

EMC TEST REPORT

Report No.: EME-070538

Model No.: RU-87P SERIES

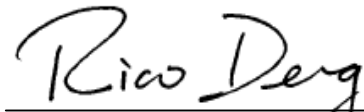
Issued Date: Jun. 11, 2007

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Test By: Intertek Testing Services Taiwan Ltd.
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Project Engineer


Rico Deng

Reviewed By


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1. General Information

1.1 Identification of the EUT

Product: ICPDAS CPU with Converter
Model No.: RU-87P SERIES
Applicant: ICP Das Co., Ltd.
Rated Power: 85-264Vac, 47-63Hz
Power Cord: 3C×18AWG×1.8meter unshielded cable
Data Cable: Fiber 10meter × 1
Sample receiving date: Jun. 04, 2007
Testing date: Jun. 06, 2007 ~ Jun. 07, 2007

1.2 Additional information about the EUT

The EUT is an ICPDAS CPU with Converter, and was defined as information technology equipment.

The modules are listed as below:

| Module | Diversity |
|----------|--|
| RU-87P2 | 2 slots Remote I/O Expansion Unit (For RS-485) |
| RU-87P4 | 4 slots Remote I/O Expansion Unit (For RS-485) |
| RU-87P8 | 8 slots Remote I/O Expansion Unit (For RS-485) |
| M-7033 | 3-channel RTD Input Module |
| M-7033D | 3-channel RTD Input Module , with LED Display |
| M-7041 | Isolated Digital Input Module |
| M-7041D | Isolated Digital Input Module , with LED Display |
| M-7050 | M-7050:Digital I/O Module |
| M-7050D | M-7050:Digital I/O Module , with LED Display |
| M-7052 | Isolated Digital Input Module |
| M-7052D | Isolated Digital Input Module , with LED Display |
| M-7053 | Non-isolated Digital Input Module |
| M-7053D | Non-isolated Digital Input Module , with LED Display |
| M-7060 | 4-channel Relay Output and 4-channel isolated Digital Input Module |
| M-7060D | 4-channel Relay Output and 4-channel isolated Digital Input Module ,with LED Display |
| M-7067 | Relay Output Module with Modbus protocol |
| M-7067D | Relay Output Module with Modbus protocol , with LED Display |
| M-7080 | Counter/Frequency Input Module |
| M-7080D | Counter/Frequency Input Module , with LED Display |
| I-87013W | 4-channel RTD Input Module |
| I-87017W | 8-channel Analog Input Module |
| I-87018W | 8-Channel Thermocouple Input Module |
| I-87018Z | 10-channel Thermocouple Input Module with High Over Voltage Protection |
| I-87024W | 4-channel 14-bit analog output module |
| I-87051W | 16-channel Non-isolated Digital Input Module |
| I-87052W | 8-channel Non-isolation Digital Input Module |
| I-87055W | 16-channel Non-isolated Digital I/O Module |
| I-87057W | 16-channel Isolated Open Collector Output Module |
| I-87058W | 8-Channel Isolated Digital Input Module |
| I-87063W | 8-Channel Power Relay Output Module |
| I-87064W | 8-Channel Power Relay Output Module |
| I-87066W | 8-channel SSR-DC Output Module |
| I-87068W | 8-channel Relay Output Module |
| I-7018Z | 10 channel Thermocouple Input Module with High Voltage Protection |

For more detail features, please refer to user's Manual.

1.3 Peripherals equipment

| Peripherals | Manufacturer | Product No. | Serial No. |
|------------------|--------------|-------------|------------|
| RS-232 Converter | N/A | i-7502OR | N/A |
| RS-485 Converter | N/A | ICP CON | N/A |
| Notebook PC | Compaq | DP2130 | 3912A556 |

2. Test Summary

| <i>Emission</i> | | | |
|---|-------------------------------|---------------|---|
| Standard | Test Type | Result | Remarks |
| EN 55022: 1998 +A1: 2000+A2: 2003 Class A | Conducted Test | PASS | Pass by -26.37 dB at 0.243 MHz Line Phase |
| | Radiated Test | PASS | Pass by -9.56 dB at 43.60 MHz With antenna polarization Horizontal |
| EN 61000-3-2: 2000+A2: 2005 | Harmonic current Emissions | PASS | Meet the requirements |
| EN 61000-3-3: 1995 +A1: 2001+A2: 2005 | Voltage fluctuation & Flicker | PASS | Meet the requirements |

| <i>Immunity (EN 55024: 1998+A1: 2001+A2: 2003)</i> | | | | |
|--|------------------|---------------|--|---|
| Standard | Test Type | Result | Performance Criteria | Test Judgment |
| IEC 61000-4-2: 2001 | ESD test | PASS | Criterion B | Meets the requirements of Performance Criterion A |
| IEC 61000-4-3: 2002 | RS test | PASS | Criterion A | Meets the requirements of Performance Criterion A |
| IEC 61000-4-4: 2004 | EFT test | PASS | Criterion B | Meets the requirements of Performance Criterion A |
| IEC 61000-4-5: 2001 | Surge test | PASS | Criterion B | Meets the requirements of Performance Criterion A |
| IEC 61000-4-6: 2003 | CS test | PASS | Criterion A | Meets the requirements of Performance Criterion A |
| IEC 61000-4-11: 1994+A1: 2001 | Dip test | PASS | 1. >95% reduction- Performance Criterion B 2. 30% reduction- Performance Criterion C 3. >95% reduction- Performance Criterion C | Meets the requirements of Voltage Dips: 1. >95% reduction- Performance Criterion A 2. 30% reduction- Performance Criterion A 3. >95% reduction- Performance Criterion B |

Remark:

The EUT has been tested/evaluated and pass the above standards without modification.

3. Test Specifications

3.1 Standards

EN 55022: 1998+A1: 2000+A2: 2003 Electromagnetic compatibility - requirements for radio disturbance characteristics of information technology equipment.

EN 61000-3-2: 2000+A2: 2005 Electromagnetic compatibility Part 3. Limits. Section 2. Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)

EN 61000-3-3: 1995+A1: 2001+A2: 2005 Electromagnetic compatibility Part 3. Limits. Section 3. Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current ≤ 16 A

EN 55024: 1998+A1: 2001+A2: 2003 Information technology equipment - Immunity characteristics Limits and methods of measurement.

Remark: IEC 61000-4-8 Magnetic field immunity test

The equipment does not contain components susceptible to magnetic fields, therefore, the test can be waived.

3.2 Mode of operation during the test

The EUT was supplied with 230Vac, 50Hz and was tested in normal operating mode.

3.3 Classification of ITE

ITE is subdivided into two categories denoted class A ITE and class B ITE.

Class B ITE

Class B ITE is a category of apparatus which satisfies the class B ITE disturbance limits.

Class B ITE is intended primarily for use in the domestic environment and may include:

- equipment with no fixed place of use; for example, portable equipment powered by built-in batteries;
- telecommunication terminal equipment powered by a telecommunication network;
- personal computers and auxiliary connected equipment.

NOTE: The domestic environment is an environment where the use of broadcast radio and television receivers may be expected within a distance of 10 m of the apparatus concerned.

Class A ITE

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.

3.4 Performance criteria

The performance criteria listed below are based on those regulated in the standard, specified by the manufacturer or derived from the product specification.

