

# EMC TEST REPORT

Authorized under Declaration of Conformity

according to

EN 55022 : 1998/ A1:2000 (Class B)

EN 61000-3-2 : 1995/ A1/ A2:1998/ A14:2000

EN 61000-3-3 : 1995/ A1:1998

EN 55024 : 1998

IEC 61000-4-2 : 1995/ A1:1998/ A2:2000

IEC 61000-4-3 : 1996/ A1:1998/ A2:2000

IEC 61000-4-4 : 1995/ A2:2000

IEC 61000-4-5 : 1995/ A2:2000

IEC 61000-4-6 : 1996/ A2:2000

IEC 61000-4-11 : 1994/ A2:2000

Applicant	TRENDware International, Inc.
Address	3135 Kashiwa Street, Torrance, CA90505 U.S.A.
Equipment	4-Port ADSL Modem Firewall Router
Model No.	TW100-BRM504
Trade Name	TRENDware

- The test result refers exclusively to the test presented test model / sample.
- Without written approval of *Exclusive Certification Corp.* the test report shall not be reproduced except in full.

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## CERTIFICATE OF COMPLIANCE

according to

EN 55022 : 1998/ A1:2000 (Class B)  
EN 61000-3-2 : 1995/ A1/ A2:1998/ A14:2000  
EN 61000-3-3 : 1995/ A1:1998

EN 55024 : 1998  
IEC 61000-4-2 : 1995/ A1:1998/ A2:2000  
IEC 61000-4-3 : 1996/ A1:1998/ A2:2000  
IEC 61000-4-4 : 1995/ A2:2000  
IEC 61000-4-5 : 1995/ A2:2000  
IEC 61000-4-6 : 1996/ A2:2000  
IEC 61000-4-11 : 1994/ A2:2000

Applicant	TRENDware International, Inc.
Address	3135 Kashiwa Street, Torrance, CA90505 U.S.A.
Equipment	4-Port ADSL Modem Firewall Router
Model No.	TW100-BRM504

### I HEREBY CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **EUROPEAN COUNCIL DIRECTIVE 89/336/EEC**. The equipment was **passed** the test performed according to **European Standard EN 55022:1998/ A1:2000 (Class B), EN 61000-3-2:1995/ A1/ A2:1998/ A14:2000, EN 61000-3-3:1995/ A1:1998 and EN 55024:1998 (IEC 61000-4-2 : 1995/ A1:1998/ A2:2000, IEC 61000-4-3 : 1996/ A1:1998/ A2:2000, IEC 61000-4-4 : 1995/ A2:2000, IEC 61000-4-5 : 1995/ A2:2000, IEC 61000-4-6 : 1996/ A2:2000, IEC 61000-4-11 : 1994/ A2:2000 )**.

The test was carried out on Oct. 23, 2003 at Electronics Testing Center, Taiwan.

Signature

\_\_\_\_\_  
Anson Chou / Manager

## Definition

Unintentional radiator:

A device that intentionally generates and radio frequency energy for use within the device, or that sends radio frequency signals by conduction to associated equipment via connecting wiring, but which is not intended to emit RF energy by radiation or induction.

Class A Digital Device:

A digital device Which is marketed for use in commercial or business environment; exclusive of a device which is market for use by the general public, or which is intended to be used in the home.

Class B Digital Device:

A digital device which is marketed for use in a residential environment notwithstanding use in a commercial, business or industrial environment. Example of such devices that are marketed for the general public.

Note:

A manufacturer may also qualify a device intended to be marketed in a commercial, business, or industrial environment as a Class B digital device, and in fact is encouraged to do so, In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B Digital Device, Regardless of its intended use.

Intentional radiator:

A device that intentionally generates and emits radio frequency energy by radiation or induction.

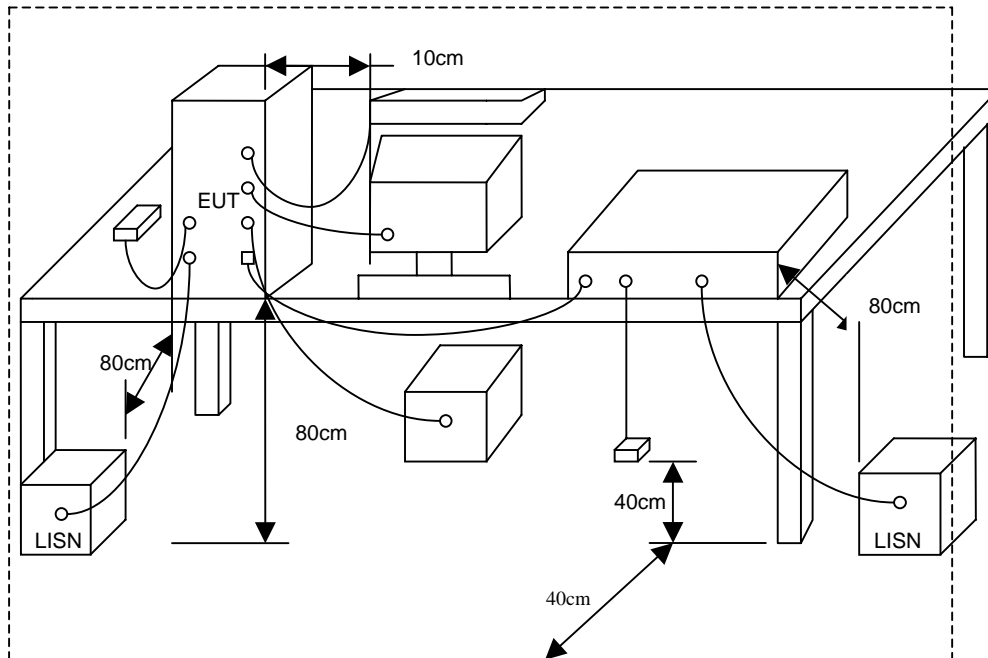
## 1. Test of Conducted Emission

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 kHz and return leads of the EUT according to the methods defined in European Standard EN 55022 Clause 9. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 2.2. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position producing maximum conducted emissions.

### 1.1. Test Procedures

- a. The EUT was placed on a desk 0.8 meters height from the metal ground plane and 0.4 meter from the conducting wall of the shielding room and it was kept at least 0.8 meters from any other grounded conducting surface.
- b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
- c. All the support units are connecting to the other LISN.
- d. The LISN provides 50 ohm coupling impedance for the measuring instrument.
- e. The CISPR states that a 50 ohm, 50 microhenry LISN should be used.
- f. Both sides of AC line were checked for maximum conducted interference.
- g. The frequency range from 150 kHz to 30 MHz was searched
- h. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

## 1.2. Typical Test Setup Layout of Conducted Emission



## 1.3. Conducted Emission Requirement

The equipment under test EUT shall meet the limits in table 1 and 3 or 2 and 4, as applicable, including the average limit and the quasi-peak limit when using, respectively, an average detector receiver and quasi-peak detector receiver and measured in accordance with the methods described in clause 9. Either the voltage limits or the current limits in table 3 or 4, as applicable, shall be met except for the measurement method of C.1.3 where both limits shall be met. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

If the reading of the measuring receiver shows fluctuations close to the limit, the reading shall be observed for at least 15 s at each measurement frequency, the higher reading shall be recorded with the exception of any brief isolated high reading which shall be ignored.

