Korea Technology Institute Co., Ltd.

Test Report

Test Report No.:	**KTI11RF04001**		
Registration No.:	**99058**		
Applicant:	**UNION COMMUNITY Co.,Ltd.**		
Applicant Address:	**3F, Hyundai Topics Bldg., 44-3, Bangi-dong, Songpa-gu, Seoul, 138-050, Korea**		
Product:	**Access Controller**		
FCC ID:	**XX2-AC-5000RF**	**Model No.**	**AC-5000RF**
Receipt No.:	**11-0411**	**Date of receipt:**	**April 14, 2011**
Date of Issue:	**April 21, 2011**		
Testing location	**Korea Technology Institute Co., Ltd. 51-19, Sanglim3-Ri, Docheok-Myeun, Gwangju-Shi, Gyeungki-Do, Korea**		
Test Standards:	**FCC/ANSI. C63.4: 2003**		
Rule Parts: FCC	**47CFR, Part 15 Rules**		
Equipment Class:	**DCD – Part 15 Low Power Transmitter Below 1705kHz**		
Test Result:	**The above-mentioned product has been tested with compliance.**		

Tested by: O.H. Kwon / Engineer

Signature Date

Approved by: G. C. Min /President

Signature Date

Other Aspects:	
Abbreviations:	**∗ OK, Pass=passed ∗ Fail=failed ∗ N/A=not applicable**

☞ **- This test report is not permitted to copy partly without our permission.**

- This test result is dependent on only equipment to be used.

- This test result is based on a single evaluation of one sample of the above mentioned.

- This test report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S Government.

- We certify this test report has been based on the measurement standards that is traceable to the national or international standards.

>> Contents <<

1. General

This equipment has been shown to be capable of compliance with the applicable technical standards and was tested in accordance with the measurement procedures as indicated in this report.

We attest to the accuracy of data. Korea Technology Institute Co., Ltd. performed all measurements reported herein. And were made under Chief Engineer's supervisor.
We assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

2. Test Site

Korea Technology Institute Co., Ltd.

2.1 Location

51-19, Sanglim3-Ri, Docheok-Myeun, Gwangju-Shi, Gyeungki-Do, Korea

The Test Site is in compliance with ANSI C63.4/2003 for measurement of radio Interference.

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

- Conducted Emissions

Kind of Equipment	Type	S/N	Calibrated until
Field Strength Meter	ESIB40	100093	09.2011
LISN	EM-7823	115019	05.2011
LISN	KNW407	8-1157-2	01.2012
Conducted Cable	N/A	N/A	06.2011

- Radiated Emissions

Kind of Equipment	Type	S/N	Calibrated until
Field Strength Meter	ESIB40	100093	09.2011
Loop Antenna	6502	3434	02.2012
Biconic Logarithmic Periodic Antenna	VULB9163	9163-281	10.2012
Horn Antenna	3115	6443	07.2012
Open Site Cable	N/A	N/A	11.2011
Antenna Master	DETT-03	N/A	N / A
Antenna & Turntable controller	DETT-04	91X519	N / A

2.3 Test Date

Date of Application: April 15, 2011

Date of Test: April 18, 2011

2.4 Test Environment

Indoor: 21℃/42%/997mbar

Outdoor: 9.3℃/36%/997mbar

3. Description of the tested samples

The EUT is Access Controller.