Criteria A:

During the test, the equipment shall continue to operate as intended. No degradation of performance or loss of function is allowed below performance level specified by manufacturer.

Criteria B:

Loss of function is allowed, provided the function self-recoverable or restored by the operation of the controls by the user in accordance with manufacturers instructions or after the test the equipment shall continue to operate as intended. Degradation of performance or loss of function is allowed after the application of the phenomena below a performance level specified by the manufacturer. During the test, degradation of performance is allowed. However, no change of actual operating state or stored data is allowed.

Criteria C:

Temporary degradation or loss of function or performance that requires operator Intervention or system reset.

3.5 Performance verification

The EUT has been monitored based on manufacturer's specification; the performance fulfilled the requirements of standard.

4. EN 55022 Conducted Emission Test

4.1 Mains Terminals Emission Test

4.1.1 Operating Environment

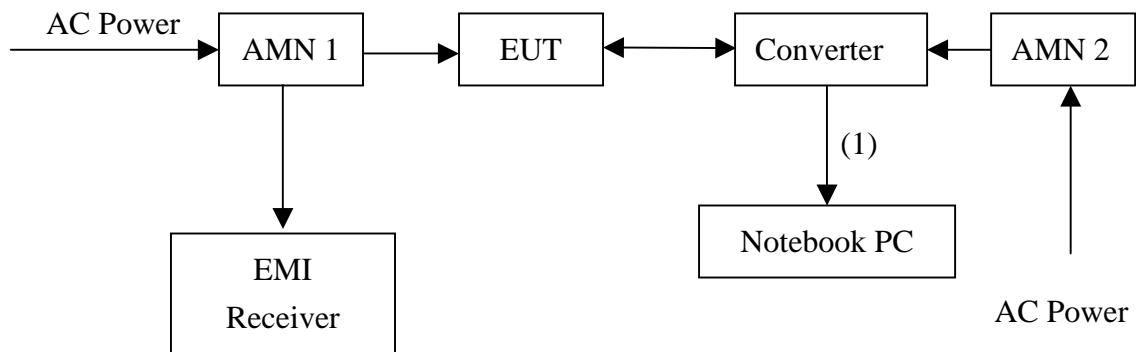
Temperature: 25

Atmospheric Pressure: 1023 hPa

Relative Humidity: 55 %

Test Voltage: 230Vac, 50Hz

4.2 Test Procedure



(1) Fiber 10meter × 1

The EUT along with its peripherals were placed on a 1.0m(W)×1.5m(L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4meter space from a vertical reference plane. The EUT was connected to power mains through a Artificial Mains Network (AMN), which provided 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.

The excess power cable between the EUT and the AMN was bundled. All connecting cables of EUT and peripherals were moved to find the maximum emission

4.3 Test Equipment

| Equipment | Brand | Model No. | Intertek ID No. | Next Cal. Date |
|--------------|-----------------|-----------|-----------------|----------------|
| EMI Receiver | Rohde & Schwarz | ESCS 30 | EC303 | 04/26/2008 |
| AMN | Rohde & Schwarz | EHS3-Z5 | EC320 | 12/19/2007 |
| AMN | Schaffner | MN2050D | EC384 | 04/27/2008 |
| Shield Room | N/A | N/A | N/A | N/A |

Note: The above equipments are within the valid calibration period.

4.4 Conducted Emission Limit

| Freq. (MHz) | Maximum RF Line Voltage | | | |
|----------------|-------------------------|------|----------------------|-------|
| | Class A (dB μ V) | | Class B (dB μ V) | |
| | Q.P. | Avg. | Q.P. | Avg. |
| 0.15~0.50 | 79 | 66 | 66~56 | 56~46 |
| 0.50~5.00 | 73 | 60 | 56 | 46 |
| 5.00~30.0 | 73 | 60 | 60 | 50 |

4.5 Uncertainty of Conducted Emission

Expanded uncertainty (k=2) of conducted emission measurement is ± 2.26 dB.

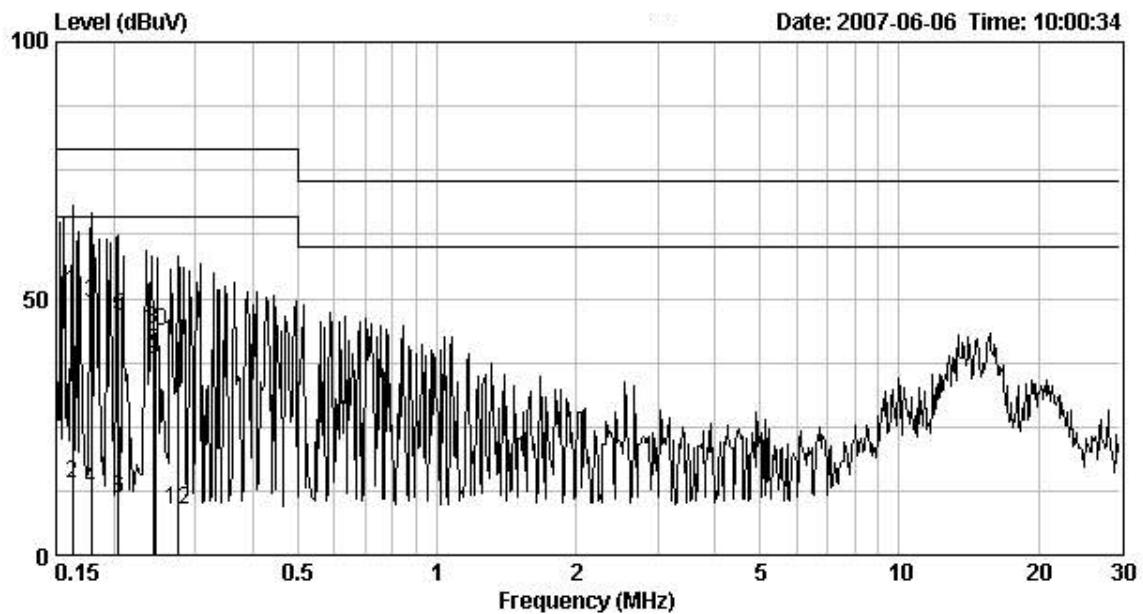
4.6 Mains Terminals Emission Data

Phase: Line
 Model No.: RU-87P SERIES
 Test Condition: Normal operating mode

| Frequency (MHz) | Corr. Factor (dB) | Level Qp (dBuV) | Limit Qp (dBuV) | Level AV (dBuV) | Limit Av (dBuV) | Margin (dB) | |
|--------------------|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------|--------|
| | | | | | | Qp | Av |
| 0.162 | 0.10 | 51.20 | 79.00 | 13.80 | 66.00 | -27.80 | -52.20 |
| 0.179 | 0.10 | 49.23 | 79.00 | 12.77 | 66.00 | -29.77 | -53.23 |
| 0.205 | 0.10 | 46.65 | 79.00 | 11.13 | 66.00 | -32.35 | -54.87 |
| 0.243 | 0.10 | 43.90 | 79.00 | 39.63 | 66.00 | -35.10 | -26.37 |
| 0.245 | 0.10 | 43.49 | 79.00 | 38.21 | 66.00 | -35.51 | -27.79 |
| 0.275 | 0.10 | 41.80 | 79.00 | 8.85 | 66.00 | -37.20 | -57.15 |