Frequency range (MHz)	Limits (dB $\mu$ V)	
	Quasi Peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5. to 30.	60	50
NOTE 1-The lower limits shall apply at the transition frequencies.		
NOTE 2-The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

## 2. Test of Radiated Emission

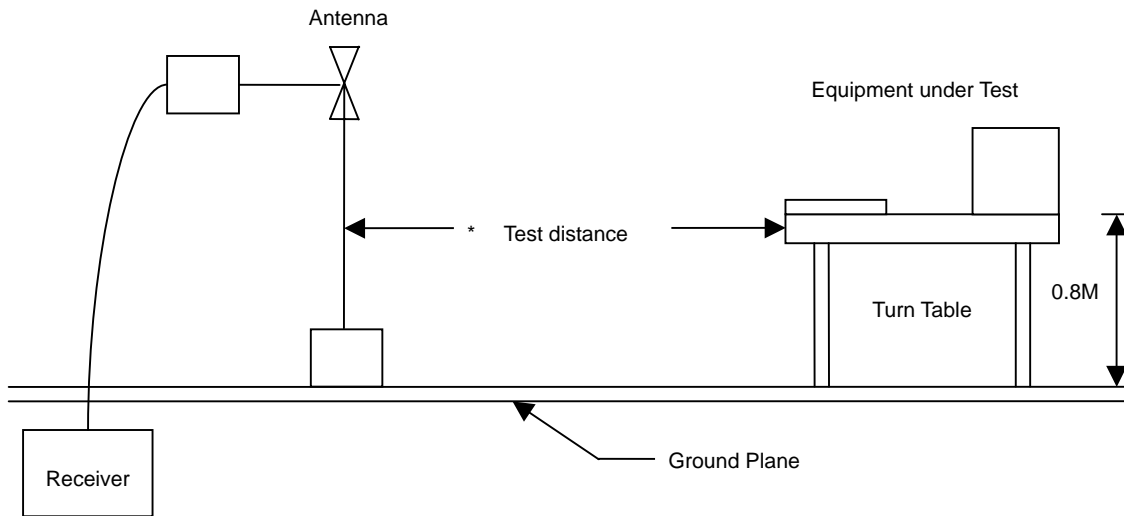
Radiated emissions from 30 MHz to 1000 MHz were measured with a bandwidth of 120 kHz according to the methods defines in European Standard EN 55022, Clause 10. The EUT was placed on a nonmetallic stand in the open-field site, 0.8 meter above the ground plane, as shown in section 3.2. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

### 2.1. Test Procedures

- a. The EUT was placed on a rotatable table top 0.8 meter above ground.
- b. The EUT was set 10 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- c. The table was rotated 360 degrees to determine the position of the highest radiation.
- d. The antenna is a half wave dipole and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- f. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.



## 2.2. Typical Test Setup Layout of Radiated Emission



## 2.3. Radiated Emission Requirement

The EUT shall meet limits of tables as below when measured at the measuring distance R in accordance with the methods described in clause 10. If the reading on the measuring receiver shows fluctuations close to the limit, the reading shall be observed for at least 15 s at each isolated high reading, which shall be ignored.

Limit for radiated disturbance of class B ITE at a measuring distance of 10 m

Frequency (MHz)	Quasi-peak limits dB (uV/m)
30 to 230	30
230 to 1000	37
Note 1- The lower limit shall apply at the transition frequency. 2- Additional provisions may be required for cases where interference occurs.	

## 2.4. Test Procedures

The equipment shall be tested under the conditions of **Clause 5**.

The total impedance of the test circuit, excluding the appliance under test, but including the internal impedance of the supply source, shall be equal to the reference impedance. The stability and tolerance of the reference impedance shall be adequate to ensure that the overall accuracy of  $\pm 8\%$  is achieved during the whole assessment procedure.

### 3. Harmonics Test

As specified on clause 7 and figure Z1 of EN 61000-3-2:2000, the limits are not specified for equipment with a rated power of 75W or less.

The EUT meets the above condition, so it conforms to EN 61000-3-2.

## 4. Voltage Fluctuations Test

### 4.1. STANDARD

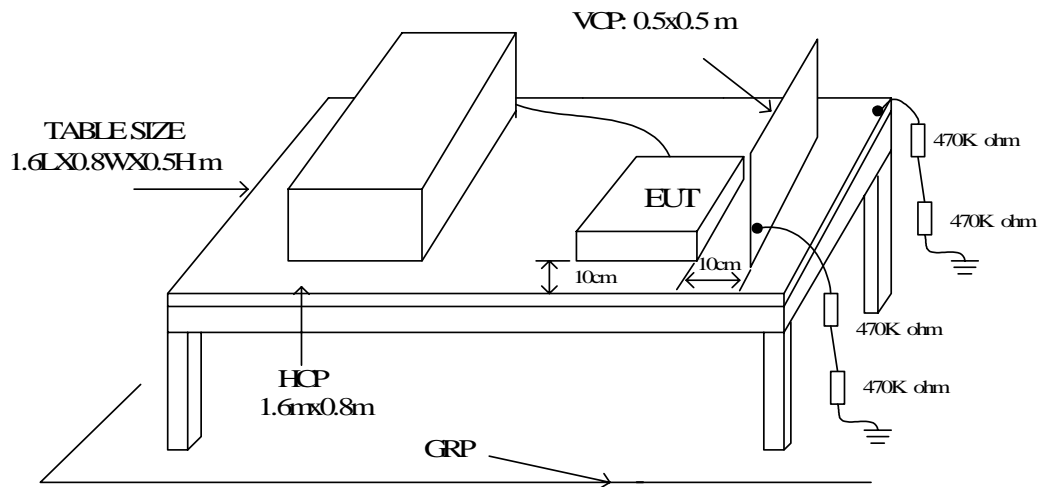
Product Standard: EN 61000-3-3:1995/A1:2001

### 4.2. Test Procedure

The equipment shall be tested under the conditions of **Clause 5**.

The total impedance of the test circuit, excluding the appliance under test, but including the internal impedance of the supply source, shall be equal to the reference impedance. The stability and tolerance of the reference impedance shall be adequate to ensure that the overall accuracy of  $\pm 8\%$  is achieved during the whole assessment procedure.

## 5. Test setup (ESD)



The test setup consists of the test generator, EUT and auxiliary instrumentation necessary to perform DIRECT and INDIRECT application of discharges to the EUT as applicable, in the following manner :

- a. CONTACT DISCHARGE to the conductive surfaces and to coupling plane;
- b. AIR DISCHARGE at insulating surfaces.

The preferred test method is that of type tests performed in laboratories and the only accepted method of demonstrating conformance with this standard. The EUT was arranged as closely as possible to arrangement in final installed conditions.

### 5.1. Test Setup for Tests Performed in Laboratory

A ground reference plane was provided on the floor of the test site. It was a metallic sheet (copper or aluminum) of 0.25 mm, minimum thickness; other metallic may be used but they shall have at least 0.65 mm thickness. In the Electronics Testing Center, Taiwan, we provided 1 mm thickness stainless steel ground reference plane. The minimum size of the ground reference plane is 2.5 m x 2.5 m, the exact size depending on the dimensions of the EUT. It was connected to the protective grounding system.

The EUT was arranged and connected according to its functional requirements. A distance of 1m minimum was provided between the EUT and the wall of the lab. and any other metallic structure. In cases where this length exceeds the length necessary to apply the discharges to the selected points, the excess length shall, where possible, be placed non-inductively off the ground reference plane and shall not come closer than 0.2m to other conductive parts in the test setup.