3.1 Rating and Physical Characteristics

Division	SPEC	REMARK
CPU	32Bit RISC CPU(400MHz)	
Rainproof	IP65	
LCD	2.8'' TFT Color (320*240)	
Touch Key	15Key (0~9, F1~F4, Enter)	
MEMORY	32M SDRAM	
	32M FLASH	20,016 User 20,016 Finger 61,439 Log
Fingerprint sensor	Optical	
Authentication speed	Within 1 second	
Scan Area / Resolution	15*17mm / 500 DPI	
FRR / FAR	0.1% / 0.001%	
Temperature / Humidity	-10~50 / Lower than 95% RH	
POE	Supports 13W POE	
AC / DC Adapter	INPUT : Universal AC 100 ~ 240 V	
	OUTPUT : DC 12 V (Option : DC 24 V)	
	UL, CSA, CE Approved	
Lock Control	EM, Strike, Motor Lock, Auto Door	
I/O	3 In (1 Exit, 2 Monitor) 2 Out (Lock Control)	
Communication Port	TCP/IP (10/100Mbps)	Authentication server communication
	RS-232	Meal ticket printer
	RS-485	External device communication
	Wiegand In/Out	Card reader or External device communication
Card Reader	125KHz RF	
SIZE	88.0mm*175.0mm*43.4mm	

3.2 Submitted Documents

- **User's Guide**
- **Block Diagram**
- **Schematic diagram**
- **Part List**

4. Measurement Conditions

Testing Input Voltage: AC 110V

4.1 Modes of Operation

The EUT was in the following operation mode during all testing;

Prior to a measurement, the Instruments of education shall be operated until stabilization has been reached.

4.2 Additional Equipment

DEVICE TYPE	Manufacturer	M/N	S/N
AC/DC Adaptor	BRIDGEPOWER CORP	JPW128KA1200F03	K1111/REV A/RoHS
Door lock sensor	Supplied by the applicant	-	-
RFID tag	HID CORPORATION	-	S013-05423
COMPUTER	Yeon-il Electronics Inc.	EvoD5M	6F28KN8ZH110
MONITOR	LG Electronics	M2362DL	002KCLH3F288
KEYBOARD	Sitecsystem Inc.	AK1600	09040015249
MOUSE	Microsoft	1113	X817159-004
MOUSE	Microsoft	28898	4477811