Remark:

1. Corr. Factor (dB) = AMN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)

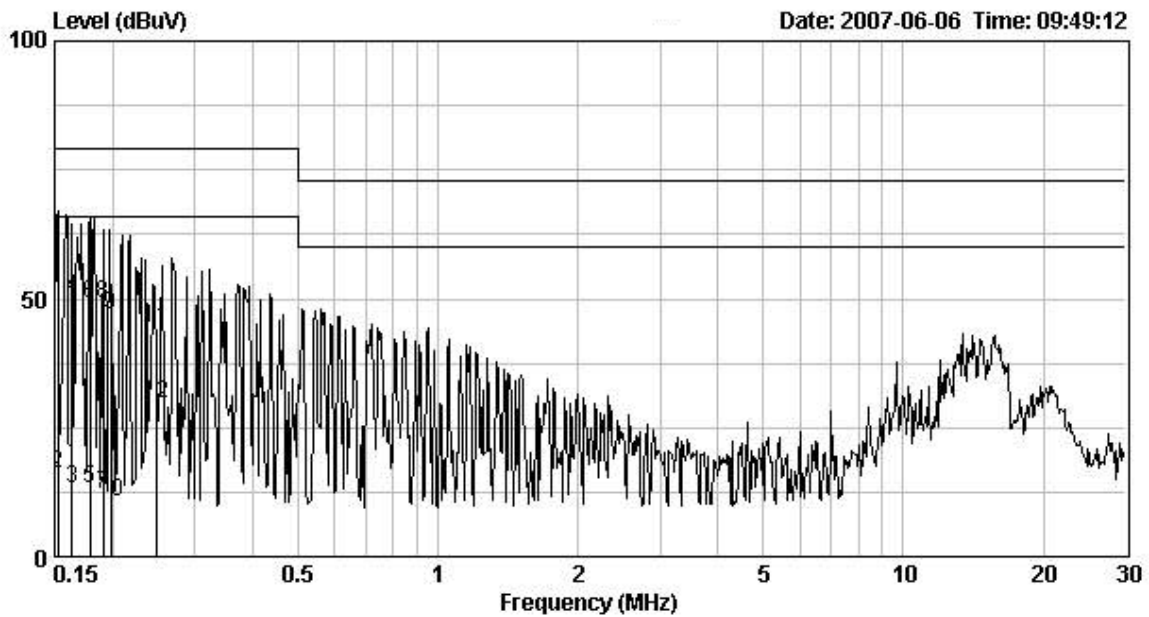


Phase: Neutral
 Model No.: RU-87P SERIES
 Test Condition: Normal operating mode

| Frequency (MHz) | Corr. Factor (dB) | Level Qp (dBuV) | Limit Qp (dBuV) | Level AV (dBuV) | Limit Av (dBuV) | Margin (dB) | |
|--------------------|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------|--------|
| | | | | | | Qp | Av |
| 0.152 | 0.10 | 52.59 | 79.00 | 16.29 | 66.00 | -26.41 | -49.71 |
| 0.164 | 0.10 | 50.01 | 79.00 | 13.18 | 66.00 | -28.99 | -52.82 |
| 0.179 | 0.10 | 49.23 | 79.00 | 13.29 | 66.00 | -29.77 | -52.71 |
| 0.191 | 0.10 | 49.09 | 79.00 | 12.08 | 66.00 | -29.91 | -53.92 |
| 0.198 | 0.10 | 46.75 | 79.00 | 10.55 | 66.00 | -32.25 | -55.45 |
| 0.247 | 0.10 | 44.45 | 79.00 | 29.71 | 66.00 | -34.55 | -36.29 |

Remark:

1. Corr. Factor (dB) = AMN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



5. EN 55022 Radiated Emission Test

5.1 Operating Environment

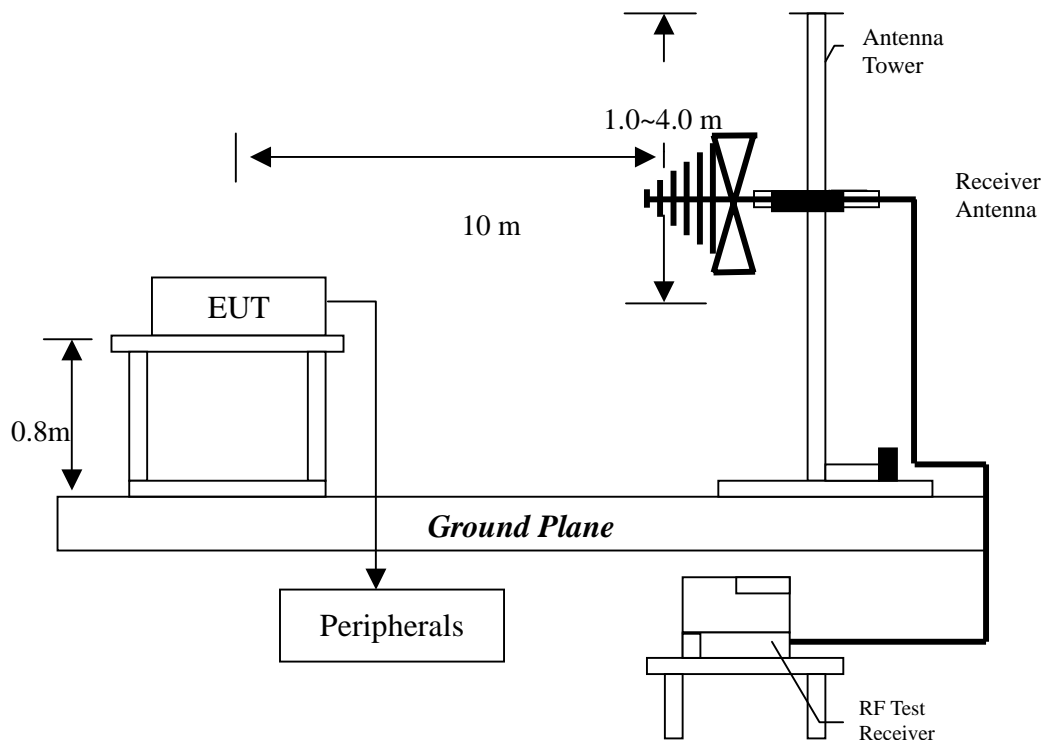
Temperature: 25

Atmospheric Pressure: 1023 hPa

Relative Humidity: 55 %

Test Voltage: 230Vac, 50Hz

5.2 Test Procedure



Radiated testing was performed at a 10 meters open area test site. The equipment under test were placed on a turntable top 0.8 m above ground. The table was 360 degrees to determine the position of the highest radiation. EUT is set 10 meters from the EMI receiving antenna, which is mounted on a variable height mast. The antenna 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 was set to conduct the measurement.

The bandwidth was set on the EMI meter 120 kHz.

The levels are quasi peak value readings. The frequency spectrum from 30 MHz to 1000 MHz was investigated.