Where the EUT is installed on a metal table, the table was connected to the reference plane via a cable with a 470k ohm resistor located at each end, to prevent a build-up of charge. The test setup was consist a wooden table, 0.8m high, standing on the ground reference plane. A HCP, 1.6 m x 0.8 m, was placed on the table. The EUT and cables was isolated from the HCP by an insulating support 0.5 mm thick. The VCP size, 0.5 m x 0.5 m.

## 5.2. Test Procedure

- a. In the case of air discharge testing the climatic conditions shall be within the following ranges:
  - ambient temperature: 15 to 35 ;
  - relative humidity : 30 to 60 ;
  - atmospheric pressure : 68 KPa (680 mbar) to 106 KPa (1060 mbar).
- b. Test programs and software shall be chosen so as to exercise all normal modes of operation of the EUT. The use of special exercising software is encouraged, but permitted only where it can be shown that the EUT is being comprehensively exercised.
- c. The test voltage shall be increased from the minimum to the selected test severity level, in order to determine any threshold of failure. The final severity level should not exceed the product specification value in order to avoid damage to the equipment.
- d. The test shall be performed with both air discharge and contact discharge. On preselected points at least 10 single discharges (in the most sensitive polarity) shall be applied on air discharge. On preselected points at least 25 single discharges (in the most sensitive polarity) shall be applied on contact discharge.
- e. For the time interval between successive single discharges an initial value of one second is recommended. Longer intervals may be necessary to determine whether a system failure has occurred.
- f. In the case of contact discharges, the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.
- g. In the case of painted surface covering a conducting substrate, the following procedure shall be adopted :
  - ✧ If the coating is not declared to be an insulating coating by the equipment manufacturer, then the pointed tip of the generator shall penetrate the coating so as to make contact with the conducting substrate.
  - ✧ Coating declared as insulating by the manufacturer shall only be submitted to the air discharge.
  - ✧ The contact discharge test shall not be applied to such surfaces.
- h. In the case of air discharges, the round discharge tip of the discharge electrode shall be approached as fast as possible (without causing mechanical damage) to touch the EUT . After each discharge, the ESD generator (discharge electrode) shall be removed from the EUT. The generator is then retriggered for a new single discharge. This procedure shall be repeated until the discharges are completed. In the case of an air discharge test, the discharge switch, which is used for contact discharge, shall be closed.

### 5.3. Test Severity Levels

Contact Discharge		Air Discharge	
Level	Test Voltage (KV) of Contact discharge	Level	Test Voltage (KV) of Air Discharge
1	±2	1	±2
2	±4	2	±4
3	±6	3	±8
4	±8	4	±15
X	Specified	X	Specified
Remark: "X" is an open level.			

## 6. Test Procedure (RS)

- a. The equipment to be tested is placed in the center of the enclosure on a wooden table. The equipment is then connected to power and signal leads according to pertinent installation instructions.
- b. The antenna which is enabling the complete frequency range of 80-1000 MHz is placed 3m away from the equipment. The required field strength is determined by placing the field strength meter(s) on top of or directly alongside the equipment under test and monitoring the field strength meter via a remote field strength indicator outside the enclosure while adjusting the continuous-wave to the applicable antennae.
- c. The test is normally performed with the antenna facing the most sensitive side of the EUT. The polarization of the field generated by the biconical antenna necessitates testing each position twice, once with the antenna positioned vertically and again with the antenna positioned horizontally. The circular polarization of the field from the log-spiral antenna makes a change of position of the antenna unnecessary.
- d. At each of the above conditions, the frequency range is swept 80-1000 MHz, pausing to adjust the R.F. signal level or to switch oscillators and antenna. The rate of sweep is in the order of  $1.5 \times 10^{-3}$  decades/s. The sensitive frequencies or frequencies of dominant interest may be discretely analyzed.

### 6.1. Test Severity Levels

Frequency Band : 80-1000 MHz	
Level	Test field strength (V/m)
1	1
2	3
3	10
X	Specified
Remark: "X" is an open class.	

## 7. Test on Power Line (EFT)

- a. The EFT/B-generator was located on the GRP.. The length from the EFT/B-generator to the EUT is not exceeding 1 m.
- b. The EFT/B-generator provides the ability to apply the test voltage in a non-symmetrical condition to the power supply input terminals of the EUT..

### 7.1. Test on Communication Lines

- a. The coupling clamp is composed of a clamp unit for housing the cable (length more than 3 m), and was placed on the GRP.
- b. The coupling clamp provides the ability of coupling the fast transient/bursts to the cable under test.

### 7.2. Test Procedure

- a. In order to minimize the effect of environmental parameters on test results, the climatic conditions when test is carrying out shall comply with the following requirements:
  - ✧ ambient temperature: 15 to 35 ;
  - ✧ relative humidity : 45 to 75 ;
  - ✧ Atmospheric pressure: 68 Kpa (680 mbar) to 106 Kpa (1060 mbar).
- b. In order to minimize the effect of environmental parameters on test results, the electromagnetic environment of the laboratory shall not influence the test results.
- c. The variety and diversity of equipment and systems to be tested make it difficult to establish general criteria for the evaluation of the effects of fast transients/bursts on equipment and systems.
- d. The test results may be classified on the basic of the operating conditions and the functional specification of the equipment under test, according to the following performance criteria :
  - ✧ Normal performance within the specification limits.
  - ✧ Temporary degradation or loss of function or performance which is self-recoverable.
  - ✧ Temporary degradation or loss of function or performance which requires operator intervention or system reset.
  - ✧ Degradation or loss of function which is not recoverable due to damage of equipment (components).



### 7.3. Test Severity Levels

The following test severity levels are recommended for the fast transient/burst test :

Open circuit output test voltage $\pm 10$		
Level	On Power Supply	On I/O signal, data and control line
1	0.5 KV	0.25 KV
2	1.0 KV	0.50 KV
3	2.0 KV	1.00 KV
4	4.0 KV	2.00 KV
X	Specified	Specified

Remark : “ X ” is an open level. The level is subject to negotiation between the user and the manufacturer or is specified by the manufacturer.

## 8. Test Procedure (Surge)

a. Climatic conditions

The climatic conditions shall comply with the following requirements :

- ✧ ambient temperature : 15 to 35
- ✧ relative humidity : 10 % to 75 %
- ✧ atmospheric pressure : 86 kPa to 106 kPa ( 860 mbar to 1060 mbar )

b. Electromagnetic conditions

the electromagnetic environment of the laboratory shall not influence the test results.

c. The test shall be performed according the test plan that shall specify the test set-up with

- ✧ generator and other equipment utilized;
- ✧ test level ( voltage/current );
- ✧ generator source impedance;
- ✧ internal or external generator trigger;
- ✧ number of tests : at least five positive and five negative at the selected points;
- ✧ repetition rate : maximum 1/min.
- ✧ inputs and outputs to be tested;
- ✧ representative operating conditions of the EUT;
- ✧ sequence of application of the surge to the circuit;
- ✧ phase angle in the case of AC. power supply;
- ✧ actual installation conditions, for example :

AC : neutral earthed,

DC : ( + ) or ( - ) earthed to simulated the actual earthing conditions.

