EMC

TEST REPORT

REPORT NO. : CE89042109
MODEL NO. : PCM-3724
DATE OF TEST : April 22 ~ May 6, 2000

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

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1. CERTIFICATION

Issue date: May 8, 2000

Product	:	48-CH DIGITAL I/O MODULE	
Trade Name	:	ADVANTECH	
Model No.	:	PCM-3724	
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 April 22 to May 6, 2000. 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.

TESTED BY (Emission) : Kent Chen (Kent Chen) , DATE: 5/8/2000

TESTED BY (Immunity) : Dennis Chuang (Dennis Chuang) DATE: 5/8/2000

CHECKED BY : (Yemmy Soong) , DATE: 5/8/2000

APPROVED BY : Mike Su (Mike Su) , DATE: 5/8/2000

ADVANCE DATA TECHNOLOGY CORPORATION

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2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product	:	48-CH DIGITAL I/O MODULE
Model No.	:	PCM-3724
Power Supply Type	:	DC (from PC)
Power Cord	:	NA

Note: The EUT is a 48-ch relay actuator and isolated digital input module that attaches to the PC/104 connector on CPU card or PC/104 module. It offers forty-eight relay actuators and forty eight-bit isolated digital input channels.

For more detailed features description, please refer to manufacturer' s specification and User's Manual.

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	PC	HP	VECTRA VE 4/66	SG52902164	Nonshielded Power (1.8m)
2	MONITOR	HP	D2842A	KR93473118	Shielded Signal (1.8m) Nonshielded Power (1.8m)
3	KEYBOARD	FORWARD	FDA-104GA	FDKB8110129	Shielded Signal (1.4m)
4	PRINTER	HP	2225C+	2936S56294	Shielded Signal (1.2m) Nonshielded Power (1.9m)
5	MOUSE	LOGITECH	M-S43	LZE00703078	Shielded Signal (1.8m)
6	MODEM	ACEEX	1414	980020532	Shielded Signal (1.2m) Nonshielded Power (1.9m)

Note: 1. Two cables (1.0m each) were connected between two loads and the EUT.
2. The EUT was installed in support unit 1.

IMMUNITY TEST

No	Product	Brand	Model No.	Serial No.	I/O Cable
1	PC	HP	VECTRA VE 4/66	SG52902164	Nonshielded Power (1.8m)
2	MONITOR	ACER	7254e	9171602008	Shielded Signal (1.5m) Nonshielded Power (1.8m)
3	KEYBOARD	HP	C3758A	C3758-60223	Shielded Signal (1.5m)
4	PRINTER	HP	C2145A	SG59N16035	Shielded Signal (1.5m) Nonshielded Power (1.8m)
5	MOUSE	LOGITECH	M-S43	LZE93501269	Shielded Signal (1.5m)
6	MODEM	GVC	F-1114V/R6	96-191-113003	Shielded Signal (1.25m) Nonshielded Power (1.5m)

Note: 1. Two cables (1.0m each) were connected between two loads and the EUT.
2. The EUT was installed in support unit 1.

2.4 TEST SETUP

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

3. TEST INSTRUMENTS

3.1 TEST INSTRUMENTS (EMISSION)

CONDUCTED EMISSION MEASUREMENT

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
ROHDE & SCHWARZ Test Receiver	ESH3	893495/006	July 7, 2000
ROHDE & SCHWARZ Spectrum Monitor	EZM	893787/013	July 8, 2000
ROHDE & SCHWARZ Artificial Mains Network	ESH2-Z5	892107/003	July 13, 2000
EMCO L.I.S.N.	3825/2	9504-2359	July 13, 2000
Shielded Room	Site 3	ADT-C03	NA

