000-4-2:1995, and its cables were placed on the **HCP** and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC 61000-4-2:1995, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The **GRP** consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

5.5.5 TEST RESULTS

EUT	15" LCD MONITOR	MODEL	AL512
MODE	1024x768 (60 kHz)	INPUT POWER	230Vac, 50 Hz
ENVIRONMENTAL CONDITIONS	25 deg. C, 40 % RH, 1005 hPa	TESTED BY: WIN CHING LIN	

TEST RESULTS OF DIRECT APPLICATION					
Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge	Performance Criterion
2,4,8	+/-	1~4	NA	Note	A
2,4	+/-	5	Note	NA	A

Description of test point (Please refer to ESD test photo):

1. Junction of case
2. Panel
3. Switch
4. All I/O ports
5. Metal board

TEST RESULTS OF INDIRECT APPLICATION					
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling Plane	Vertical Coupling Plane	Performance Criterion
2,4	+/-	1 ~ 4	Note	Note	A

Description of test point:

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

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



5.6 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS)

5.6.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-3
Frequency Range:	80 MHz - 1000 MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3 m
Antenna Height:	1.5m
Dwell Time:	at least 3 seconds

5.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
ROHDE & SCHWARZ Signal Generator	SMY01	841104/033	SEP. 25, 2002
KALMUS Power Amplifier	LA1000V	091995-1	NA
KALMUS Power Amplifier	757LC	091995-2	NA
HOLADAY Field Probe	HI-4422	89915	Aug. 13, 2002
EMCO BiconiLog Antenna	3141	1001	NA
COMTEST Compact Full Anechoic Chamber (7x3x3 m)	CFAC	ADT-S01	Aug. 17, 2002

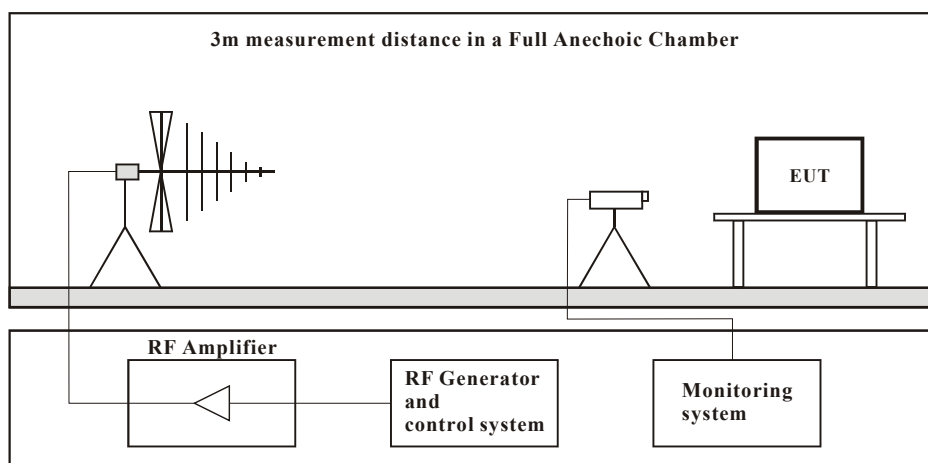
NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

5.6.3 TEST PROCEDURE

The test procedure was in accordance with IEC 61000-4-3

- a. The testing was performed in a fully-anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.
- b. The frequency range is swept from 80 MHz to 1000 MHz, with the signal 80% amplitude modulated with a 1kHz sinewave. The rate of sweep did not exceed 1.5×10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- c. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- d. The field strength level was 3V/m.
- e. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

5.6.4 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLETOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC 61000-4-3:1996 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC 61000-4-3:1996 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.



5.6.5 TEST RESULTS

EUT	15" LCD MONITOR	MODEL	AL512
MODE	1024x768 (60 kHz)	INPUT POWER	230Vac, 50 Hz
ENVIRONMENTAL CONDITIONS	27 deg. C, 60 % RH, 1005 hPa	TESTED BY: WIN CHING LIN	

Frequency (MHz)	Result	Polarity	Azimuth	Field Strength (V/m)	Observation	Performance Criterion
80 -1000 MHz	PASS	V&H	0	3	Note	A
80 -1000 MHz	PASS	V&H	90	3		
80 -1000 MHz	PASS	V&H	180	3		
80 -1000 MHz	PASS	V&H	270	3		

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

5.7 ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST (EFT)

5.7.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-4
Test Voltage:	Power Line - 1 kV Signal/Control Line - NA
Polarity:	Positive & Negative
Impulse Frequency:	5 kHz
Impulse Waveshape :	5/50 ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	Not less than 1 min.