4.3 Uncertainty

1) Radiated disturbance

Uc (Combined standard Uncertainty) = ± 1.8dB

Expanded uncertainty U=KUc

K = 2

∴ U = ± 3.6dB

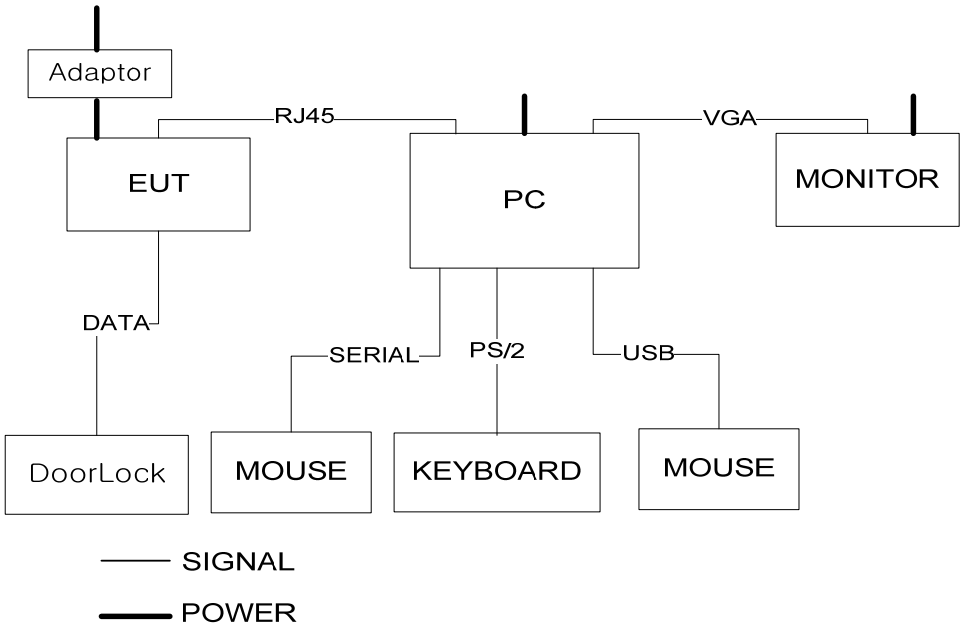
2) Conducted disturbance

Uc = ± 0.88dB

U = KUc=2 x Uc = ± 1.8dB

4.4 Test Setup

Figure 1: Test Setup



4.5 Type of Used Cables

#	START		END		CABLE	
	NAME	I/O PO T	NAME	I/O PORT	LENGTH(m)	SHIELDED
1	EUT	DC IN	AC/DC Adaptor	DC OUT	1.8	NO
2	AC/DC Adaptor	AC IN	AC mains	AC mains	1.2	NO
3	EUT	Terminal	Door lock sensor	Terminal	0.3	NO
4	COMPUTER	VGA	MONITOR	VGA	1.8	YES
5	COMPUTER	PS/2	KEYBOARD	PS/2	1.8	YES
6	COMPUTER	USB	MOUSE	USB	1.8	YES
7	COMPUTER	SERIAL	MOUSE	SERIAL	1.7	YES
8	COMPUTER	RJ45	EUT	RJ45	3.0	NO

5. TEST AND MEASUREMENTS

Summary of Test Results

Requirement	FCC, 47CFR15	Report Section	Test Result
Antenna Requirement	15.203	5.1	**PASS**
Radiated Spurious Emissions	15.209	5.2	**PASS**
AC Power Line Conducted Emissions	15.207	5.3	**PASS**

5.1 ANTNNA REQUIRMENT

5.1.1 Regulation

FCC 47CFR15 – 15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

5.1.2 Result: PASS

The EUT has an integral loop coil antenna, and meets the requirements of this section.

5.2 Radiated Emissions

5.2.1 Regulation

FCC 47CFR15 – 15.209

(a)Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength limit (uV/m)	Field strength limit (dBuV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz) 266.7-4.9	48.5-13.8	300
0.490 – 1.705	24000/F(kHz) 49.0-14.1	33.8-23.0	30
1.705 – 30.0	30	29.5	30
30 – 88	100	40.0	3
88 – 216	150	43.5	3
216 – 960	200	46.0	3
Above 960	500	54.0	3

***** The emission limits shown in the above table are based on measurement instrumentation employing a CISPR quasi-peak detector. For the frequency bands 9-90 KHz, 110-490 KHz and zbove1000 MHz, the radiated emission limits are based on measurements employing an average detector.

* The lower limit shall apply at the transition frequencies.

5.2.2 Measurement Procedure

Radiated Emissions Test, 9kHz to 30MHz (Magnetic Field Test)

1. The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions at a distance of 3 meters according to Section 15.31(f)(2).

2. The EUT was placed on the top of the 0.8-meter height, 1 x 1.5 meter non-metallic table.

3. Emissions from the EUT are maximized by adjusting the orientation of the Loop antenna and rotating the EUT on the turntable. Manipulating the system cables also maximizes EUT emissions if applicable.

4. To obtain the final measurement data, each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector with specified bandwidth.

Radiated Emissions Test, 30 MHz to 1000 MHz

1. The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions in an anechoic chamber at a distance of 3 meters.

2. The EUT was placed on the top of the 0.8-meter height, 1 x 1.5 meter non-metallic table. To find the maximum emission levels, the height of a measuring antenna was changed and the turntable was rotated 360

3. The antenna polarization was also changed from vertical to horizontal. The spectrum was scanned from 30 to 1000 MHz using the Biconical and Logperiodue broadband antenna,

4. To obtain the final measurement data, the EUT was arranged on a turntable situated on a 4 x 4 meter at the Open Area Test Site. The EUT was tested at a distance 3 meters.

5. Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.

6. The EUT is situated in three orthogonal planes (if appropriate)

7. The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT

5.2.3 Calculation of the field strength limits below 30 MHz

1. No special calculation for obtaining the field strength in dBuV/m is necessary, because the EMI receiver and the active loop antenna operate as a system, where the reading gives directly the field strength result (dBuV/m). The antenna factors and cable losses are already taken into consideration.