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

RADIATED EMISSION MEASUREMENT

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
HP Spectrum Analyzer	8594E	3520A01861	Feb. 10, 2001
HP Preamplifier	8447D	2944A08118	June 20, 2000
HP Preamplifier	8347A	3307A01088	Aug. 30, 2000
HP Preamplifier	8449B	3008A01201	Dec. 14, 2000
ROHDE & SCHWARZ TEST RECEIVER	ESVS 10	840241/010	Sept. 9, 2000
SCHWARZBECK Tunable Dipole Antenna	VHA 9103 UHA 9105	E101051 E101055	Nov. 23, 2000
ROHDE & SCHWARZ TEST RECEIVER	ESMI	839013/007 839379/002	Aug. 30, 2000
CHASE BILOG Antenna	CBL6111A	1079	July 17, 2000
EMCO Double Ridged Guide Antenna	3115	9312-4192	March 29, 2001
CHANCE Turn Table	U200	9701	NA
CHANCE Tower	AT-100	CM-A003	NA
Open Field Test Site	Site 3	ADT-R03	July 16, 2000

Note: 1. The measurement uncertainty is less than +/- 3.0dB, which is calculated as per 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.

CURRENT HARMONICS, VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

Description & Manufacturer	Model no.	Serial No.	Calibrated Until
KeyTek, Power Arb Waveform Generator	EP72HF	9508346	Mar. 29, 2001
KIKUSUI AC SWITCHING POWER SUPPLY	PCR 4000L	9508355	Mar. 29, 2001

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.	Calibrated Until
KeyTek, ESD Test System	2000	9105240/41	Aug. 10, 2000
KeyTek, ESD Simulator	MZ-15/EC	9902287	Feb. 28, 2001
KeyTek, EFT Generator	CE-40	9508257	Sept. 5, 2000
KeyTek, Capacitive Clamp	CE-40-CCL	9508259	Sept. 5, 2000
KeyTek, Control Center	E103	9508347	NA
KeyTek, Surge Combination Wave	E501A	9508349	Aug. 30, 2000
KeyTek, Surge Coupler/Decoupler	E551	9508350	Aug. 30, 2000
External Coupler /Decoupler	CM-TELCD	9926194	NA
I/O Signal Line Coupler/Decoupler	CM-110CD	9907177	NA
ROHDE & SCHWARZ Signal Generator	SMY01	840490/009	Aug. 19, 2000
KALMUS Power Amplifier	LA1000V	091995-1	NA
KALMUS Power Amplifier	757LC	091995-2	NA
HOLADAY Field Probe	HI-4422	89915	Aug. 12, 2000
EMCO BiconiLog Antenna	3141	1001	NA
FCC Coupling Decoupling Network	FCC-801-M3-25	48	NA
FCC Coupling Decoupling Network	FCC-801-M2-25	20	NA
FISCHER CUSTOM COMMUNICATIONS EM Injection Clamp	FCC-203I	50	NA
FCC Coupling Decoupling Network	FCC-801-M1-25	17	NA
BOONTON RF Voltage Meter	9200B	331801AE	Aug. 19, 2000
COMTEST Compact Full Anechoic Chamber (7x3x3 m)	CFAC	ADT-S01	Aug. 24, 2000
HAEFELY Magnetic Field Tester	MAG 100.1	083794-06	NA
COMBINOVA Magnetic Field Meter	MFM10	224	Oct. 29, 2000
KEYTEK Mains Interference Simulator	EMC Pro	9902207	Feb. 16, 2001

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	:	24 degree C
Humidity	:	75 %
Atmospheric Pressure	:	998 mbar

TEST RESULT	Remarks
PASS	Minimum passing margin of conducted emission: -27.4 dB at 0.953 MHz Minimum passing margin of radiated emission: -2.2 dB at 71.60 MHz

4.2 EUT OPERATION CONDITION

1. Turn on the power of all equipment.
2. PC runs a test program to enable all functions.
3. PC sends messages to EUT and then EUT simulates transmission of messages. This is monitored on the display screen of monitor.
4. Repeat steps 3-4.