5.3 Test Equipment

| Equipment | Brand | Model No. | Intertek ID No. | Next Cat. Date |
|---------------|-----------------|-----------|-----------------|----------------|
| EMI Receiver | Rohde & Schwarz | ESCS 30 | EC346 | 07/24/2007 |
| Turn Table | Electro-Metrics | EM4710 | EP306 | N/A |
| Bilog Antenna | Schaffner | CBL6112B | EC367 | 03/16/2008 |
| Ferrite Clamp | Rohde & Schwarz | EZ-24 | N/A | N/A |

Note: The above equipments are within the valid calibration period.

5.4 Radiated Emission Limit

| Frequency (MHz) | Distance(m) | Class A(dB μ V/m) | Class B(dB μ V/m) |
|-----------------|-------------|-----------------------|-----------------------|
| 30~230 | 10 | 40 | 30 |
| 230~1000 | 10 | 47 | 37 |

Note:

1. The tighter limit shall apply at the edge between two frequency bands.
2. Distance refers to the distance in meters between the EUT to antenna.

5.5 Uncertainty of Radiated Emission

Expanded uncertainty (k=2) of radiated emission measurement is ± 4.68 dB.

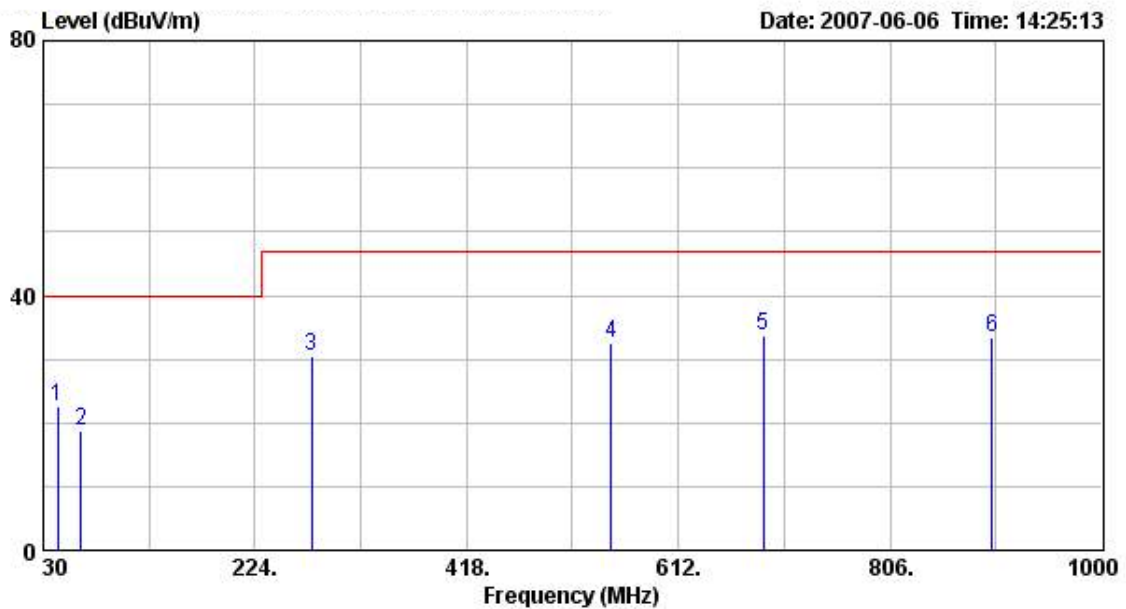
5.6 Radiated Emission Test Data

Polarity: Vertical
 Model No.: RU-87P SERIES
 Test Condition: Normal operating mode

| Freq | Pol/Phase | Factor | Read | | Limit | Over | Remark |
|--------|-----------|--------|-------|--------|--------|--------|--------|
| | | | Level | Level | Line | Limit | |
| MHz | | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 43.60 | VERTICAL | 12.24 | 10.30 | 22.54 | 40.00 | -17.46 | QP |
| 64.90 | VERTICAL | 7.46 | 11.30 | 18.76 | 40.00 | -21.24 | QP |
| 275.77 | VERTICAL | 15.13 | 15.30 | 30.43 | 47.00 | -16.57 | QP |
| 550.29 | VERTICAL | 22.24 | 10.20 | 32.44 | 47.00 | -14.56 | QP |
| 690.10 | VERTICAL | 22.64 | 11.10 | 33.74 | 47.00 | -13.26 | QP |
| 899.10 | VERTICAL | 24.87 | 8.60 | 33.47 | 47.00 | -13.53 | QP |

Remark:

1. Level (dB μ V/m) = Factor (dB/m) + Read Level (dB μ V)
2. Factor = Antenna Factor (dB/m) + Cable Loss (dB)
3. Over Limit (Margin) (dB) = Level (dB μ V/m) – Limit Line (dB μ V/m)

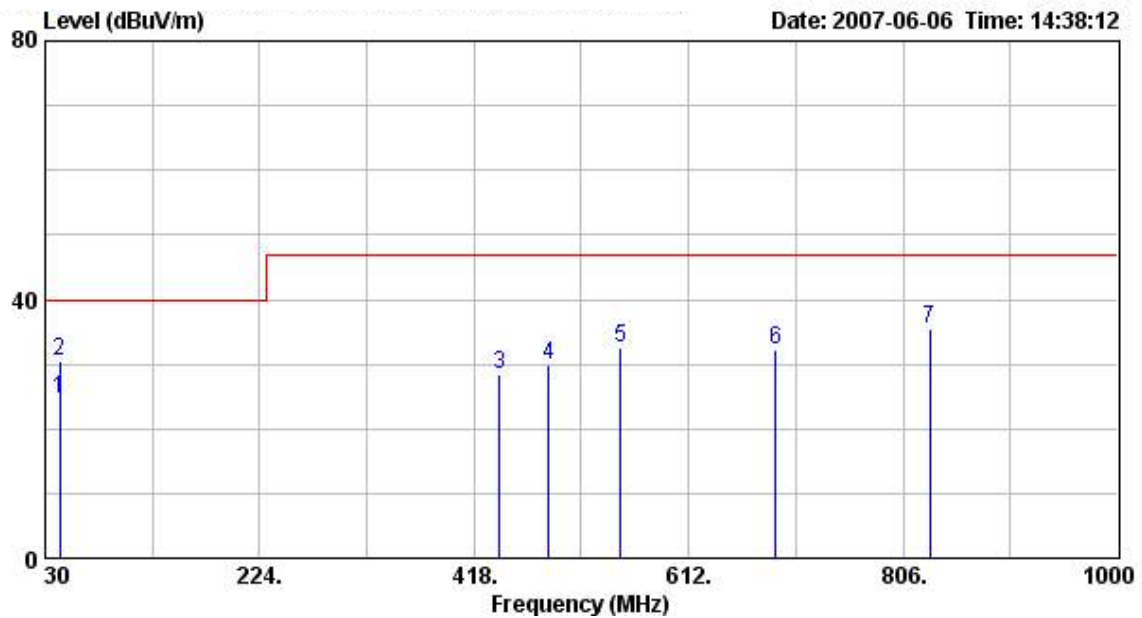


Polarity: Horizontal
 Model No.: RU-87P SERIES
 Test Condition: Normal operating mode

| Freq | Pol/Phase | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|--------|------------|--------|------------|--------|------------|------------|--------|
| MHz | | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 43.60 | HORIZONTAL | 12.24 | 12.30 | 24.54 | 40.00 | -15.46 | QP |
| 43.60 | HORIZONTAL | 12.24 | 18.20 | 30.44 | 40.00 | -9.56 | QP |
| 441.30 | HORIZONTAL | 19.58 | 8.90 | 28.48 | 47.00 | -18.52 | QP |
| 485.90 | HORIZONTAL | 20.34 | 9.50 | 29.84 | 47.00 | -17.16 | QP |
| 550.60 | HORIZONTAL | 22.24 | 10.20 | 32.44 | 47.00 | -14.56 | QP |
| 690.50 | HORIZONTAL | 22.64 | 9.50 | 32.14 | 47.00 | -14.86 | QP |
| 830.20 | HORIZONTAL | 24.29 | 11.20 | 35.49 | 47.00 | -11.51 | QP |