5.7.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
KeyTek, EFT Generator	CE-40	9508257	Aug. 28, 2002
SCHAFFNER Coupling Decoupling Network	CDN T400	16903	July 22, 2002
SCHAFFNER Coupling Decoupling Network	CDN T002	19017	Oct.16, 2002
KeyTek, Capacitive Clamp	CE-40-CCL	9508259	NA

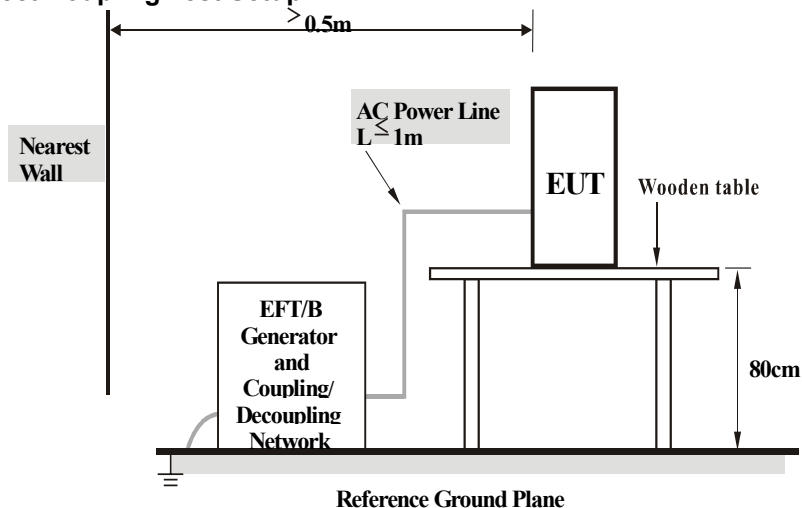
NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

5.7.3 TEST PROCEDURE

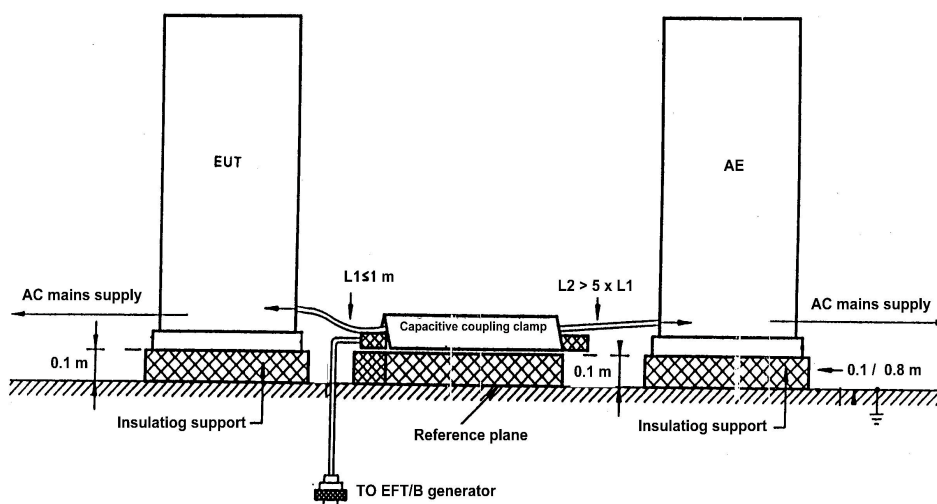
- a. The EUT was tested with 1000 volt discharges to the AC power input leads and 500 volt discharges to the interconnect cables.
- b. Both positive and negative polarity discharges were applied.
- c. The length of the “hot wire” from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 1 meter.
- d. The duration time of each test sequential was 1 minute.
- e. The transient/burst waveform was in accordance with IEC 61000-4-4, 5/50ns.

5.7.4 TEST SETUP

a. Direct Coupling Test Setup



b. Capacitive Clamp Test Setup (if any)



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLETOP EQUIPMENT

The configuration consisted of a wooden table (0.8m high) standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system. A minimum distance of 0.5m was provided between the EUT and the walls of the laboratory or any other metallic structure.