4.3 TEST DATA OF CONDUCTED EMISSION

EUT: **48-CH DIGITAL I/O MODULE** MODEL: **PCM-3724**

PHASE: LINE (L) Bandwidth: 10 kHz

Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.177	0.2	40.9	-	41.1	-	79.0	66.0	-37.9	-
0.266	0.2	40.7	-	40.9	-	79.0	66.0	-38.1	-
0.548	0.2	30.7	-	30.9	-	73.0	60.0	-42.1	-
0.853	0.3	36.4	-	36.7	-	73.0	60.0	-36.3	-
0.953	0.3	45.3	-	45.6	-	73.0	60.0	-27.4	-
12.110	0.9	33.5	-	34.4	-	73.0	60.0	-38.6	-

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

TEST DATA OF CONDUCTED EMISSION

EUT: **48-CH DIGITAL I/O MODULE** MODEL: **PCM-3724**

PHASE: LINE (N) Bandwidth: 10 kHz

Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.177	0.2	43.6	-	43.8	-	79.0	66.0	-35.2	-
0.266	0.2	43.1	-	43.3	-	79.0	66.0	-35.7	-
0.548	0.2	26.0	-	26.2	-	73.0	60.0	-46.8	-
0.853	0.3	35.8	-	36.1	-	73.0	60.0	-36.9	-
0.953	0.3	44.0	-	44.3	-	73.0	60.0	-28.7	-
12.110	0.6	34.0	-	34.6	-	73.0	60.0	-38.4	-

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

4.4 TEST DATA OF RADIATED EMISSION

EUT: **48-CH DIGITAL I/O MODULE** MODEL: **PCM-3724**

POLARITY: Horizontal

DETECTOR FUNCTION: Quasi-peak 6 dB BANDWIDTH: 120 kHz

FREQUENCY RANGE: 30-1000 MHz MEASURED DISTANCE: 10 M

Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)
49.00	9.0	24.7	33.7	40.0	-6.3	274	173
71.60	6.8	31.0	37.8	40.0	-2.2	278	7
126.98	12.9	17.9	30.8	40.0	-9.2	400	129
133.64	13.2	23.3	36.5	40.0	-3.5	400	47
150.38	12.7	18.4	31.1	40.0	-8.9	400	66
167.08	11.7	21.6	33.3	40.0	-6.7	400	213
187.28	11.3	23.3	34.6	40.0	-5.4	400	114
200.48	11.7	20.3	32.0	40.0	-8.0	400	155
216.78	12.5	17.5	30.0	40.0	-10.0	316	242
225.53	13.0	17.1	30.1	40.0	-9.9	254	289
367.48	17.6	18.6	36.2	47.0	-10.8	387	82

REMARKS:
1. Emission level (dBuV/m) = Correction Factor (dB) + Reading value (dBuV).
2. Correction Factor (dB) = Ant. Factor (dB)+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: **48-CH DIGITAL I/O MODULE** MODEL: **PCM-3724**

POLARITY: Vertical

DETECTOR FUNCTION: Quasi-peak 6 dB BANDWIDTH: 120 kHz

FREQUENCY RANGE: 30-1000 MHz MEASURED DISTANCE: 10 M

Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)
48.99	9.0	26.3	35.3	40.0	-4.7	175	88
70.41	6.5	29.2	35.7	40.0	-4.3	157	352
123.60	12.7	23.2	35.9	40.0	-4.1	100	252
134.18	13.2	21.4	34.6	40.0	-5.4	100	182
165.90	11.8	23.5	35.3	40.0	-4.7	100	19
186.18	11.3	21.5	32.8	40.0	-7.2	100	168
200.48	11.7	24.6	36.3	40.0	-3.7	100	168
216.73	12.5	20.7	33.2	40.0	-6.8	100	315
225.55	13.0	19.7	32.7	40.0	-7.3	100	114
367.48	17.6	16.9	34.5	47.0	-12.5	100	169

REMARKS:
1. Emission level (dBuV/m) = Correction Factor (dB) + Reading value (dBuV).
2. Correction Factor (dB) = Ant. Factor (dB)+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

