



**Underwriters  
Laboratories UL Japan, Inc.**

Test report No. : 27KE0140-HO-A-R2  
Page : 1 of 42  
Issued date : July 17, 2007  
Revised date : July 23, 2007  
FCC ID : E4E6CYSIDV6800507

## RADIO TEST REPORT

**Test Report No. : 27KE0140-HO-A-R2**

**Applicant** : OMRON Corporation  
**Type of Equipment** : RFID system  
**Model No.** : ReaderWriter : V680-HAM42-FRT  
Antenna : V680-HS63-SP, V680-HS63,  
V680-HS52  
**Test standard** : FCC Part 15 Subpart C : 2007  
Section 15.207 and 15.225  
**FCC ID** : E4E6CYSIDV6800507  
**Test Result** : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with above regulation.
4. The test results in this report are traceable to the national or international standards.
5. Original test report number of this report is 27KE0140-HO-A.

**Date of test:** June 14 to July 20, 2007

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## **SECTION 1: Client information**

Company Name : OMRON Corporation  
Address : Shiokoji Horikawa, Shimogyo-ku, Kyoto 600-8530, Japan  
Telephone Number : +81-75-344-7022  
Facsimile Number : +81-75-344-7113  
Contact Person : Shinyu Fujiki

## **SECTION 2: Equipment under test (E.U.T.)**

### **2.1 Identification of E.U.T.**

Type of Equipment : RFID system  
Model No. : ReaderWriter: V680-HAM42-FRT  
Antenna : V680-HS63-SP, V680-HS63, V680-HS52  
Serial No. : ReaderWriter: 6  
Antenna : 17(V680-HS63-SP), 4(V680-HS63), 5(V680-HS52)  
Rating : DC 24.0V  
Country of Manufacture : Japan  
Receipt Date of Sample : June 14, 2007  
Condition of EUT : Engineering prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Modification of EUT : No modification by the test lab.

### **2.2 Product Description**

Model No: V680-HAM42-FRT / V680-HS63-SP, V680-HS63, V680-HS52 is the ReaderWriter / Antenna.

The clock frequency of EUT is as bellow:

CPU: 15.625MHz, 16MHz, 25MHz and 125MHz (internal)

PLD: 13.56MHz

Equipment Type : Transceiver  
Frequency Band : 13.553-13.567 MHz  
Frequency of Operation : 13.56 MHz  
Type of Modulation : ASK  
Mode of Operation : Simplex  
Antenna Type : Loop coil antenna  
Method of Frequency Generation : Crystal  
Operating Voltage (inner) : DC6V  
Operating Temperature : -10 deg. C. to +55 deg. C.

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## **SECTION 3: Test specification, procedures & results**

### **3.1 Test Specification**

Test Specification : FCC Part15 Subpart C : 2007

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.225 : Operation within the band 13.110-14.010MHz

#### **FCC 15.31 (e)**

This EUT provides stable voltage(DC6.0V) constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

#### **FCC Part 15.203 Antenna requirement**

The EUT has an external and particular antenna connector, but it is installed by the professionals. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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### 3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Conducted emission	ANSI C63.4:2003 7. AC powerline conducted emission measurements <IC>RSS-Gen 7.2.2	Section 15.207 <IC>RSS-Gen 7.2.2	-	N/A	12.3dB 13.55989MHz AV, L	Complied
2	Electric Field Strength of Fundamental Emission	ANSI C63.4:2003 13. Measurement of intentional radiators <IC>RSS-Gen 4.8, 4.11	Section 15.225(a) <IC>RSS-210 A2.6	Radiated	N/A	61.1dB 13.55986MHz QP, 45deg.	Complied
3	Spectrum Mask	ANSI C63.4:2003 13. Measurement of intentional radiators <IC>RSS-Gen 4.9, 4.11	Section 15.225(b)(c) <IC> RSS-210 A2.6	Radiated	N/A	39.8dB 13.553MHz QP, 45deg.	Complied
4	20dB Bandwidth	ANSI C63.4:2003 13. Measurement of intentional radiators <IC>-	Section 15.215(c) <IC>-	Conducted	N/A	See data	Complied
5	Electric Field Strength of Spurious Emission	ANSI C63.4:2003 13. Measurement of intentional radiators <IC>RSS-Gen 4.9, 4.11	Section 15.209, Section 15.225 (d) <IC>RSS-210 A2.6	Radiated	N/A	3.1dB 461.035MHz QP, Horizontal	Complied
6	Frequency Tolerance	ANSI C63.4:2003 13. Measurement of intentional radiators <IC>RSS-Gen 4.7	Section 15.225(e) <IC> RSS-210 A2.6	Conducted	N/A	See data	Complied