FLOOR STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC 61000-4-4:1995 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1-meter thick. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system.

5.7.5 TEST RESULTS

EUT	15" LCD MONITOR	MODEL	AL512
MODE	1024x768 (60 kHz)	INPUT POWER	230Vac, 50 Hz
ENVIRONMENTAL CONDITIONS	27 deg. C, 40 % RH, 1005 hPa	TESTED BY: WIN CHING LIN	

Test Point	Polarity	Test Level (kV)	Observation	Performance Criterion
L1	+/-	1	Note 1	A
L2	+/-	1	Note 1	A
GND	+/-	1	Note 2	B

- NOTE:** 1. There was no change compared with the initial operation during the test.
 2. The noise of pulse frequency was heard from speaker.



5.8 SURGE IMMUNITY TEST

5.8.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-5
Wave-Shape:	Combination Wave 1.2/50 us Open Circuit Voltage 8 /20 us Short Circuit Current
Test Voltage:	Power Line - 1 kV / 2 kV
Surge	
Input/Output:	L1-L2 / L1-G / L2-G / L1, L2-G
Generator Source	2 ohm between networks
Impedance:	12 ohm between network and ground
Polarity:	Positive/Negative
Phase Angle:	0° /90°/180°/270°
Pulse Repetition	
Rate:	1 time / min. (maximum)
Number of Tests:	5 positive and 5 negative at selected points

5.8.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATION UNTIL
KeyTek, Control Center	E103	9508347	NA
KeyTek, Surge Combination Wave	E501A	9508349	Aug. 28, 2002
KeyTek, Surge Coupler/Decoupler	E551	9508350	Aug. 28, 2002
SCHAFFNER Coupling Decoupling Network	CDN T400	16904	July 22, 2002
SCHAFFNER Coupling Decoupling Network	CDN T002	19005	Oct.16, 2002
KeyTek External Coupler/Decoupler for Telecom Lines	CM-TELCD	9906194	NA
KeyTek I/O Signal Line Coupler/Decoupler	CM-I/OCD	9907177	NA

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

5.8.3 TEST PROCEDURE

a. For EUT power supply:

The surge is to be applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

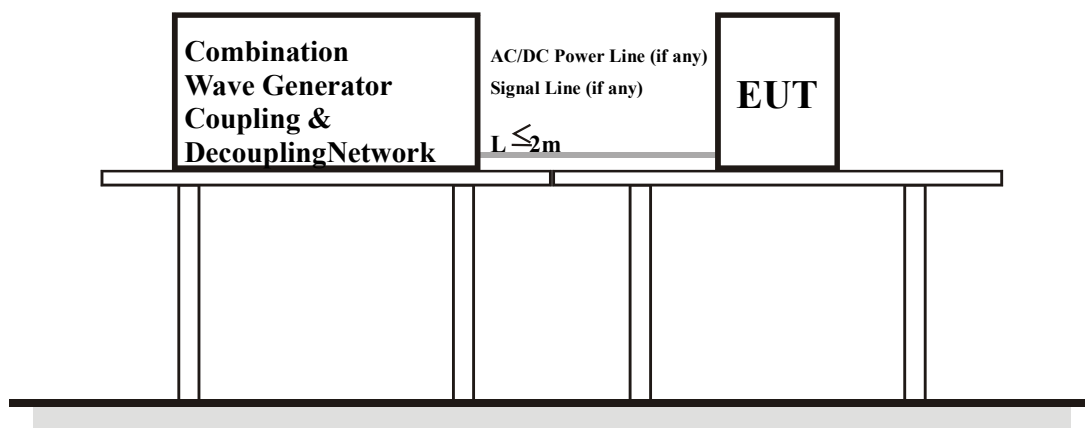
b. For test applied to unshielded unsymmetrically operated interconnection lines of EUT:

The surge is applied to the lines via the capacitive coupling. The coupling / decoupling networks shall not influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

c. For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT:

The surge is applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor cannot be specified. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

5.8.4 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



5.8.5 TEST RESULTS

EUT	15" LCD MONITOR	MODEL	AL512
MODE	1024x768 (60 kHz)	INPUT POWER	230Vac, 50 Hz
ENVIRONMENTAL CONDITIONS	24 deg. C, 56 % RH, 1005 hPa	TESTED BY: WIN CHING LIN	