- d. If not otherwise specified the surges have to be applied synchronized to the voltage phase at the zero-crossing and the peak value of the AC. voltage wave ( positive and negative ).
- e. The surges have to be applied line to line and line(s) and earth. When testing line to earth, the test voltage has to be applied successively between each of the lines and earth, if there is no other specification.
- f. The test procedure shall also consider the non-linear current-voltage characteristics of the equipment under test. Therefore the test voltage has to be increased by steps up to the test level specified in the product standard or test plan.
- g. All lower levels including the selected test level shall be satisfied. For testing the secondary protection, the output voltage of the generator shall be increased up to the worst-case voltage breakdown level ( let-through level ) of the primary protection.
- h. If the actual operating signal sources are not available, that may be simulated. Under no circumstances may the test level exceed the product specification. The test shall be carried out according to a test plan.
- i. To find all critical points of the duty cycle of the equipment, a sufficient number of positive and negative test pulses shall be applied. For acceptance test previously unstressed equipment shall be used to the protection devices shall be replaced.

### 8.1. Test Severity Levels

Level	Open-circuit test voltage, ± 10 , KV	NOTE
1	0.5	This level can be specified in the product specification.
2	1.0	
3	2.0	
4	4.0	
X	Specified	
Remark: “X” is an open class.		

## 9. Test Procedure (CS)

- a. The EUT shall be operated within its intended climatic conditions. The temperature and relative humidity should be recorded.
- b. This test method test can be performed without using a sell shielded enclosure. This is because the disturbance levels applied and the geometry of the setups are not likely to radiated a high amount of energy, especially at the lower frequencies. If under certain circumstances the radiated energy is too high, a shielded enclosure has to be used.
- c. 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.
- d. The frequency range is swept from 150 KHz to 230 MHz, using the signal levels established during the setting process, and with the disturbance signal 80% amplitude modulated with a 1KHz sign wave, pausing to adjust the RF-signal level or to switch coupling devices as necessary. The rate of sweep shall no exceed  $1.5 \times 10^{-3}$  decades/s. Where the frequency is swept incrementally, the step size shall no exceed 1% of the start and thereafter 1% of the preceding frequency value.
- e. 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 e.g. clock frequency (ies) and harmonics or frequencies of dominant interest shall be analyzed separately.
- f. An alternative test procedure may be adopted, wherein the frequency range is swept incrementally, with a step size not exceeding 4% of the start ad thereafter 4% of the preceding frequency value. The test level should be at least twice the value of the specified test level.
- g. In cases of dispute, the test procedure using a step size not exceeding 1% of the start and thereafter 1% of preceding frequency value shall take precedence.
- h. Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.
- i. The use of special exercising programs is recommended.
- j. Testing shall be performed according to a Test Plan, which shall be included in the test report.
- k. It may be necessary to carry out some investigatory testing in order to establish some aspects of the test plan.

### 9.1. Test Severity Levels

Level	Voltage Level ( EMF ),
1	1 V
2	3 V
3	10 V
x	Specified
NOTE - x is an open class. This level can be specified in the product specification.	

## 10. Testing Requirement and Procedure (DIP)

### 10.1. Test Conditions

1. Source voltage and frequency : 230V / 50Hz, Single phase.
2. Test of interval : 10 sec.
3. Level and duration : Sequence of 3 dips/interrupts.
4. Voltage rise (and fall) time : 1 ~ 5  $\mu$ s.
5. Test severity :

Voltage dips and Interrupt reduction (%)	Test Duration (ms)
30	500
60	100
100	10
100	80
100	5000

### 10.2. Operating Condition

Full system

## 11. Notice for Class A Product

**This Notice is for class A product only. If the Equipment under Test is a class B product, this notice should be disregarded.**

Class A ITE is a category of all other ITE which satisfies the class A ITE limits but not the class B ITE limits. Such equipment should not be restricted in its sale but the following warning shall be included in the instructions for use:

### **Warning**

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

## 12. Declaration of Conformity and the CE Mark

There are three possible procedures pertaining to the declaration of conformity:

### **12.1. Conformity Testing and Declaration of Conformity by the Manufacturer or His Authorized Representative Established within the Community or by an Importer.**

- Article 10 (1) of the EMC Directive,                      - § 3 (1) no. 2a of the EMC Act.

### **12.2. Declaration of Conformity Issued by the Manufacturer or His Authorized Representative Established within the Community or by an Importer Following Testing of the Product and Issued of an EC certificate of conformity by a competent body.**

- Article 10 (2) of the EMC Directive,                      - § 3 (1) no. 2b of the EMC Act.

### **12.3. Declaration of Conformity Issued by the Manufacturer or His Authorized Representative Established within the Community or by an Importer Following Testing and Certification of the Product by a Notified Body.**

- Article 10 (5) of the EMC Directive,  
- § 3 (1) no. 2b of the EMC Act (radio transmitting installations).

### **12.4. Specimen For The CE Marking Of Electrical / Electronic Equipment**

The components of the CE marking shall have substantially the same vertical dimension, which may not be less than 5 mm.



## 13. Test Configuration of Equipment under Test

### 13.1. Test Mode

- The following test mode was performed for conduction test.
- Frequency range investigated: conduction 150 KHz to 30 MHz, radiation 30 MHz to 1000MHz.

### 13.2. Description of Test System

Support Unit 1. – ADSL Router

Manufacturer : Sercomm

Model No. : IP505A

Power Cord : Non-Shielded, 1.2m

Support Unit 2. – Notebook PC

Manufacturer : Compaq

Model No. : Presario 2800

Power Cord : Non-Shielded, 1.8m

### 13.3. Test Software

At the same time, "Ping.EXE" was executed to link with the remote workstation to receive and transmit data by UTP Cable.



## 14. Feature of Equipment under Test

1. A powerful, true firewall.
2. Content filtering.
3. Auto Sensing and Auto Uplink™ LAN Ethernet connections.
4. Extensive Internet protocol support.
5. Easy, Web-based setup for installation and management.
6. A built-in ADSL modem.

### 14.1. History of this test report

The Model No. TW100-BRM504 (Report No:CE04020401-A) is the same and it only differs from the outside cosmetic. The functions and specifications are the same.

## 15. General Information of Test

Test Site :	Electronics Testing Center, Taiwan No. 34, Lin 5, Ding Fu Tsun, Linkou Hsiang, Taipei Hsien, Taiwan, R.O.C.
Test Voltage :	AC 230V/ 50Hz
Test in Compliance with :	EMI Test (conduction and radiation) : European Standard EN 55022 Class B Harmonics Test : European Standard EN 61000-3-2. Voltage Fluctuations Test : European Standard EN 61000-3-3. EMS Test : European Standard EN 55024. ESD : IEC 61000-4-2, RS : IEC 61000-4-3, EFT : IEC 61000-4-4, SURGE : IEC 61000-4-5, CS : IEC 61000-4-6, Power Frequency Magnetic Field : IEC 61000-4-8, DIPS : IEC 61000-4-11

## 16. Test Data and Result

### 16.1. Test Result of Conducted Emission

#### 16.1.1 Test Mode: Operation Mode

Relative Humidity : 65 %

Relative Humidity : 25°C

Test Date : Sep. 29, 2003

All emissions not reported here are more than 10 dB below the prescribed limit.

The Conducted Emission test was passed at minimum margin NEUTRAL 4.453 MHz / 51.7 dBuV.