2. For test distance other than what is specified, but fulfilling the requirements of section 15.31 (f)(2) the field strength is calculated by adding additionally an extrapolation factor of 40dB/decade (inverse linear distance for field strength measurements).

3. All following emission measurements were performed using the test receiver's average, peak, and quasi-peak detector function with specified bandwidth.

5.2.4 Test Results PASS

Table 2: Field strength below 30 MHz

Frequency [KHz]	RBW [KHz]	Reading [dB(μV/m)]	Cable Loss [dB]	Actual [dB(μV/m)]	Limit (at 3m) [dB(μV/m)]	Margin [dB]
Emissions (Average Detector)						
124.97	0.2	54.35	0.5	54.40	105.60	51.20
375.90	9	39.73	0.5	39.78	96.10	56.32
Emissions (Peak Detector)						
124.97	0.2	59.28	0.5	59.33	125.60	66.27
375.90	9	45.81	0.5	45.86	116.10	70.24
Emissions (Quasi-Peak Detector)						
1928.00	9	38.97	0.13	39.10	69.50	30.40

FCC 47CFR15 – 15.209 (30 MHz – 1 GHz)

Table 3: Test Data, Radiated Emission 30 MHz to 1 GHz

Frequency [MHz]	RBW [KHz]	Pol [V/H]	Height [m]	Reading [dBμV]	AF [dB/m]	CL [dB]	Actual [dBμV/m]	Limit [dBμV/m]	Margin [dB]
48.24	120	V	1.04	16.55	13.15	1.9	31.6	39.00	7.4
104.04	120	H	1.09	12.27	12.13	2.5	26.9	43.50	16.6
203.92	120	H	1.15	18.57	10.13	3.6	32.3	43.50	11.2
299.88	120	H	1.27	16.25	13.25	2.4	31.9	46.40	14.5
587.80	120	V	1.35	6.52	19.18	5.9	31.6	46.40	14.8

Margin (dB) = Limit – Actual
[Actual = FS + AF + CL]

1.H = Horizontal, V = Vertical Polarization
2.AF/CL = Antenna Factor and Cable Loss
3.FS = RA + DF

Where FS = Field strength in dBuV/m
RA = Reciever Amplitude in dBuV/m
DF = Distance Extrapolation Factor in dB

5.3 AC POWER LINE CONDUCTED EMISSIONS

5.3.1 Regulationd

According to §15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 KHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56*	56 to 46*
0.5 - 5	56	46
5 - 30	60	50

*Decreases with the logarithm of the frequency

5.3.2 Test procedure

1. The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 cm in which is located 40 cm away from the vertical wall and 1.5 m away from the side wall of the shielded room.
2. Each Current-carrying conductor of the EUT power cord was individually connected through a 50 Ω/50μH LISN, which is an input transducer to a Spectrum Analyzer of an EMI/Field Intensity Meter, to the input power source.
3. Exploratory measurement were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory test of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
4. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 MHz to 30 MHz.
5. The measurements were made with the detector set to PEAK amplitude within a bandwidth of 10KHz or to QUASI-PEAK and AVERAGE within a bandwidth of 9 KHz. The EUT was in transmitting mode during the measurements.