VOLTAGE (kV)	TEST POINT	POLARITY (+/-)	OBSERVATION	PERFORMANCE CRITERION
1	L1-L2	+/-	NOTE	A
2	L1-G	+/-	NOTE	A
2	L2-G	+/-	NOTE	A
2	L1, L2-G	+/-	NOTE	A

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



5.9 IMMUNITY TO CONDUCTED DISTURBANCES INDUCED BY RF FIELDS (CS)

5.9.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-6
Frequency Range:	0.15 MHz - 80 MHz
Field Strength:	3 V _{r.m.s.}
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Coupled Cable:	Power Mains, Unshielded
Coupling Device:	CDN-M3 (3 wires)

5.9.2 TEST INSTRUMENTS

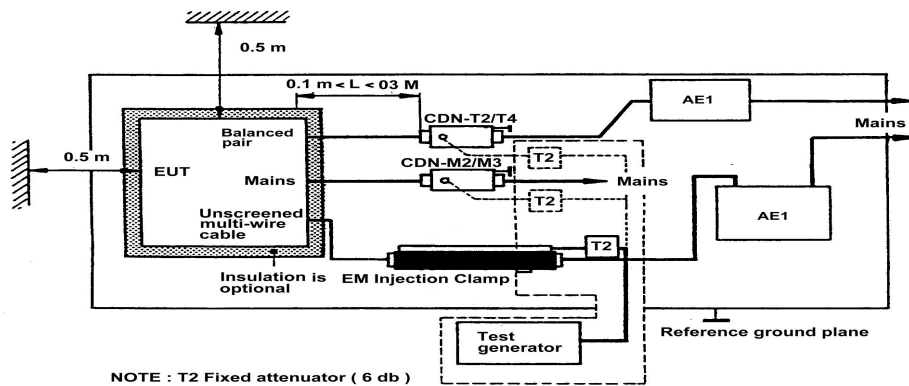
DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
ROHDE & SCHWARZ Signal Generator	SMY01	848027/030	Feb. 19, 2003
COMTEST Power Amplifier	GPA301	BCS320-1038	NA
FCC Coupling Decoupling Network	FCC-801- M3-25A	48	Aug. 9, 2002
FCC Coupling Decoupling Network	FCC-801- M3-25A	01022	Apr. 9, 2003
FCC Coupling Decoupling Network	FCC-801- M2-16A	01047	Aug. 5, 2002
FISCHER CUSTOM COMMUNICATIONS EM Injection Clamp	FCC-203I	50	NA
FCC Coupling Decoupling Network	FCC-801- M1-25A	17	Aug. 9, 2002
BOONTON RF Voltage Meter	9200B	331801AE	Aug. 03, 2002
SCHAFFNER Coupling Decoupling Network	CDN T400	16909	June 09, 2003
SCHAFFNER Coupling Decoupling Network	CDN T002	19004	Oct.16, 2002
SCHAFFNER Arranging adapter set for RJ45	ADR T444	NA	NA
SCHAFFNER Arranging adapter set for RJ11	ADR T411	NA	NA

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

5.9.3 TEST PROCEDURE

- a. The EUT shall be tested within its intended operating and climatic conditions.
- b. The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.
- c. The frequency range is swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal is modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The sweep rate shall not exceed 1.5×10^{-3} decades/s. The step size shall not exceed 1 % of the start and thereafter 1 % of the preceding frequency value where the frequency is swept incrementally.
- d. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequency(ies) and harmonics or frequencies of dominant interest, shall be analyzed separately.
- e. Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.

5.9.4 TEST SETUP



Note: 1. The EUT is setup 0.1m above Reference Ground Plane

2. The CDNs and / or EM clamp used for real test depends on ports and cables configuration of EUT.

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

FLOOR-STANDING EQUIPMENT

The equipment to be tested is placed on an insulating support of 0.1 meters height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.