Generic Standard	:	EN 50082-2: 1995	
Basic Standard Specification and Performance Criteria	:	EN 61000-4-2	(Electrostatic Discharge, ESD, 8kV air discharge, 4kV Contact discharge, Performance Criterion B)
		EN 61000-4-3	(Radio-Frequency Electromagnetic Field Susceptibility Test, RS, 80-1000 MHz, 10V/m, 80% AM (1kHz), Performance Criterion A)
		EN 61000-4-4	(Electrical Fast Transient/Burst, EFT, Power line: 2kV, Signal line: 1kV, Performance Criterion B)
		EN 61000-4-6	(Conducted Radio Frequency Disturbances Test, CS, 0.15-80 MHz, 10V/m, 80% AM, 1kHz, Performance Criterion A)
		EN 61000-4-8	(Power Frequency Magnetic Field Test, 50 Hz, 30A/m, Performance Criterion A)
		ENV 50204	(Radio-Frequency Electromagnetic Field, Pulse modulated, 900+/-5 MHz, 10V/m, 50 % duty cycle, Rep. Frequency 200 Hz, Performance Criterion A)
Input Voltage	:	230 Vac, 50 Hz	
Temperature	:	21 degree C	
Humidity	:	54 %	
Atmospheric Pressure	:	1002 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 **4.2**

5.4 TEST RESULT OF ELECTROSTATIC DISCHARGE (ESD)

Basic Standard	:	EN 61000-4-2
Discharge Impedance	:	330 ohm / 150 pF
Discharge Voltage	:	Air Discharge - 8 kV (Direct)
		Contact Discharge - 4 kV (Indirect)
Polarity	:	Positive/Negative
Number of Discharge	:	Minimum 20 times at each test point
Discharge Mode	:	Single Discharge
Discharge Period	:	1-second minimum

Test Result		Remarks
Criterion A	**PASS**	MODEL: PCM-3724

OBSERVATION DESCRIPTION

Direct Application			Test Result	
Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge
8	+/-	1	NA	Note 1

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

1. Cable connector

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

Description of test point:

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

Description of test result:

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

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 Result		Remarks
Criterion A	**PASS**	MODEL: PCM-3724

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 - NA
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 Result		Remarks
Criterion A	**PASS**	MODEL: PCM-3724

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:

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

Test Result		Remarks
Criterion A	**PASS**	MODEL: PCM-3724

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	:	30 A/m
Observation Time	:	1 minute
Inductance coil	:	Rectangular type, 1mx1m

Test Result		Remarks
Criterion A	**PASS**	MODEL: PCM-3724

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 Result		Remarks
Criterion A	**PASS**	MODEL: PCM-3724

Note: Four sides of EUT are verified separately.

OBSERVATION DESCRIPTION

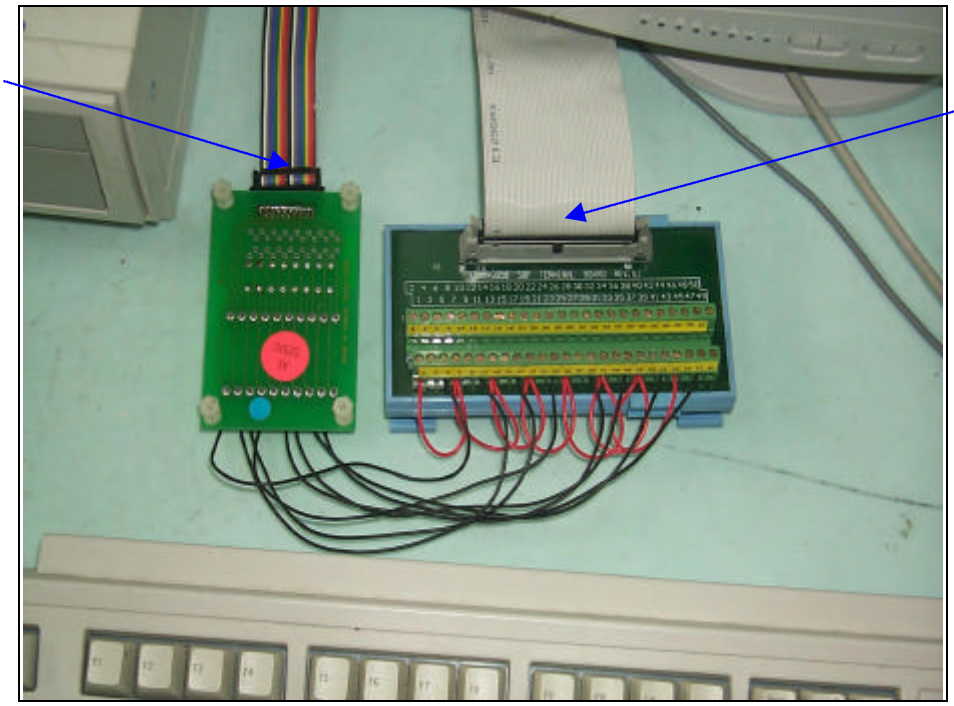
There was no change compared with initial operation during the test.