Note: UL Japan, Inc.'s EMI Work Procedures No.QPM05 and QPM15

\*These tests were performed without any deviations from test procedure except for additions or exclusions.

### 3.3 Addition to standards

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied Band Width	<IC>RSS-Gen 4.6.1	<IC>RSS-Gen 4.6.1	Conducted	N/A	N/A	Complied

\*Reference data

### 3.4     Uncertainty

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

#### **Conducted Emission**

The measurement uncertainty for this test is  $\pm 2.6$ dB.

The data listed in this test report has enough margin, more than the site margin.

#### **Spurious Emission (Radiated)**

The measurement uncertainty for this test using Loop antenna is  $\pm 4.41$ dB(3m)/  $\pm 4.39$ dB(10m).

The measurement uncertainty for this test using Biconical antenna is  $\pm 4.59$ dB(3m)/  $\pm 4.58$ dB(10m).

The measurement uncertainty for this test using Logperiodic antenna is  $\pm 4.62$ dB(3m)/  $\pm 4.60$ dB(10m).

The measurement uncertainty for this test using Horn antenna is  $\pm 5.27$ dB.

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

#### **Bandwidth and Frequency tolerance**

The measurement uncertainty for this test is  $1 \times 10^{-5}$ .

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### 3.5 Test Location

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	FCC Registration Number	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	313583	IC4247A	19.2 x 11.2 x 7.7m	7.0 x 6.0m	Preparation room
No.2 semi-anechoic chamber	655103	IC4247A-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	IC4247A-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	IC4247A-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	-
No.4 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	4.75 x 5.4 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-

\* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

### 3.6 Test set up, Test instruments and Data of EMI

Refer to APPENDIX 1 to 3.

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## SECTION 4: Operation of E.U.T. during testing

### 4.1 Operating Modes

The EUT was operated in a manner similar to typical use during the tests.

The mode is used : Transmitting 13.56MHz with Tag

Justification: The system was configured in typical fashion (as a customer would normally use it) for testing.

Frequency Tolerance:

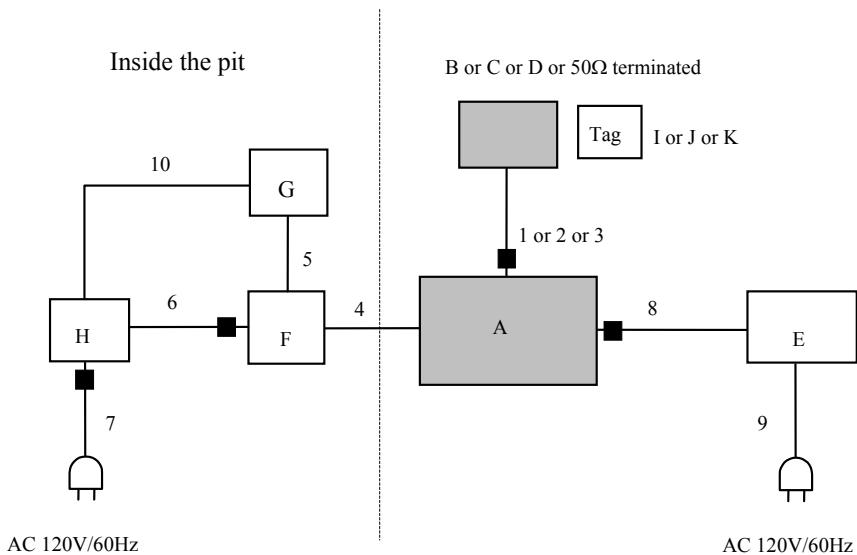
Temperature for the extreme tests : -20 deg.C.(minimum) to + 50deg.C.(maximum)

Voltage for the extreme tests : Vnom: DC 24.0V, Vmin: 20.4V, Vmax: 27.6V

\*Voltage extreme tests were performed, although this EUT provides stable voltage (DC6.0V) constantly to RF Module regardless of input voltage.