5.9.5 TEST RESULTS

EUT	15" LCD MONITOR	MODEL	AL512
MODE	1024x768 (60 kHz)	INPUT POWER	230Vac, 50 Hz
ENVIRONMENTAL CONDITIONS	26 deg. C, 52 % RH, 1005 hPa	TESTED BY: WIN CHING LIN	

FREQUENCY (MHz)	RESULTS	FIELD STRENGTH (V_{r.m.s.})	CABLE	OBSERVATION	INJECTION METHOD	PERFORMANCE CRITERION
0.15 –80 MHz	PASS	3	AC power line	Note	CDN-M3	A

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

5.10 POWER FREQUENCY MAGNETIC FIELD IMMUNITY TEST

5.10.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-8
Frequency Range:	50Hz
Field Strength:	1 A/m
Observation Time:	1 minute
Inductance Coil:	Rectangular type, 1mx1m

5.10.2 TEST INSTRUMENTS

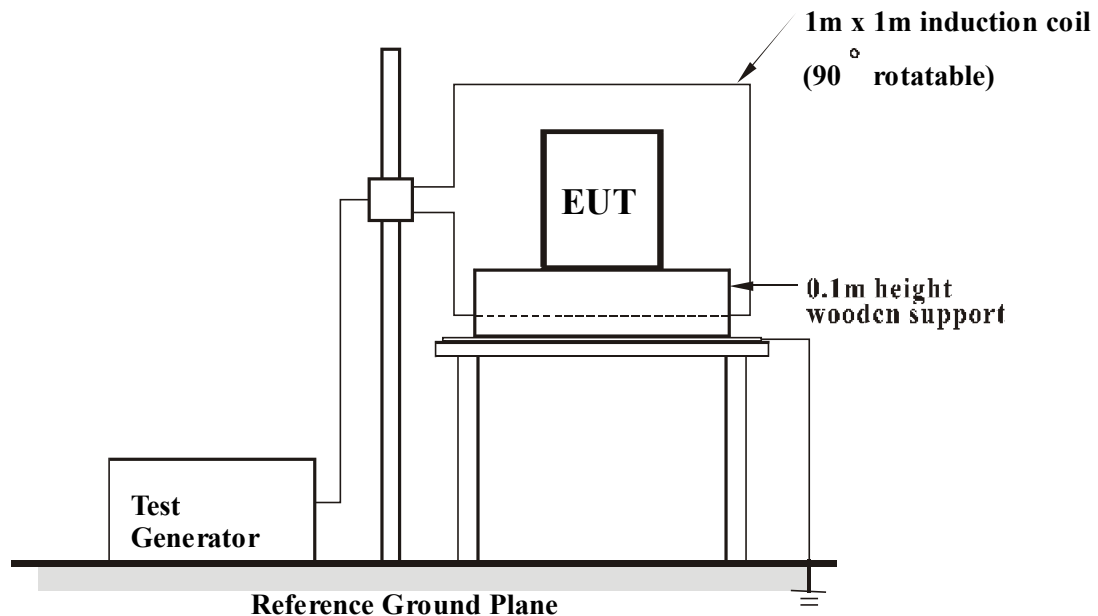
DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
HAEFELY Magnetic Field Tester	MAG 100.1	083794-06	NA
COMBINOVA Magnetic Field Meter	MFM10	224	Oct. 24, 2002

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

5.10.3 TEST PROCEDURE

- a. The equipment is configured and connected to satisfy its functional requirements. It shall be placed on the GRP with the interposition of a 0.1m-thick insulating support.
- b. The equipment cabinets shall be connected to the safety earth directly on the GRP via the earth terminal of the EUT.
- c. The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.
- d. The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.

5.10.4 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLETOP EQUIPMENT

The equipment shall be subjected to the test magnetic field by using the induction coil of standard dimension (1 m x 1 m). The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

FLOOR-STANDING EQUIPMENT

The equipment shall be subjected to the test magnetic field by using induction coils of suitable dimensions. The test shall be repeated by moving and shifting the induction coils, in order to test the whole volume of the EUT for each orthogonal direction. The test shall be repeated with the coil shifted to different positions along the side of the EUT, in steps corresponding to 50 % of the shortest side of the coil. The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.