#### N

Freq. (MHz)	Meter Reading (dBuV)		Factor (dB)	Result (dBuV)		Limit (dBuV)		Margins (dB)	
	Q.P Value	AVG. Value		Q.P Value	AVG. Value	Q.P Value	AVG. Value	Q.P	AVG.
3.285	40.9	---	0.6	41.5	---	56.0	46.0	-14.5	---
3.848	40.0	---	0.6	40.6	---	56.0	46.0	-15.4	---
4.055	48.2	33.6	0.6	48.8	34.2	56.0	46.0	-7.2	-11.8
4.258	50.4	38.0	0.6	51.0	38.6	56.0	46.0	-5.0	-7.4
4.453	51.7	39.2	0.6	52.3	39.8	56.0	46.0	-3.7	-6.2
4.468	48.8	35.9	0.6	49.4	36.5	56.0	46.0	-6.6	-9.5

#### L1

Freq. (MHz)	Meter Reading (dBuV)		Factor (dB)	Result (dBuV)		Limit (dBuV)		Margins (dB)	
	Q.P Value	AVG. Value		Q.P Value	AVG. Value	Q.P Value	AVG. Value	Q.P	AVG.
3.285	33.9	---	0.6	34.5	---	56.0	46.0	-21.5	---
3.848	33.4	---	0.6	34.0	---	56.0	46.0	-22.0	---
4.055	42.5	---	0.6	43.1	---	56.0	46.0	-12.9	---
4.258	44.3	---	0.6	44.9	---	56.0	46.0	-11.1	---
4.453	45.8	34.8	0.6	46.4	35.4	56.0	46.0	-9.6	-10.6
4.468	43.0	---	0.6	43.6	---	56.0	46.0	-12.4	---

#### Notes:

1. The EUT was placed 0.8m above reference ground plane.
2. Example calculation : result for 3.285 MHz:  $40.9 + 0.6 = 41.5 \text{ dB } \mu\text{V}$
3. The symbol of "---" means the Q.P. value is under the limit for AVG. so, the AVG.value doesn't need to be measured.

4. The expanded uncertainty of the conducted emission tests is 2.45 dB.

## CONDUCTION EMISSION TEST

## Peak Value

EUT: IP505A

Manuf:

Op Cond:

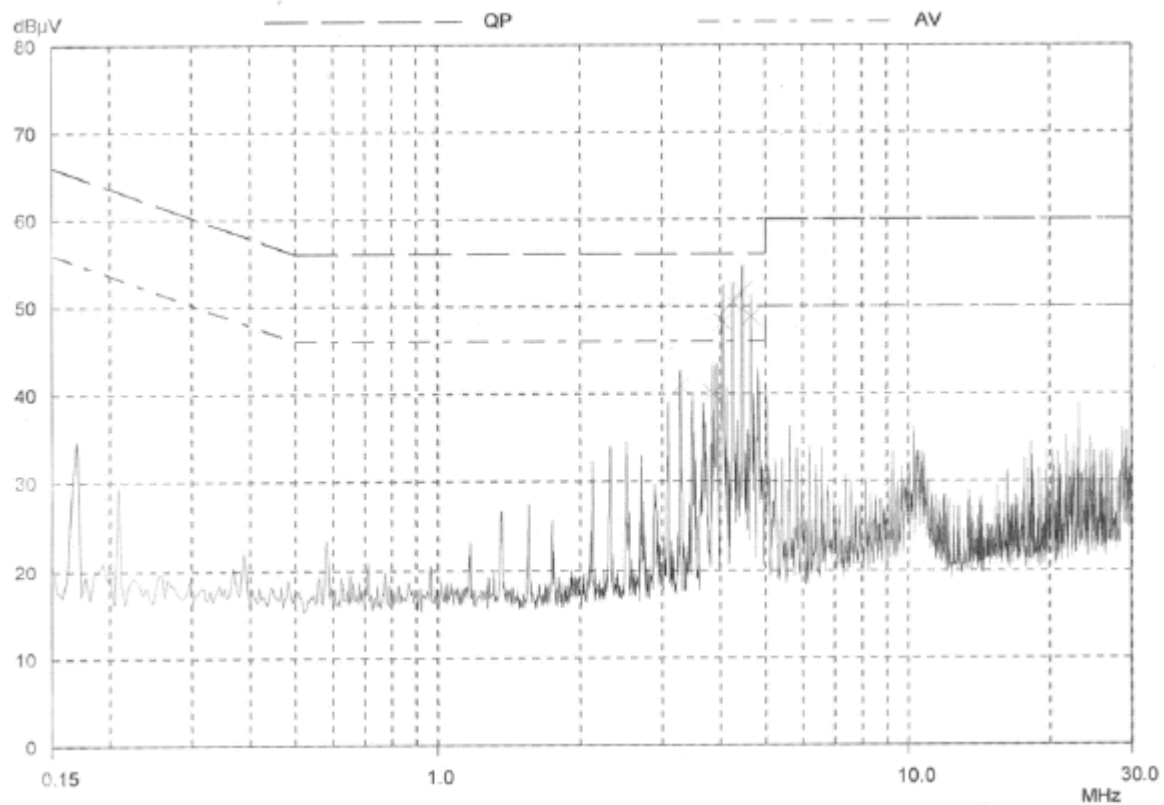
Operator:

Test Spec:

Comment:

N

Final Measurement:      Detector:      X QP  
                                 Meas Time:      1sec  
                                 Peaks:      8  
                                 Acc Margin:      25 dB



## CONDUCTION EMISSION TEST

## Peak Value

EUT: IP505A

Manuf:

Op Cond:

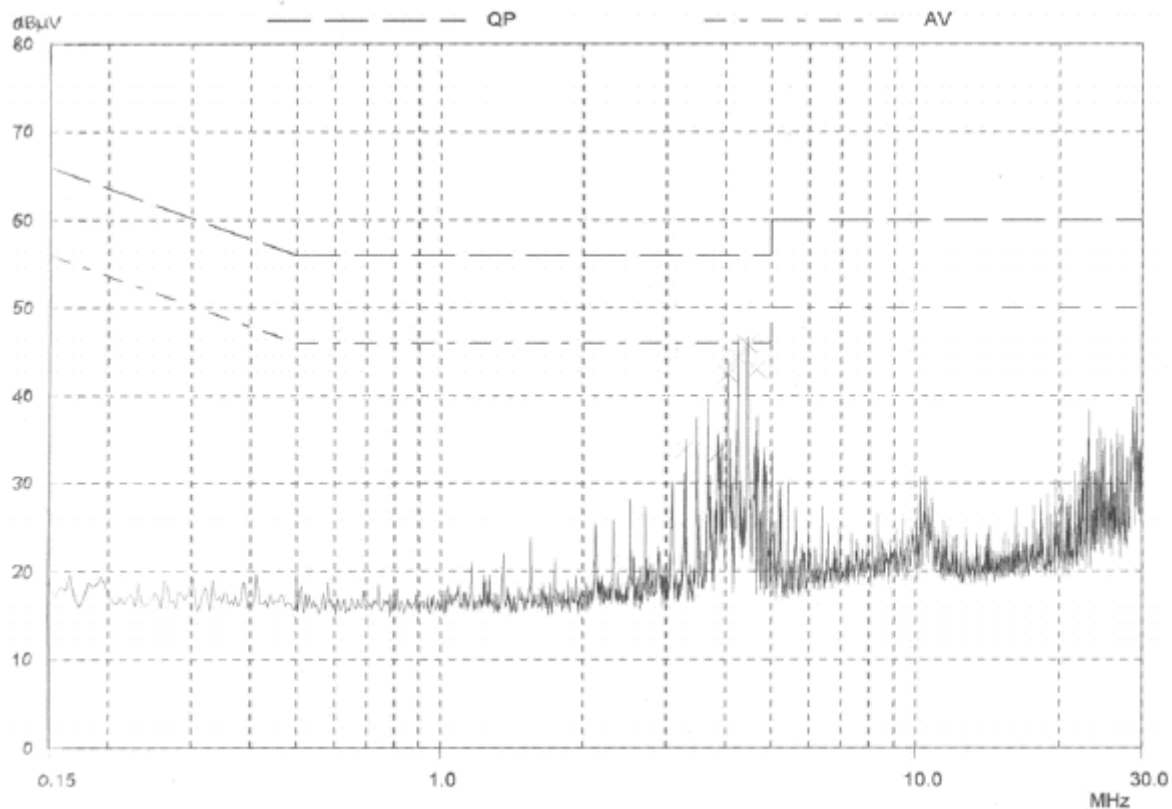
Operator:

Test Spec:

Comment:

L1

Final Measurement: Detector: X QP  
Meas Time: 1sec  
Peaks: 8  
Acc Margin: 25 dB



16.1.2 Photographs of Conducted Emission Test Configuration

FRONT VIEW



REAR VIEW



## 16.2. Test Result of Radiated Emission

### 16.2.1 Test Mode: Operation Mode

Relative Humidity : 65 %

Temperature : 25°C

Test Date : Sep. 29, 2003

Emission level (dBuV/m) = 20 log Emission level (uV/m)

Corrected Reading : Antenna Factor + Cable Loss + Read Level - Preamp  
Factor = Level

### HOR.

Emission frequency (MHz)	Meter Reading (dBuV)	CORR'd Factor (dB)	Results (dBuV/m)	Limit (3m) (dBuV/m)	Margins (dB)
42.952	30.9	-15.6	15.3	30	-14.7
200.914	39.4	-13.3	26.0	30	-4.0
250.856	41.4	-9.2	32.2	37	-4.8
231.800	39.0	-10.8	28.2	37	-8.8
377.011	36.3	-6.3	30.0	37	-7.0
500.897	32.8	-4.2	28.6	37	-8.4

### VERT.

Emission frequency (MHz)	Meter Reading (dBuV)	CORR'd Factor (dB)	Results (dBuV/m)	Limit (3m) (dBuV/m)	Margins (dB)
42.952	39.4	-15.6	23.8	30	-6.2
200.914	36.3	-13.3	23.0	30	-7.0
250.856	41.0	-9.2	31.8	37	-5.2
231.800	33.9	-10.8	23.1	37	-13.9
377.011	32.9	-6.3	26.6	37	-10.4
500.897	29.7	-4.2	25.5	37	-11.5

#### Notes:

1. Measurement Distance: 10 m
2. Height of table on which the EUT was placed: 0.8 m
3. Height of Receiving Antenna: 1 - 4 m
4. Example Calculation : result for 42.952 MHz: 30.9 + (-15.6) = 15.3 dBuV/ m
5. Remark "---" means that the emissions level is too low to be measured.
6. The expanded uncertainty of the radiated emission tests is -3.53 dB.



### 16.2.2 Photographs of Radiated Emission Test Configuration

- The photographs show the configuration that generates the maximum emission.

FRONT VIEW



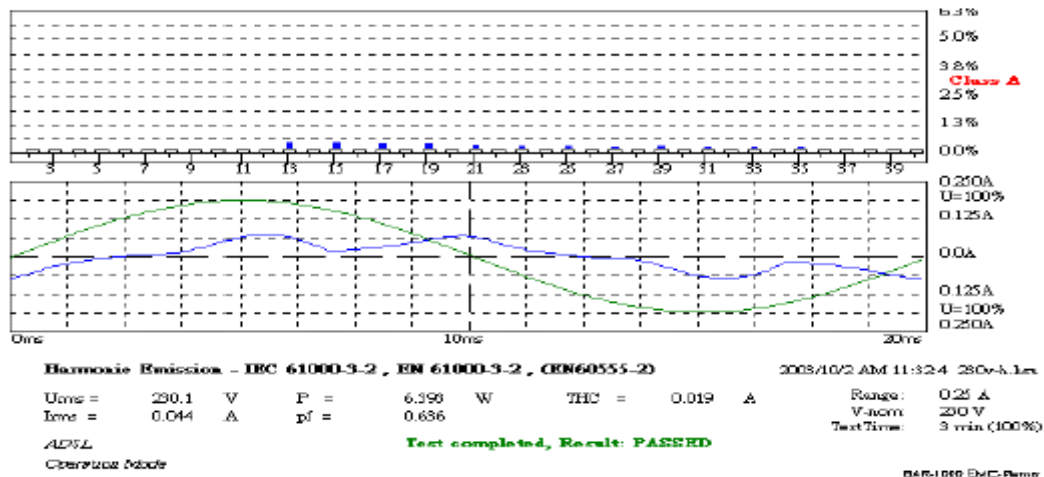
REAR VIEW



### 16.3. Harmonics Test

FINAL TEST RESULT : **PASS**  
 Fundamental Current : 0.082 A  
 Real Power : 11.69 W  
 Power Factor : 0.618  
 Temperature : 25°C  
 Relative Humidity : 45%  
 Test Date : Oct. 02, 2003

Urms = 230.1V Freq = 49.984 Range: 0.25A				Irms = 0.044A Ipk = 0.073A cf = 1.682			
P = 6.393W Pap = 10.06VA pf = 0.636				THDi = 42.70% THDu = 0.10% Calss A			
Test-Time : 3 min (100%)				Test completed Result: PASSED			
Order	Freq. (Hz)	I <sub>max</sub> (A)	Limit (A)	Order	Freq. (Hz)	I <sub>max</sub> (A)	Limit (A)
1	50	0.149		21	1050	0.0003	0.1071
2	100	0.0005	1.08	22	1100	0	0.0836
3	150	0.0122	2.3	23	1150	0.0002	0.978
4	200	0.0003	0.43	24	1200	0	0.0767
5	250	0.0136	1.14	25	1250	0.0002	0.09
6	300	0.0002	0.3	26	1300	0	0.0708
7	350	0.0019	0.77	27	1350	0.0001	0.0833
8	400	0.0001	0.23	28	1400	0	0.0657
9	450	0.0022	0.4	29	1450	0.0002	0.0776
10	500	0	0.184	30	1500	0	0.0613
11	550	0.0016	0.33	31	1550	0.0001	0.0726
12	600	0	0.1533	32	1600	0	0.0575
13	650	0.0008	0.21	33	1650	0.0001	0.0682
14	700	0	0.1314	34	1700	0	0.0541
15	750	0.0006	0.15	35	1750	0.0001	0.0643
16	800	0	0.115	36	1800	0	0.0511
17	850	0.0004	0.1324	37	1850	0.0001	0.0608
18	900	0	0.1022	38	1900	0	0.0484
19	950	0.0004	0.1184	39	1950	0.0001	0.0577
20	1000	0	0.092	40	2000	0	0.046



## 16.4. Voltage Fluctuations and Flicker Test

Basic Standard : EN 61000-3-3:1995/A1:1998

FINAL TEST RESULT : **PASS**

Temperature : 25

Test Data : Oct. 02, 2003

Relative Humidity : 45 % RH

	Pst	Plt	Dc ( % )	Dmax ( % )	Dt ( % )
Reading	0.070	0.070	0.00	0.00	0.00
Limit	0.65	1.0	3.0	4.0	3.0

### 16.4.1 TEST EQUIPMENT SETTINGS

- Line Voltage : 230 V
- Line Frequency : 50 Hz
- Pst Integration Periods : 1
- Test Duration : 00:10:00 minutes
- Measurement Delay : 10.0 seconds
- Pst Integration Time : 10 minutes