Remark:

1. Level (dB μ V/m) = Factor (dB/m) + Read Level (dB μ V)
2. Factor = Antenna Factor (dB/m) + Cable Loss (dB)
3. Over Limit (Margin) (dB) = Level (dB μ V/m) – Limit Line (dB μ V/m)



6. EN 61000-3-2 Harmonics

6.1 Operating Environment

Temperature: 25 Atmospheric Pressure: 1023 hPa
Relative Humidity: 55 % Test Voltage: 230Vac, 50Hz

6.2 Test Procedure

Harmonics of the fundamental current were measured up to 2 kHz using a digital power analyzer. The test voltage was supplied from an AC source, which meets the requirements according to the standard.

The steady-state harmonic current measurements were carried out using averaging.

The transitory harmonics were measured during an observation period of 2.5 minutes. The disturbance duration time (limit 15 s) is defined as the total time under which the transitory harmonics exceeds the limit level for steady-state harmonics during an observation period of 2.5 minutes.

6.3 Test Equipment

| Equipment | Brand | Model No. | Intertek ID No. | Next Cal. Date |
|---------------------|-------------|----------------|-----------------|----------------|
| EMC Emission Tester | EMC Partner | HARMONICS-1000 | EC364 | 12/18/2007 |

Note: The above equipments are within the valid calibration period.

6.4 Uncertainty of Radiated Emission

Expanded uncertainty (k=2) of radiated emission measurement is ± 0.2 dB.

6.5 Test Result

EUT: RU-87P SERIES

CLASSIFICATION: CLASS A
SUMMARY RESULT: PASS

Harmonic Current Results

| Hn | AMPs | Current Limit | Result |
|----|-------|---------------|--------|
| 1 | 0.144 | NaN | Pass |
| 2 | 0.075 | 1.080 | Pass |
| 3 | 0.027 | 2.300 | Pass |
| 4 | 0.023 | 0.430 | Pass |
| 5 | 0.023 | 1.140 | Pass |
| 6 | 0.016 | 0.300 | Pass |
| 7 | 0.014 | 0.770 | Pass |
| 8 | 0.010 | 0.230 | Pass |
| 9 | 0.009 | 0.400 | Pass |
| 10 | 0.007 | 0.184 | Pass |
| 11 | 0.007 | 0.330 | Pass |
| 12 | 0.006 | 0.153 | Pass |
| 13 | 0.006 | 0.210 | Pass |
| 14 | 0.005 | 0.131 | Pass |
| 15 | 0.005 | 0.150 | Pass |
| 16 | 0.005 | 0.115 | Pass |
| 17 | 0.005 | 0.132 | Pass |
| 18 | 0.005 | 0.102 | Pass |
| 19 | 0.004 | 0.118 | Pass |
| 20 | 0.004 | 0.092 | Pass |

| Hn | AMPs | Current Limit | Result |
|----|-------|---------------|--------|
| 21 | 0.004 | 0.107 | Pass |
| 22 | 0.004 | 0.084 | Pass |
| 23 | 0.004 | 0.098 | Pass |
| 24 | 0.003 | 0.077 | Pass |
| 25 | 0.003 | 0.090 | Pass |
| 26 | 0.003 | 0.071 | Pass |
| 27 | 0.003 | 0.083 | Pass |
| 28 | 0.003 | 0.066 | Pass |
| 29 | 0.003 | 0.078 | Pass |
| 30 | 0.003 | 0.061 | Pass |
| 31 | 0.003 | 0.073 | Pass |
| 32 | 0.002 | 0.058 | Pass |
| 33 | 0.002 | 0.068 | Pass |
| 34 | 0.002 | 0.054 | Pass |
| 35 | 0.002 | 0.064 | Pass |
| 36 | 0.002 | 0.051 | Pass |
| 37 | 0.002 | 0.061 | Pass |
| 38 | 0.002 | 0.048 | Pass |
| 39 | 0.002 | 0.058 | Pass |
| 40 | 0.002 | 0.046 | Pass |

7. EN 61000-3-3 Voltage Fluctuations-Flicker

7.1 Operating Environment

Temperature: 25 Atmospheric Pressure: 1023 hPa
Relative Humidity: 56 % Test Voltage: 230Vac, 50Hz

7.2 Test Procedure

The voltage changes at the supply terminals were measured using the voltage method.

The test voltage was supplied from an AC source which meets the requirements according to the standard. The voltage source has virtually zero internal impedance and is connected

(1 phase)
 $Z = 0.4 + j 0.25$ (total impedance)

(3 phases)
Impedance in line conductor: $Z_a = 0.25 + j 0.25$
Impedance in neutral conductor: $Z_n = 0.15 + j 0.10$

The short-term flicker P_{st} is measured during a time interval of 10 minutes.
The long-term flicker P_{lt} is evaluated from 12 subsequently measured short-term flicker values.

24 measurement have been tasted and calculated the average from 22 records, exclude highest and lowest.

7.3 Test Equipment

| Equipment | Brand | Model No. | Intertek ID No. | Next Cal. Date |
|---------------------|-------------|----------------|-----------------|----------------|
| EMC Emission Tester | EMC Partner | HARMONICS-1000 | EC364 | 12/18/2007 |

Note: The above equipments are within the valid calibration period.

7.4 Uncertainty of Radiated Emission

Expanded uncertainty (k=2) of radiated emission measurement is ± 0.47 dB.

7.5 Test result

EUT: RU-87P SERIES

SUMMARY RESULT: PASS

TEST CONDITIONS: STANDARD TEST CONDITIONS

| | EUT DATA | LIMIT | RESULT | TEST ENABLED |
|-----------------------------|-----------------|--------------|---------------|-------------------------------------|
| Pst max | 0.087 | 1.00 | PASS | <input type="checkbox"/> |
| Plt max | 0.075 | 0.65 | PASS | <input type="checkbox"/> |
| d_c % | 0.26 | 3.30 | PASS | <input type="checkbox"/> |
| d_{max} % | 0.33 | 4.00 | PASS | <input checked="" type="checkbox"/> |
| d_(t) Sec. | 0.00 | 0.50 | PASS | <input type="checkbox"/> |

8. IEC 61000-4-2 Electrostatic Discharge Immunity Test

8.1 Operating Environment

| | | | |
|--------------------|------|-----------------------|--------------|
| Temperature: | 25 | Atmospheric Pressure: | 1023 hPa |
| Relative Humidity: | 55 % | Test Voltage: | 230Vac, 50Hz |

8.2 Purpose

The object of the test is to evaluate the ESD immunity performance of EUT.