### 4.2 Configuration and peripherals

<Conducted Emission test>



■ : Standard Ferrite Core

\* Cabling and setup were taken into consideration and test data was taken under worse case conditions.

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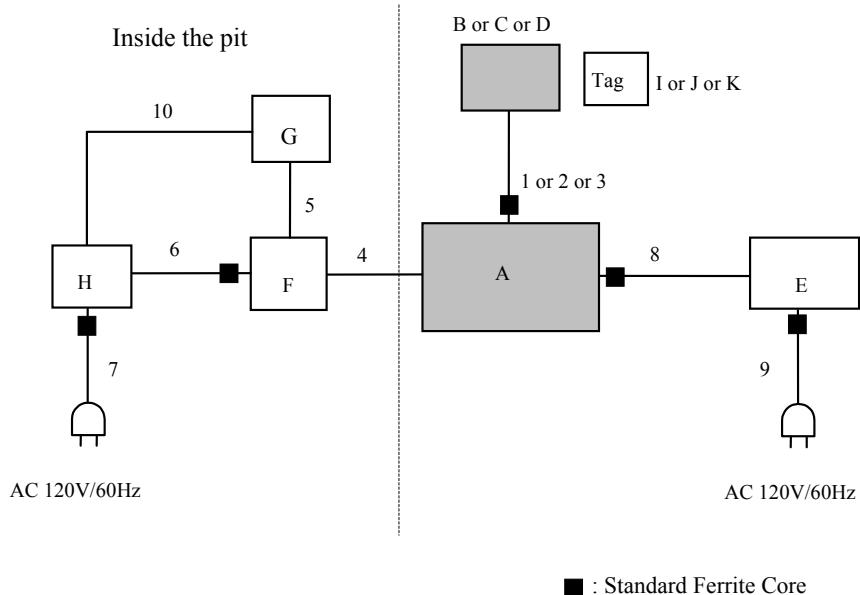
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<Other tests>



\* Cabling and setup were taken into consideration and test data was taken under worse case conditions.

**Description of EUT and Support equipment**

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	ReaderWriter	V680-HAM42-FRT	6	OMRON	EUT
B	Antenna	V680-HS63-SP	17	OMRON	EUT
C	Antenna	V680-HS63	4	OMRON	EUT
D	Antenna	V680-HS52	5	OMRON	EUT
E	DC Power supply	6654A	MY40000510	Agilent	for Conducted Emission test
	Power supply Unit	S8VS-03024	1	OMRON	for Other tests
F	HUB	SFN 5TX	6	OMRON	-
G	PLC	CJ1Series	2	OMRON	-
H	Power supply Unit	S8VS-03024	2	OMRON	-
I	Tag	V680-D1KP66T-SP	5	OMRON	for V680-HS63-SP
J	Tag	V680-D1KP66T	1	OMRON	for V680-HS63
K	Tag	V680-D1KP52MT	1	OMRON	for V680-HS52

**List of cables used**

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna Cable	12.0	Shielded	Shielded	for V680-HS63-SP
2	Antenna Cable	2.0	Shielded	Shielded	for V680-HS63
3	Antenna Cable	2.0	Shielded	Shielded	for V680-HS52
4	LAN Cable	5.0	Shielded	Shielded	-
5	LAN Cable	5.0	Shielded	Shielded	-
6	DC Power Supply	0.1	Unshielded	Unshielded	-
7	AC Power Supply	1.7	Unshielded	Unshielded	-
8	DC Power Supply	1.8	Unshielded	Unshielded	-
9	AC Power Supply	2.2	Unshielded	Unshielded	for Conducted Emission test
	AC Power Supply	1.8	Unshielded	Unshielded	for Other tests
10	DC Power Supply	0.4	Unshielded	Unshielded	-