5.3.3 Test Results:

Table 4: Measured values of the Conducted Emissions

Frequency [MHz]	Reading [dBμV]	L/N	CF [dB]	CL [dB]	Actual [dVμV]	Limit [dVμV]	Margin [dB]
QUASI-PEAK DATA							
0.19	49.15	H	0.10	0.05	49.3	64.04	14.74
0.26	43.18	H	0.27	0.05	43.5	61.43	17.93
0.33	38.77	H	0.27	0.06	39.1	59.45	20.35
0.39	40.97	H	0.27	0.06	41.3	58.06	16.76
0.46	39.76	N	0.17	0.07	40.0	56.69	16.69
0.59	44.06	H	0.17	0.07	44.3	56.00	11.70
1.32	38.82	H	0.39	0.09	39.3	56.00	16.70
2.11	38.52	H	0.25	0.13	38.9	56.00	17.10
15.84	34.70	N	0.24	0.26	35.2	60.00	24.80
23.99	37.76	H	0.37	0.37	38.5	60.00	21.50
AVERAGE DATA							
0.19	35.05	H	0.10	0.05	35.2	54.04	18.84
0.26	30.58	H	0.27	0.05	30.9	51.43	20.53
0.33	29.77	H	0.27	0.06	30.1	49.45	19.35
0.39	33.67	H	0.27	0.06	34.0	48.06	14.06
0.46	32.36	N	0.17	0.07	32.6	46.69	14.09
0.59	37.36	H	0.17	0.07	37.6	46.00	8.40
1.32	31.72	H	0.39	0.09	32.2	46.00	13.80
2.11	31.02	H	0.25	0.13	31.4	46.00	14.60
15.84	27.60	N	0.24	0.26	28.1	50.00	21.90
23.99	37.16	H	0.37	0.37	37.9	50.00	12.10

Margin (dB) Limit-Actual

[Actual Reading + CF + CL]

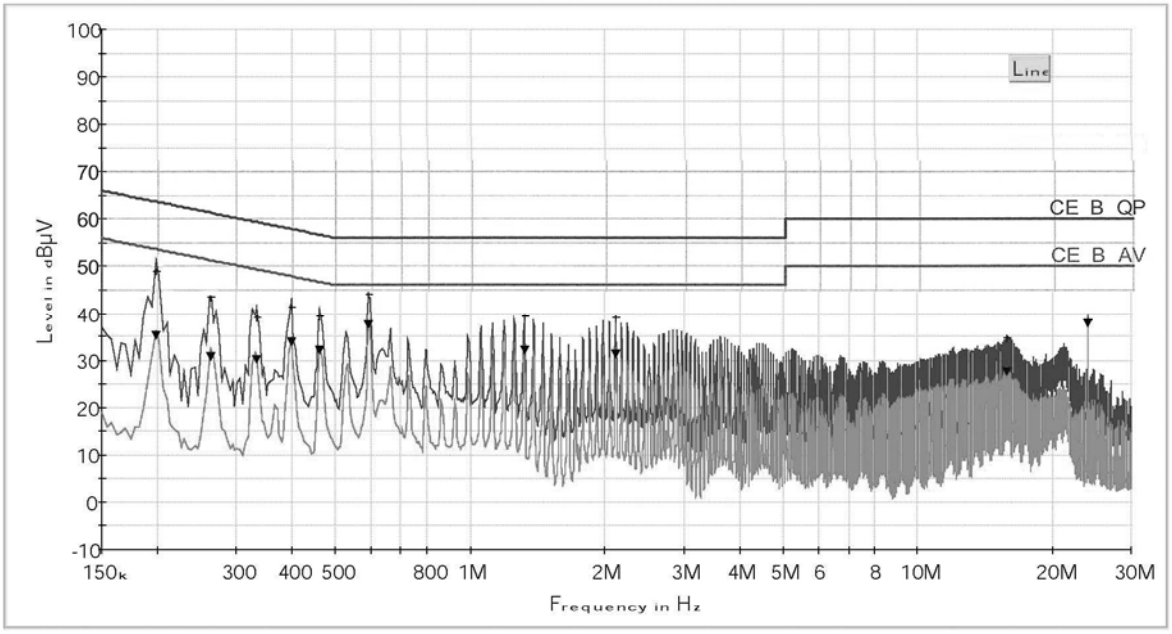
L/N LINE / NEUTRAL

CF/CL Correction Factor and Cable Loss

NOTE: All emissions not reported were more than 20 dB below the specified limit

Figure 2. Plot of the Conducted Emissions

Line-PE (Peak and Average detector used)



Neutral-PE (Peak and Average detector used)