8.3 Test Set-Up

A horizontal coupling plane (HCP) was placed on a non-metallic table 0.8 m above a reference ground plane (RGP) and connected to it with a cable with two 470 k resistors. The EUT was placed on an insulation sheet on the HCP and was operated according to the specified operating mode.

A vertical coupling plane (VCP) was connected to the RGP with a cable with two 470 k resistors.

8.4 Test Conditions

| | | | |
|-------------|-------------------|-------|---------|
| Test level: | Air discharge | ----- | +/- 8kV |
| | Contact discharge | ----- | +/- 4kV |

Single discharge at 1 second interval positive discharge and negative discharge

8.5 Test Equipment

| Equipment | Manufacturer | Model No. | Intertek ID No. | Next Cal. Date |
|--------------------------------|--------------|-----------|-----------------|----------------|
| Electrostatic Discharge System | NoiseKen | ESS-2002 | EC362 | 09/24/2007 |

Note: The above equipments are within the valid calibration period.

8.6 Test Result

| Point of Discharge | Applied Voltage (kV) | Total No. of Discharge (Each Point) | Result | Criteria Level | Remark |
|--------------------|----------------------|-------------------------------------|--------|----------------|--------|
| Contact Test Point | ±2 | 25 | P | A | - |
| | ±4 | 25 | P | A | - |
| Air Test Point | ±2 | 20 | P | A | - |
| | ±4 | 20 | P | A | - |
| | ±8 | 20 | P | A | - |
| VCP (4 sides) | ±2 | 25 | P | A | - |
| | ±4 | 25 | P | A | - |
| HCP (4 sides) | ±2 | 25 | P | A | - |
| | ±4 | 25 | P | A | - |

Description

| Contact Discharge | | Air Discharge | |
|-------------------|------------------------|---------------|-----------------------|
| | Metallic Screws | | Plastic Screws |
| | Metallic Case | | Plastic Case (gap) |
| | Metallic Connect ports | | Plastic Connect ports |
| | Metallic Junctions | | Plastic Junctions |
| | Others: | | LED indicator |
| | | | Panel Board |
| | | | Others: |

Note: 1. "P" means the EUT pass the test.

Note: 2. "-" means not applicable

Meet criterion A – operated as intended during and after the test

Meet criterion B – operated as intended after the test

Meet criterion C – loss/ error of function

9. IEC 61000-4-3 Radiated, Radio-Frequency, Electromagnetic Field Immunity Test

9.1 Operating Environment

Temperature: 23 Atmospheric Pressure: 1023 hPa
Relative Humidity: 53 % Test Voltage: 230Vac, 50Hz

9.2 Purpose

This test method subjects the EUT to a power source of disturbance comprising electric and magnetic field, simulating those coming from intentional RF transmitters.

9.3 Test Set-Up

The EUT was placed on a non-metallic table 0.8 m above the reference ground plane (RGP) and was operated according to its specified operating mode.

Ferrite tiles/absorbers were placed on the RGP between the EUT and the antenna to reduce the reflections from the RGP. The EUT and its cables were exposed for the electromagnetic field for 1.5m vertically and 1.5m horizontally.

The distance between antenna and EUT is 3 meter.

9.4 Test Conditions

| Test level | Test field strength V/m | Modulation |
|------------|----------------------------|--------------|
| 1 | 1 | 1 kHz 80% AM |
| 2 | 3 | 1 kHz 80% AM |
| 3 | 10 | 1 kHz 80% AM |
| X | Special | 1 kHz 80% AM |

The frequency steps : 1 % , Log sweep
Dwell time : 3 sec
Frequency range : 80MHz~1GHz
Test ports : Enclosure port
Test field strength : 3V/m

9.5 Test Equipment

| Equipment | Manufacture | Model No. | Intertek ID No. | Next Cal. Date |
|--|----------------------------|-----------|-----------------|----------------|
| An-echoic chamber 7m×3m×3m | Comtest Instrumentation | 9708093 | EC328 | 02/12/2008 |
| RF signal Generator | Marconi | 2024 | EC301 | 08/08/2008 |
| Dual Band RF Power Amplifier | Kalmus | 757LCB | EP314 | N/A |
| High Power Microwave Amplifier Series | MILMEGA | AS0102-30 | EP318 | N/A |
| Bi-log Antenna | EMCO | 3141 | EP386 | N/A |
| RF Power Meter | Boonton | 4230 | EC302 | 08/08/2008 |
| Power Sensor | Boonton | 51011-EMC | EC302-1 | 08/08/2008 |
| Power Sensor | Boonton | 51011-EMC | EC302-2 | 08/08/2008 |
| Field Probe | Holaday | HI-4422 | EC307 | 11/15/2007 |

Note: The above equipments are within the valid calibration period.

9.6 Generation of The Electromagnetic Field

The electromagnetic field is generated from a computer controlled signal generator. The output power is amplified and then radiated from broadband log periodic antennas. For each sweep a pre-recorded empty chamber calibration file is used to establish the required field strength. When using these files the field strength inside an area of 1.5/1.0 m x 1.5m is in accordance with the standard.

9.7 Test ResultsExposed Side: Front Left Rear Right

H: Horizontal

V: Vertical

| Frequency (MHz) | Horizontal/Vertical | Result | Criteria Level | Remark |
|-----------------|---------------------|--------|----------------|--------|
| 80MHz to 1GHz | H | P | A | - |
| 80MHz to 1GHz | V | P | A | - |

Note: 1. "P" means the EUT pass the test.

Note: 2. "-" means not applicable

 Meet criterion A – operated as intended during and after the test

Meet criterion B – operated as intended after the test

Meet criterion C – loss/error of function

10. IEC 61000-4-4 Electrical Fast Transient/Burst Immunity Test

10.1 Operating Environment

| | |
|-------------------------|--------------------------------|
| Temperature: 25 | Atmospheric Pressure: 1023 hPa |
| Relative Humidity: 55 % | Test Voltage: 230Vac, 50Hz |

10.2 Purpose

The purpose of this test is to evaluate the EUT performance during the repetitive transient bursts applied to power port and ports for I/O ports.

10.3 Test Set-Up

For power port testing, the EUT was placed on a non-metallic table 0.1 m above a reference ground plane (RGP) and was put into operation according to the specified operating mode.

10.4 Test Condition

| Open-circuit output test voltage ($\pm 10\%$) and repetition rate of the impulses ($\pm 20\%$) | | | | |
|--|--------------------------|------------------------|--|------------------------|
| Level | On power supply port, PE | | On I/O (Input/Output) signal, Data and control ports | |
| | Voltage peak kV | Repetition rate kHz | Voltage peak kV | Repetition rate kHz |
| 1 | 0.5 | 5 or 100 | 0.25 | 5 or 100 |
| 2 | 1 | 5 or 100 | 0.5 | 5 or 100 |
| 3 | 2 | 5 or 100 | 1 | 5 or 100 |
| 4 | 4 | 5 or 100 | 2 | 5 or 100 |
| X ⁽¹⁾ | Special | Special | Special | Special |

NOTE 1 Use of 5 kHz repetition rates is traditional; however, 100 kHz is closer to reality. Product committees should determine which frequencies are relevant for specific products or product types.