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## **SECTION 5: Conducted emission**

### **5.1 Operating environment**

Test place : No.4 semi anechoic chamber.  
Temperature : See data  
Humidity : See data

### **5.2 Test configuration**

EUT was placed on a wooden table of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT and its peripherals was aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from LISN/AMN and excess AC cable was bundled in center. I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN/ an AMN to the input power source. All unused 50ohm connectors of the LISN/ AMN were resistively terminated in 50ohm when not connected to the measuring equipment.  
The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT on a horizontal conducting plane 4.0 x 4.0m and a vertical conducting plane 2.0 x 2.0m in a semi Anechoic Chamber.  
A drawing of the set up is shown in the photos of APPENDIX 1.

### **5.3 Test conditions**

Frequency range : 0.15MHz – 30MHz  
EUT position : Table top  
EUT operation mode : See Clause 4.1

### **5.4 Test procedure**

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT in the semi Anechoic Chamber. The EUT was connected to a Line Impedance Stabilization Network (LISN)/ Artificial Mains Network (AMN). An overview sweep with peak detection has been performed.  
The measurements had been performed with a quasi-peak detector and if required, with an average detector.  
The conducted emission measurements were made with the following detector function of the test receiver.  
Detector Type : QP and AV  
IF Bandwidth : 9kHz

### **5.5 Test result**

Summary of the test results : Pass

## **SECTION 6: Radiated emission (Fundamental , Spurious Emission and Spectrum Mask )**

### **6.1 Operating environment**

Test place : No.4 semi anechoic chamber.  
 Temperature : See data  
 Humidity : See data

### **6.2 Test Procedure**

The Radiated Electric Field Strength intensity has been measured in a semi anechoic chamber with a ground plane and at a distance of 3m.

Frequency : From 9kHz to 30MHz at distance 3m

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for each antenna angle 0deg. , 45deg. and 90deg.

Frequency : From 30MHz to 2GHz at distance 3m

The measuring antenna height was varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for both vertical and horizontal antenna polarization.

Measurements were performed with a QP, PK, and AV detector.

The radiated emission measurements were made with the following detector function of the test receiver.

	From 9kHz to 90kHz and From 110kHz to 150kHz	From 90kHz to 110kHz	From 150kHz to 490kHz	From 490kHz to 30MHz	From 30MHz to 1GHz	From 1GHz to 2GHz
Detector Type	PK/AV	QP	PK/AV	QP	QP	PK/AV
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz	RBW 1MHz VBW 1MHz (for PK) VBW 10Hz (for AV)

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

\* Part 15 Section 15.31 (f)(2) (9kHz-30MHz)

9kHz – 490kHz [Limit at 3m]=[Limit at 300m]-40log (3[m]/300[m])

490kHz – 30MHz[Limit at 3m]=[Limit at 30m]-40log (3[m]/30[m])

### **6.3 Test result**

Summary of the test results : Pass

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## **SECTION 7: 20dB Bandwidth**

### **Test Procedure**

The measurement was performed with a spectrum analyzer connected to the antenna port.

- Detector: Positive Peak
- Trace Mode: Max Hold

Test data : APPENDIX 2  
Test result : Pass

## **SECTION 8: Frequency Tolerance**

### **Test Procedure**

The measurement was performed with a spectrum analyzer connected to the antenna port.

- Detector: Positive Peak
- Trace Mode: Max Hold

Test data : APPENDIX 2  
Test result : Pass

## **SECTION 9: 99% Occupied Bandwidth**

### **Test Procedure**

The measurement was performed with a spectrum analyzer connected to the antenna port.

- Detector: Positive Peak
- Trace Mode: Max Hold

Test data : APPENDIX 2  
Test result : Pass

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