6. PHOTOGRAPHS OF THE TEST CONFIGURATION

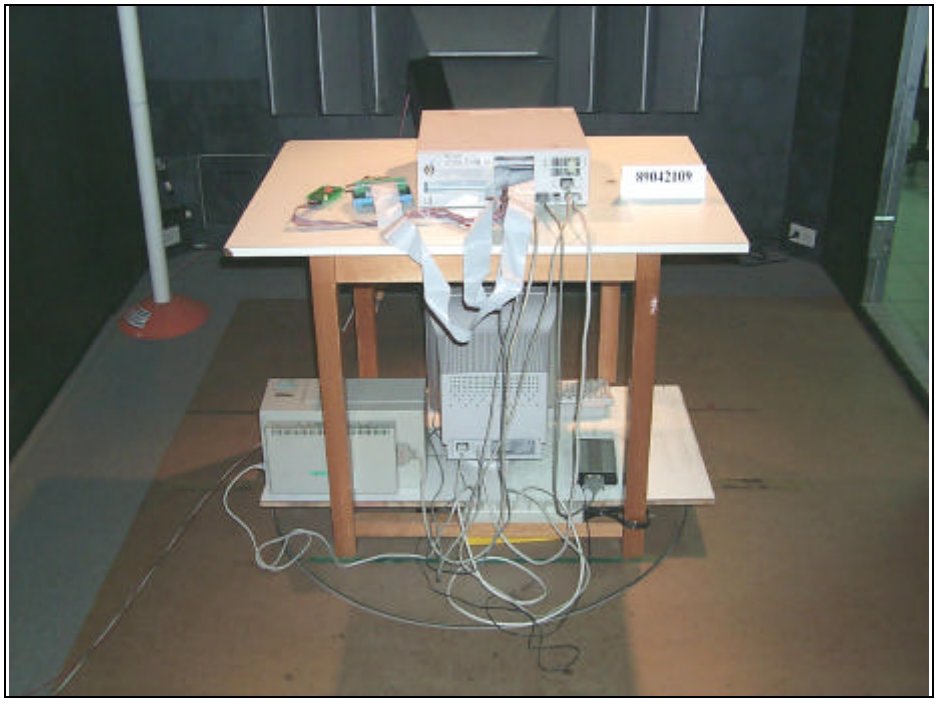
CONDUCTED EMISSION TEST

RADIATED EMISSION TEST

ESD TEST



RS TEST & PULSE MODULATION TEST



EFT TEST

CONDUCTED SUSCEPTIBILITY TEST

MAGNETIC TEST

7. APPENDIX - INFORMATION OF THE TESTING LABORATORY

Information of the testing laboratory

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

• USA	FCC, UL, NVLAP
• Germany	TUV Rheinland
	TUV Product Service
• Japan	VCCI
• New Zealand	RFS
• Norway	NEMKO, DNV
• U.K.	INCHCAPE
• R.O.C.	BSMI

Enclosed please find some certificates of our laboratory obtained from approval agencies. If you have any comments, please feel free to contact us with the following:

Lin Kou EMC Lab.:
Tel: 886-2-26032180
Fax: 886-2-26022943

Hsin Chu EMC Lab:
Tel: 886-35-935343
Fax: 886-35-935342

Lin Kou Safety Lab.:
Tel: 886-2-26093195
Fax: 886-2-26093184

Design Center:
Tel: 886-2-26093195
Fax: 886-2-26093184

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