NOTE 2 With some products, there may be no clear distinction between power ports and I/O ports, in which case it is up to product committees to make this determination for test purposes.

(1) "x" is an open level. The level has to be specified in the dedicated equipment specification

10.5 Test Equipment

| Equipment | Manufacture | Model No. | Intertek ID No. | Next Cal. Date |
|------------------|-------------|-----------|-----------------|----------------|
| EFT/Burst Tester | Keytek | CE40 | EC312 | 08/07/2008 |

Note: The above equipments are within the valid calibration period.

10.6 Test Results

| Level | Polarity | Power supply line and Protective earth terminal | Signal Line & Control Line | Criteria Level |
|--------|----------|---|----------------------------|----------------|
| 0.25kV | + | - | - | - |
| 0.25kV | - | - | - | - |
| 0.5kV | + | - | - | - |
| 0.5kV | - | - | - | - |
| 1kV | + | P | - | A |
| 1kV | - | P | - | A |
| 2kV | + | - | - | - |
| 2kV | - | - | - | - |

Note: 1. "P" means the EUT pass the test.

Note: 2. "-" means not applicable

Meet criterion A - operated as intended during and after the test

Meet criterion B - operated as intended after the test

Meet criterion C - loss/error of function

11. IEC 61000-4-5 Surge Immunity Test

11.1 Operating Environment

| | |
|-------------------------|--------------------------------|
| Temperature: 25 | Atmospheric Pressure: 1023 hPa |
| Relative Humidity: 55 % | Test Voltage: 230Vac, 50Hz |

11.2 Purpose

The object of this test is to establish a common reference to evaluate the performance of EUT when subjected to high-energy disturbances on the power and interconnection lines.

11.3 Test Set-Up

The EUT was placed on a non-metallic support 0.8 m above a reference ground plane and was put into operation according to the specified operating mode.

11.4 Test Conditions

For power supply line

| Level | Open circuit test voltage kV +/- 10% | Remark |
|-------|---|------------------------|
| 1 | 0.5 | L1 to L2 |
| 2 | 1.0 | L1 to Gnd L2 to Gnd |
| 3 | 2.0 | L1 to Gnd L2 to Gnd |
| 4 | 4.0 | - |
| X | Special | - |

Note: "X" is an open class. This level can be specified in the product specification

Surge wave form: 1.2 x 50 μs, Repetition rate: 1 /min (max)

For signal line: applicable only to ports which according to the manufacturer's specification may connect directly to outdoor cable

| Level | Open circuit test voltage kV +/- 10% | Remark |
|-------|---|----------------|
| 2 | 1.0 | Line to Ground |

Surge wave form: 1.2 x 50 μs, Repetition rate: 1 /min (max)

11.5 Test Equipment.

| Equipment | Manufacture | Model No. | Intertek ID No. | Next Cal. Date |
|---|-------------|-----------|-----------------|----------------|
| Surge Tester | Key Tek | EMC Pro | EC313 | 10/18/2007 |
| External Coupler/Decoupler for Telecom Line | Key Tek | CM-TELCD | EP326-1 | N/A |

Note: The above equipments are within the valid calibration period.

11.6 Test Results

11.6.1 Main power ports

Test 5 times for each voltage

| Phase | | | 0° | 90° | 180° | 270° | Criteria level |
|---------|-----------|----------|----|-----|------|------|----------------|
| Volt | Mode | Polarity | | | | | |
| 0.5kV | L1 to L2 | + | P | P | P | P | A |
| | | - | P | P | P | P | A |
| 1kV | L1 to L2 | + | P | P | P | P | A |
| | | - | P | P | P | P | A |
| 1kV/2kV | L1 to Gnd | + | P | P | P | P | A |
| | | - | P | P | P | P | A |
| | L2 to Gnd | + | P | P | P | P | A |
| | | - | P | P | P | P | A |

Note: 1. "P" means the EUT pass the test.

Note: 2. "-" means not applicable

Meet criterion A - operated as intended during and after the test

Meet criterion B - operated as intended after the test

Meet criterion C - loss/error of function

12. IEC 61000-4-6 Immunity to Conducted Disturbances, Inducted by Radio-Frequency Fields

12.1 Operating Environment

Temperature: 25 °C Atmospheric Pressure: 1023 hPa
Relative Humidity: 55 % Test Voltage: 230Vac, 50Hz

12.2 Purpose

The test method subjects the EUT to a power source of disturbance comprising electric and magnetic field, simulating those coming from intentional RF transmitters. The measurement is for evaluating the performance of EUT when subjected to RF conducted disturbance.

12.3 Test Set-Up

The EUT was placed on a non-metallic support 0.1 m above a reference ground plane (RGP) with the coupling/decoupling network (CDN) placed 0.3 m from the EUT on the RGP.

12.4 Test Conditions

| Test level | Voltage (Vrms) | Modulation |
|------------|----------------|--------------|
| 1 | 1 | 1 kHz 80% AM |
| 2 | 3 | 1 kHz 80% AM |
| 3 | 10 | 1 kHz 80% AM |
| X | Special | 1 kHz 80% AM |

The frequency steps : 1 % , Log sweep
Dwell time : 3 sec
Frequency range : 150kHz to 80MHz
Test ports : AC por
Test voltage : 3Vrms

12.5 Test Equipment

| Equipment | Manufacture | Model No. | Intertek ID No. | Next Cal. Date |
|------------------------------|--------------------|-----------|-----------------|----------------|
| RF signal Generator | Marconi | 2024 | EC301 | 08/08/2007 |
| RF-Generator | SCHAFFNER | NSG2070 | EC358 | 11/27/2007 |
| Dual Band RF Power Amplifier | Kalmus | 757LCB | EP314 | N/A |
| Coupling Decoupling Network | Comtest instrument | 4412-016 | EC305 | 11/15/2007 |
| Coupling Decoupling Network | Comtest instrument | 4413-016 | EC306 | 11/15/2007 |
| Coupling Decoupling Network | SCHAFFNER | CDN T400 | EC385 | 11/15/2007 |
| RF Injection Clamp | Luthi | EM101 | EC308 | 11/15/2007 |
| RF Power Meter | Boonton | 4230 | EC302 | 08/08/2007 |
| Power Sensor | Boonton | 51011-EMC | EC302-1 | 08/08/2007 |
| Power Sensor | Boonton | 51011-EMC | EC302-2 | 08/08/2007 |

Note: The above equipments are within the valid calibration period.

12.6 Generation And Calibration of The Disturbance Signal

The disturbance signal is generated from a computer controlled signal generator. The output signal is amplified and injected to the CDN/injection clamp. The disturbance signal level was calibrated as specified in the standard. A power meter was connected to the EUT side of the CDN through a 150 -50 adapter. The auxiliary equipment (AE) side of the network was terminated with 150 to ground during the calibration. The generator settings obtained during the calibration procedure were later repeated in the tests.

12.7 Test Results

| Frequency (MHz) | Test Port/Line | Result | Criteria Level | Remark |
|------------------|----------------|--------|----------------|--------|
| 0.15MHz to 80MHz | Power Line | P | A | - |

Note: 1. "P" means the EUT pass the test.