5.10.5 TEST RESULTS

EUT	15" LCD MONITOR	MODEL	AL512
MODE	1024x768 (60 kHz)	INPUT POWER	230Vac, 50 Hz
ENVIRONMENTAL CONDITIONS	27 deg. C, 40 % RH, 1005 hPa	TESTED BY: WIN CHING LIN	

DIRECTION	RESULTS	OBSERVATION	PERFORMANCE CRITERION
X	PASS	Note	A
Y	PASS	Note	A
Z	PASS	Note	A

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

5.11 VOLTAGE DIP/SHORT INTERRUPTIONS/VOLTAGE VARIATIONS (DIP) IMMUNITY TEST

5.11.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-11
Test Duration Time:	Minimum three test events in sequence
Interval between Event:	Minimum ten seconds
Phase Angle:	0°/45°/90°/135°/180°/225°/270°/315°/360°
Test Cycle:	3 times

5.11.2 TEST INSTRUMENTS

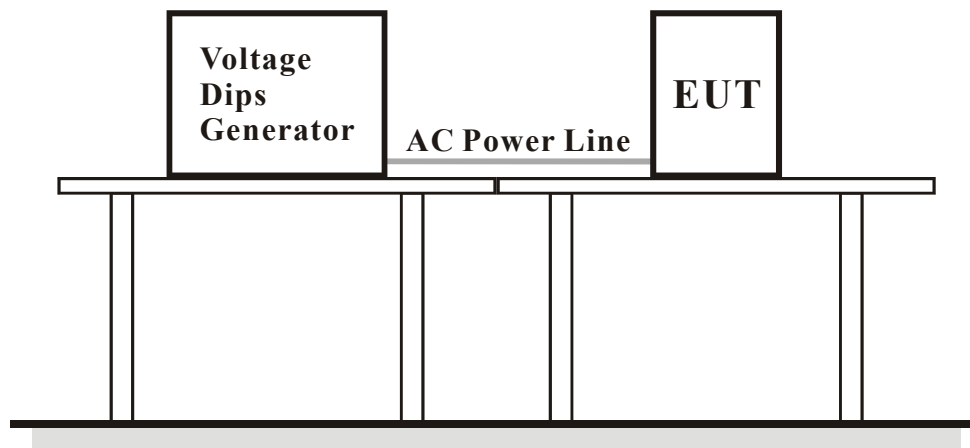
DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
HAEFELY Mains Interference Simulator	PLINE 1610	083690-17	March 8, 2003

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

5.11.3 TEST PROCEDURE

The EUT shall be tested for each selected combination of test levels and duration with a sequence of three dips/interruptions with intervals of 10 s minimum (between each test event). Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at zero crossings of the voltage waveform.

5.11.4 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

5.11.5 TEST RESULTS

EUT	15" LCD MONITOR	MODEL	AL512
MODE	1024x768 (60 kHz)	INPUT POWER	230Vac, 50 Hz
ENVIRONMENTAL CONDITIONS	27 deg. C, 40 % RH, 1005 hPa	TESTED BY: WIN CHING LIN	

VOLTAGE % REDUCTION	PERIODS	RESULTS	OBSERVATION	PERFORMANCE CRITERION
>95	0.5	PASS	Note (1)	A
30	25	PASS	Note (1)	A
>95	250	PASS	Note (2)	B

NOTE: 1. There was no change compared with the initial operation during the test.
2. The EUT reset during the test, but self-recoverable after the test.