16.4.2 Photographs of Harmonics test, Voltage Fluctuation and Flicker test

Harmonics



Flicker



## 16.5. Electrostatic Discharge Immunity Test (ESD)

Final Test Result	: <b>PASS</b>
Pass performance Criteria	: A
Required performance criteria	: B
Basic Standard	: IEC 61000-4-2:1995
Product Standard	: EN 55024:1998/A1:2001
Level	: 3 for air discharge, 2 for contact discharge
Test Voltage	: $\pm 2 / \pm 4 / \pm 8$ KV for air discharge, $\pm 2 / \pm 4$ KV for contact discharge
Temperature	: 25 °C
Relative Humidity	: 50 %
Atmospheric Pressure	: 990 mbar
Test Date	: Oct. 08, 2003

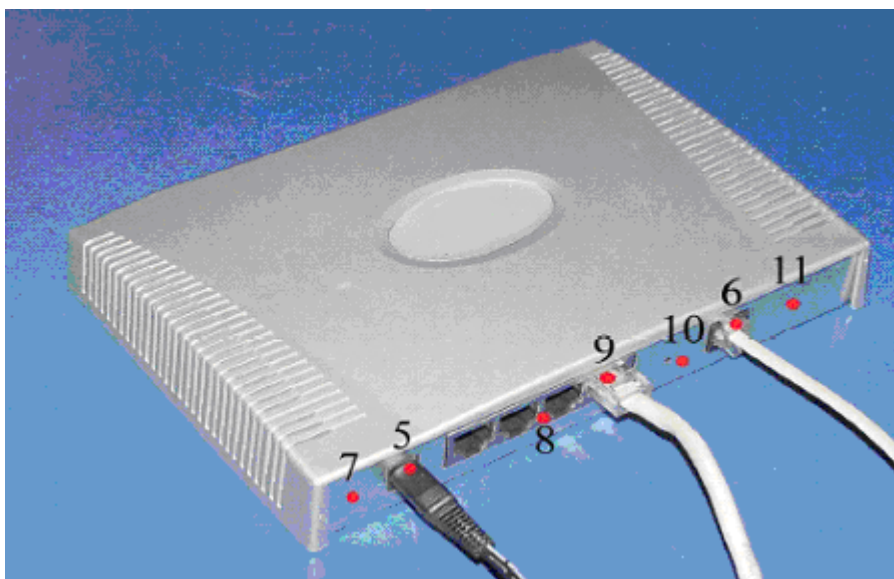
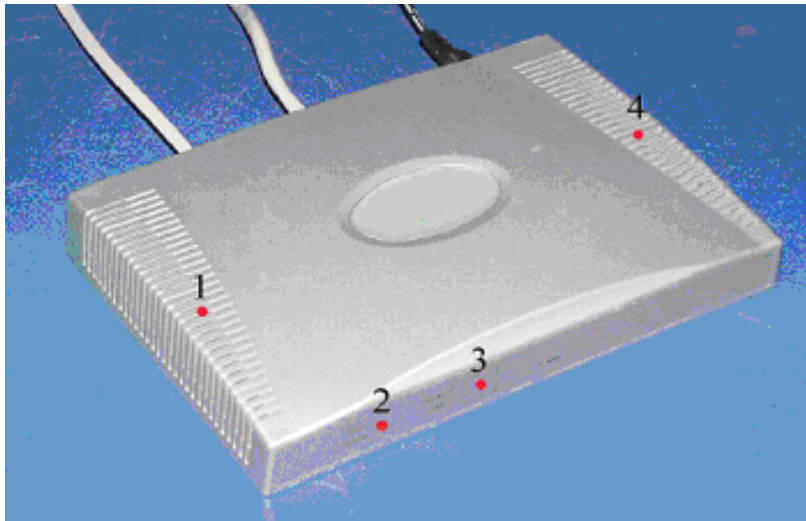
### 16.5.1 Test Record

	Contact Discharge: <u>25</u> times / each						Air Discharge: <u>10</u> times / each					
Voltage	2 kV		4 kV		kV		2 kV		4 kV		8 kV	
Point\Polarity	+		+		+		+		+		+	
HCP	A	A	A	A	---	---	---	---	---	---	---	---
VCP	A	A	A	A	---	---	---	---	---	---	---	---
P <sub>1</sub> ~P <sub>6</sub>	---	---	---	---	---	---	A	A	A	A	A	A
P <sub>7</sub> ~P <sub>11</sub>	B	B	B	B	---	---	---	---	---	---	---	---

Note: "A" means the EUT function was normal during the test.

"B" means the EUT's function was fail during test. After test, the EUT operate as intended without operator intervention.

## 16.5.2 TEST POINTS





## 16.5.3 Photographs of Electrostatic Discharge Immunity Test



## 16.6. Radio Frequency Electromagnetic Field Immunity Test (RS)

Final Test Result	: <b>PASS</b>
Pass performance Criteria	: A
Required performance criteria	: A
Basic Standard	: IEC 61000-4-3:1995
Product Standard	: EN 55024:1998/A1:2001
Level	: 2
Frequency Range	: 80-1000 MHz
Field Strength	: 3 V/m (Modulated 80% AM)
Temperature	: 26 °C
Relative Humidity	: 65 %
Atmospheric Pressure	: 990 mbar
Test Date	: Oct. 21, 2003

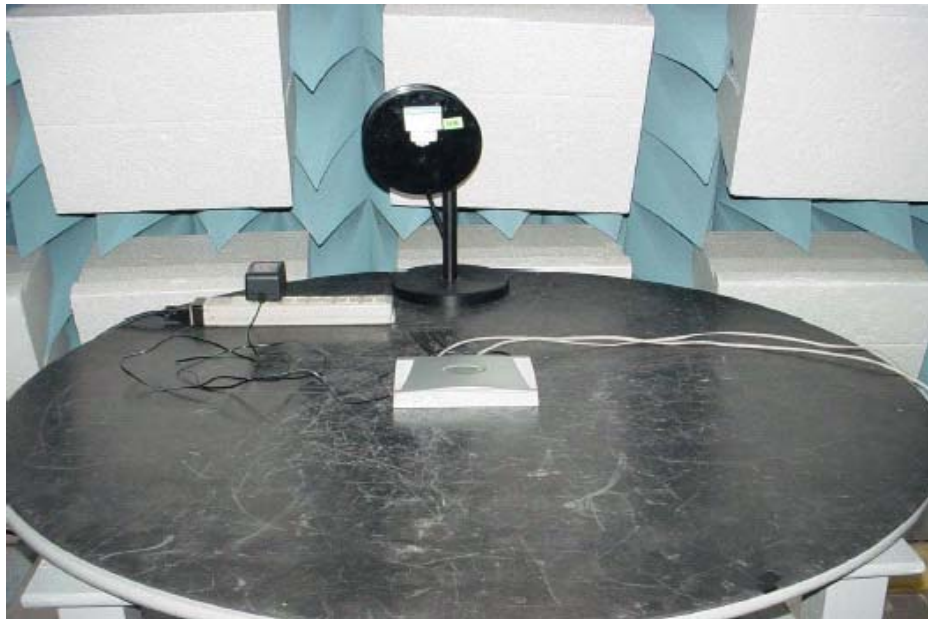
### 16.6.1 Test Record

Modulation : AM 80% , 1KHz sine wave , Dell time: 2.9 S			
Frequency Step Size : 1 % of preceding frequency value			
Frequency	Field strength (V/m)	Polarization of Device	Result
80~1000	3 V/m	Vertical	A
80~1000	3 V/m	Vertical	A
80~1000	3 V/m	Vertical	A

Note : "A " means the EUT function was normal during the test .