Note: 2. "-" means not applicable

Meet criterion A – operated as intended during and after the test

Meet criterion B – operated as intended after the test

Meet criterion C – loss error of function

13. IEC 61000-4-11 Voltage Dips, Short Interruptions and Voltage Variations**Immunity Test****13.1 Operating Environment**

Temperature: 25

Atmospheric Pressure: 1023 hPa

Relative Humidity: 55 %

Test Voltage: 230Vac, 50Hz

13.2 Purpose

The object of this standard is to establish a common reference for evaluating the immunity of electrical and electronic equipment when subjected to voltage dips, short interruptions, and voltage variations.

13.3 Test Set-Up

The EUT was placed on a non-metallic support 0.8 m above a reference ground plane and was put into operation according to the specified operating mode.

13.4 Test Condition

| Reduction '% of rated | Test Level % U _T | Duration (Period) | Tests | Recovery Time |
|--------------------------|--------------------------------|----------------------|-------|------------------|
| >95% Dip | 0% Short Circuit | 0.5 | 3 | 10 Sec. |
| >95% Dip | 0% Open Circuit | 0.5 | 3 | 10 Sec. |
| 30% Dip | 70% | 25 | 3 | 10 Sec. |

| Test Level % U _T | Duration (Period) | Tests | Recovery Time |
|--------------------------------|----------------------|-------|---------------|
| 0% Short Circuit | 250 | 3 | 10 Sec. |
| 0% Open Circuit | 250 | 3 | 10 Sec. |

13.5 Test Equipment

| Equipment | Manufacturer | Model No. | Intertek ID No. | Next Cal. Date |
|------------|--------------|-----------|-----------------|----------------|
| Dip Tester | Keytek | EMC Pro | EC313 | 11/21/2007 |

Note: The above equipments are within the valid calibration period.

13.6 Generation of The Disturbance Signal

The disturbance signal is generated using a programmable AC power source with pre-programmed test sequences for each test.

13.7 Test Result

I. Dip of mains voltage

| Test Level | Reduction % of rated | Test Level % U_T | Duration (Period) | Tests | Recovery Time | Criteria Level |
|------------|----------------------|--------------------|-------------------|-------|---------------|----------------|
| 1 | >95% Dip | 0% Short Circuit | 0.5 | 3 | 10 Sec. | A |
| | >95% Dip | 0% Open Circuit | 0.5 | 3 | 10 Sec. | A |
| 2 | 30% Dip | 70% | 25 | 3 | 10 Sec. | A |

II. 0 % of mains voltage

| Test Item | Test Level % U_T | Duration (Period) | Tests | Recovery Time | Criteria Level |
|-----------|--------------------|-------------------|-------|---------------|----------------|
| 1 | 0% Short Circuit | 250 | 3 | 10 Sec. | B |
| 2 | 0% Open Circuit | 250 | 3 | 10 Sec. | B |

Meet criterion A – operated as intended during and after the test

Meet criterion B – operated as intended after the test

Meet criterion C – loss error of function

Appendix A1: External photo of EUT

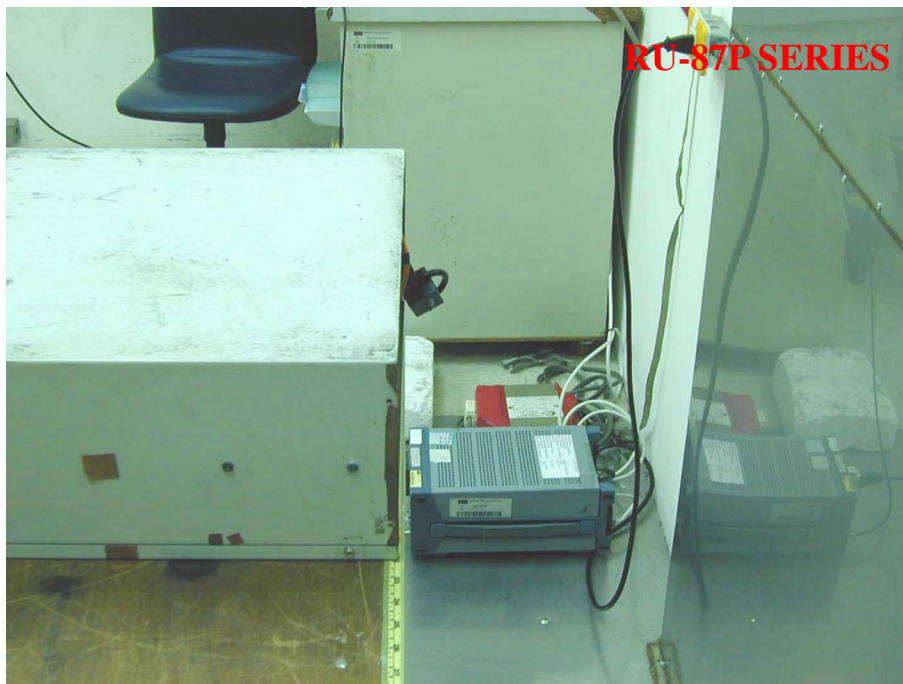
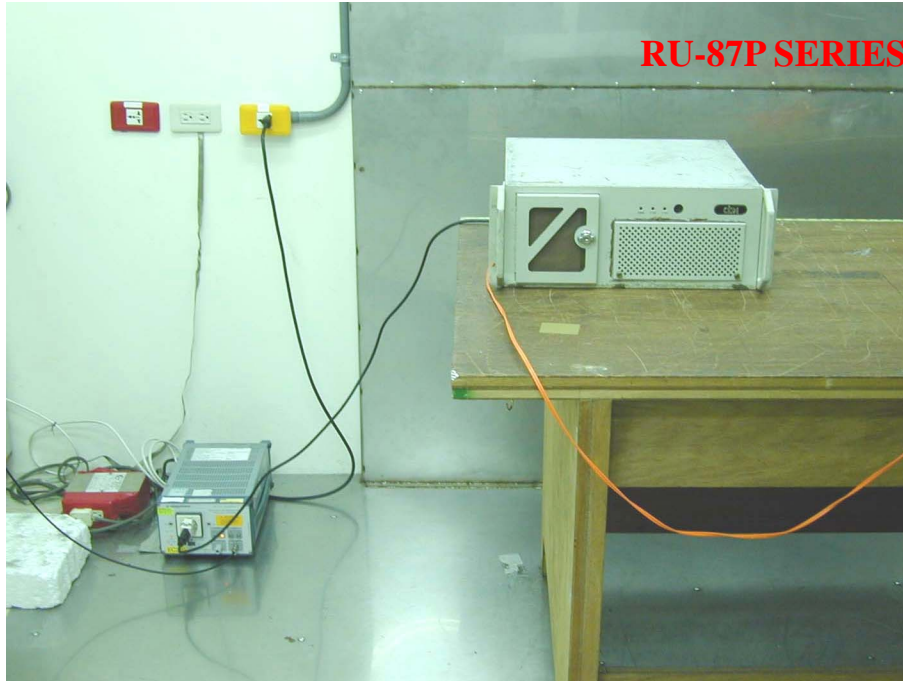




Appendix A2: Internal photo of EUT



Appendix B1: Conducted Emission Test Set-up



Appendix B2: Radiated Emission Test Set-up