6 PHOTOGRAPHS OF THE TEST CONFIGURATION

CONDUCTED EMISSION TEST



RADIATED EMISSION TEST



HARMONICS EMISSION TEST & VOLTAGE FLUCTUATIONS AND FLICKER TEST



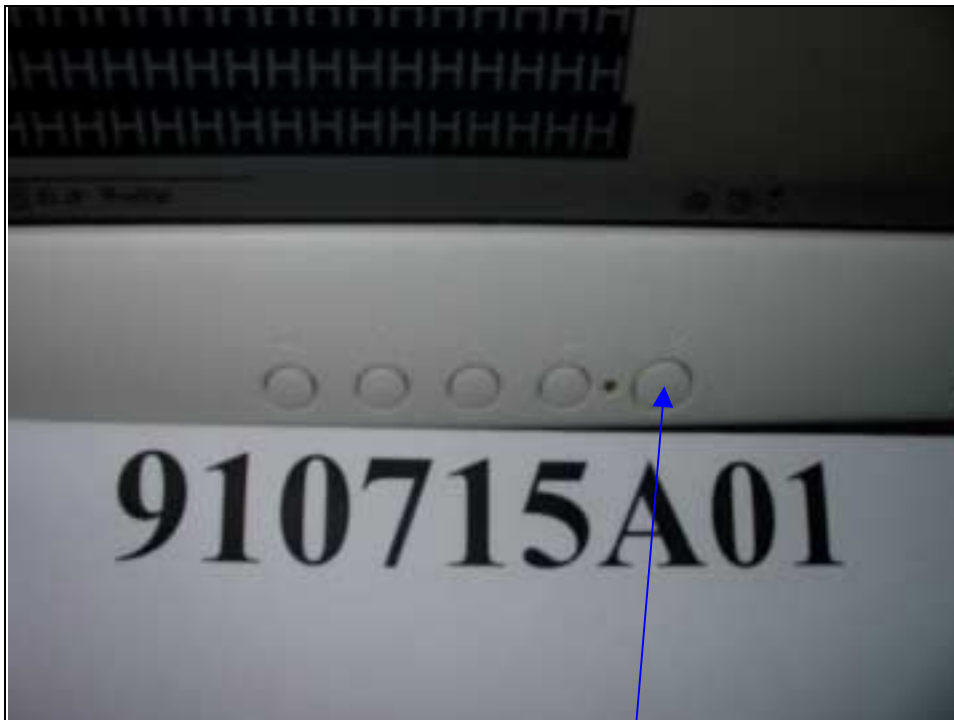
ESD TEST



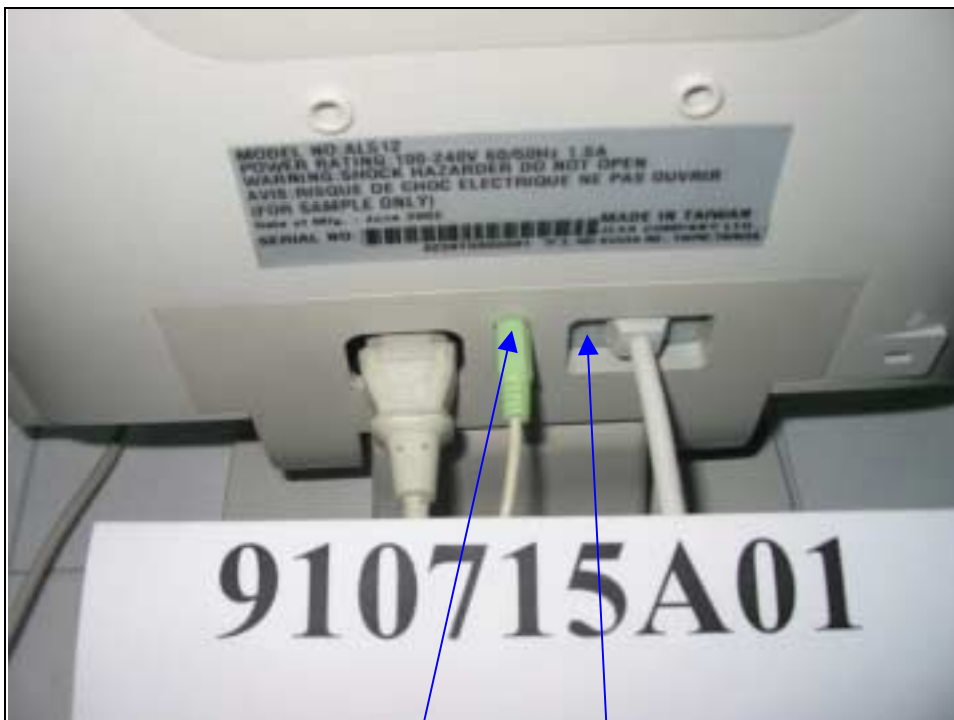
1



2



3



4

5



RS TEST



EFT TEST



SURGE TEST



CONDUCTED SUSCEPTIBILITY TEST



POWER-FREQUENCY MAGNETIC FIELDS TEST



VOLTAGE DIPS AND INTERRUPTIONS TEST





7 APPENDIX - INFORMATION ON THE TESTING LABORATORIES

We, ADT Corp., were founded in 1988 to provide our best service in EMC and Safety consultation. Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025, Guide 25 or EN 45001:

USA	FCC, NVLAP, UL
Germany	TUV Rheinland
Japan	VCCI
New Zealand	MoC
Norway	NEMKO
Canada	INDUSTRY CANADA
R.O.C.	CNLA, BSMI

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5/phtml.

If you have any comments, please feel free to contact us at the following:

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Hsin Chu EMC Lab:

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Lin Kou RF & Telecom Lab.

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Web Site: www.adt.com.tw

The address and road map of all our labs can be found in our web site also.