16.6.2 Photographs of Radio Frequency Electromagnetic Field Immunity Test



**16.7. Electrical Fast Transient/Burst Immunity Test (EFT/BURST)**

Final Test Result	: PASS
Pass performance Criteria	: A
Required performance criteria	: B
Basic Standard	: IEC 61000-4-4:1995
Product Standard	: EN 55024:1998/A1:2001
Level	: 2
Test Voltage	: on Power Supply – 2 : on I/O signal, data and control line -- 2
Temperature	: 25 °C
Relative Humidity	: 45 %
Atmospheric Pressure	: 990 mbar
Test Date	: Oct. 03, 2003

**16.7.1 Test Recode**

Pulse : 5/50 ns		Repetition Rate: <u>2.5 kHz</u> above 2.0 kV			
Burst : 15m/300ms		<u>5 kHz</u> below and equal 2.0Kv			
Voltage/ Mode/ Polarity/ Result/ Phase		<u>0.5</u> kV		<u>1</u> kV	
		+		+	
Power Line	L	A	A	A	A
	N	A	A	A	A
	L-N	A	A	A	A
Signal Line (RJ-45)		A	A	A	---
Tel Line (RJ-45)		A	A	A	---

Note : "A" Means the EUT function was normal during the test.

16.7.2 Photographs of Electrical Fast Transient/BURST Immunity Test

FRONT VIEW



REAR VIEW



## 16.8. Surge Immunity Test

FINAL TEST RESULT	:	<b>PASS</b>
Pass performance Criteria	:	A
Required performance criteria	:	B
Basic Standard	:	IEC 61000-4-5 (1995)
Product Standard	:	EN 55024:1998/A1:2001
Surge wave form (Tr/Th)	:	1, 2/50 8/20 $\mu$ s
Level	:	on Signal ports And Telecommunication – N/A on Input AC Power Port -- 2
Test Voltage	:	on Signal ports And Telecommunication – N/A on Input AC Power Port -- $\pm 1.0$ KV
Temperature	:	25 °C
Relative Humidity	:	45 %
Atmospheric Pressure	:	990 mbar
Test Date	:	Oct. 03, 2003

### 16.8.1 Test Recode

Waveform : 1.2/50 $\mu$ s(8/20 $\mu$ s) Repetition rate : <u>60</u> sec Time : <u>1</u> time/each condition							
Voltage / Mode / Polarity / Result			/Phase 0°	90°	180°	270°	360°
<u>0.5/ 1.0</u> kV	L-N	+	A	A	A	A	A
		-	A	A	A	A	A
<u>0.5</u> kV	Tel Line	+	A	A	A	A	A
		-	A	A	A	A	A

Note: "A" Means the EUT function was normal during the test.

16.8.2 Photographs of Surge Immunity Test

FRONT VIEW



REAR VIEW



## 16.9. Conducted Disturbances Induced by Radio-Frequency Field Immunity Test (CS)

Final Test Result	: <b>PASS</b>
Pass performance Criteria	: A
Required performance criteria	: A
Basic Standard	: IEC 61000-4-6 (1996)
Product Standard	: EN 55024:1998/A1:2001
Level	: 2
Test Voltage	: 3 V rms ( Modulated, 1KHz, 80%, AM )
Frequency Range	: 0.15 MHz to 80 MHz
Test Port	: on AC Power
Dwell time	: 2.9 seconds
Frequency step size	: 1 %
Coupling mode	: CDN-M2 for AC power ports, CDN-RJ45 for Signal Ports
Temperature	: 23°C
Relative Humidity	: 50 %
Atmospheric Pressure	: 990 mbar
Test Date	: Oct. 23, 2003

### 16.9.1 Test Recode

Frequency : 0.15~80MHz    Modulation : AM 80%,1KHz sine wave    Dwell time: 2.9s			
Frequency Step Size : 1 % of preceding frequency value			
Frequency	Test mode	Voltage(V)	Result
0.15 ~ 80MHz	Power Line (M2)	3	A
0.15 ~ 80MHz	Lan Line	3	A
0.15 ~ 80MHz	Tel Line	3	A

Note: "A" Means the EUT function was normal during the test.



16.9.2 Photographs of CS Tests

POWER LINE



LAN LINE



TEL LINE





**16.10. Voltage Dips and Voltage Interruptions Immunity Tests**

Final Test Result	: <b>PASS</b>
Pass performance Criteria	: C for voltage interruption, A for voltage dips
Required performance criteria	: C for voltage interruption, B/C for voltage dips
Basic Standard	: IEC 61000-4-11 ( 1994 )
Product Standard	: EN 55024:1998/A1:2001
Temperature	: 25 °C
Relative Humidity	: 50 %
Atmospheric Pressure	: 990 mbar
Test Date	: Oct. 06, 2003

**16.10.1 Test Record**

Voltage(UT): AC <u>230</u> V <u>50</u> Hz Interval(s) : <u>10s</u> Times : <u>12</u>				
Test mod	Test level UT %	Durations (period )	Phase / Result	
			0°	180°
Voltage interruptions	>95%	250	C	C
Voltage dips	30%	0.5	A	A
	>95%	25	A	A

Note : " A " means the EUT function was normal during the test.

" C " means the EUT's power off during test, and recovered by itself after the test.

Test Engineer: 

Tiffany Wu

16.10.2 Photographs of Voltage Dips and Voltage Interruptions Immunity Tests



### 16.11. List of Measuring Equipment Used

#### <EMI>

Instrument	Manufacturer	Model No.	Calibration Date	Remark
Shielded Room	Riken	---	N.C.R.	Conduction
EMI test receiver	R&S	ESCS30	Nov. 28, 2002	Conduction
L.I.S.N.	EMCO	ESH2-Z5	Sep. 04, 2003	Conduction
Monitor	IBM	E54	N.C.R.	Conduction
Printer	HP	LaserJet 1000	N.C.R.	Conduction
Computer	Acer	Veriton 7500g	N.C.R.	Conduction
Amplifier Receiver	HP	8447D	Feb. 20, 2003	Radiation
Bilog Antenna	Chase	CBL6111C	Nov. 05, 2002	Radiation
Pre -selector	HP	85685A	Jan. 09, 2003	Radiation
Spectrum Analyzer	HP	8568B	Jan. 09, 2003	Radiation
Quasi-Peak Adaptor	HP	85650A	Jan. 09, 2003	Radiation

\* Calibration Interval of instruments listed above is one year.

#### < EMS>

Instrument	Manufacturer	Model No.	Calibration Date	Remark
EMC Immunitytester	EMC-Partener	TRANSIENT-1000	2003/8/18	ESD
Metering Unit & Probe	EMCO	7122	2003/7/15	RS
SMGL Generator	R&S	1020.2005.52	2003/12/24	RS
Amplifier	IFI	M5540	2003/12/10	RS
GTEM CELL	EMCO	5317	2003/7/10	RS
Data Processing	EMCO	7110	N.C.R.	RS
EMC Immunitytester	EMC-Partener	TRANSIENT-1000	2003/8/19	Surge/ EFT/DIP
Test System	FRANKONIA EMV-Mess-System GmbH	CIT-10	2003/7/23	CS
CDN	FRANKONIA EMV-Mess-System GmbH	CDN M2+M3	2003/7/17	CS
CDN	FRANKONIA EMV-MESS-SYSTEM GmbH	CDN RJ11	2003/7/17	CS
EM Injection Clamp	SCHAFFNER	KEMZ801	2003/8/22	CS