



# RADIO TEST REPORT

Test Report No. : 28AE0160-HO-A-R1

Applicant : OMRON Corporation  
Type of Equipment : RFID READER/WRITER  
Model No. : V680-CH1D,  
V680-CHUD,  
V680-CH1D-PSI  
Test standard : FCC Part 15 Subpart C : 2007  
Section 15.207 and 15.225  
FCC ID : OZGV680-CHXD  
Test Result : Complied

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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 28AE0160-HO-A.

Date of test:

September 11 to 18 , 2007

Tested by:

*K. Adachi*  
Kenichi Adachi  
EMC Services

Approved by :

*M. Fujimura*  
Mitsuru Fujimura  
EMC Services



NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.  
\*As for the range of Accreditation in NVLAP, you may refer to the WEB address, <http://uljapan.co.jp/emc/nvlap.htm>

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## **SECTION 1: Client information**

Company Name : OMRON Corporation  
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Facsimile Number : +81-77-565-5553  
Contact Person : Kazushi Yamasaki

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

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

Type of Equipment : RFID READER/WRITER  
Model No. : V680-CH1D,  
V680-CHUD,  
V680-CH1D-PSI  
Serial No. : RF-DS-07011 (V680-CH1D),  
RF-DS-07014 (V680-CHUD),  
RF-DS-07012 (V680-CH1D-PSI)  
Rating : DC 5.0V  
Country of Manufacture : Japan  
Receipt Date of Sample : September 10, 2007  
Condition of EUT : Production model  
Modification of EUT : No modification by the test lab.

### **2.2 Product Description**

Model No: V680-CH1D, V680-CHUD and V680-CH1D-PSI are the RFID READER/WRITER.  
The clock frequencies of EUT are 13.56MHz (CPU), 16MHz(CPU), 48MHz(USB, V680-CHUD only).

The radio specification of V680-CH1D, V680-CHUD and V680-CH1D-PSI is identical.  
The difference in three models is a wired interface only.

- V680-CH1D : The RS-232C interface and the power was supplied from the attached AC adapter.
- V680-CHUD : The USB interface and the power was supplied from the USB signal cable.  
USB signal cables are 1.9m and 0.8m, and a difference in two cables is the length only.
- V680-CH1D-PSI : The RS-232C interface and the power was supplied from the RS-232C signal cable.

Equipment Type : Transceiver  
Frequency band : 13.553-13.567 MHz  
Frequency of Operation : 13.56 MHz  
Type of modulation : ASK  
Antenna Type : Coil antenna  
Method of Frequency Generation : Crystal  
Operating voltage (inner) : DC5.0V  
Operating Temperature : 0 deg. C. to +40 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(DC4.3V) constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

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

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

### 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	(V680-CH1D) 1.6dB 0.24836MHz N, AV	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	(V680-CH1D-PSI) 60.0dB 13.56019MHz 90deg., QP	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	See data	Complied
4	20dB Bandwidth	ANSI C63.4:2003 13. Measurement of intentional radiators <IC> -	Section15.215(c) <IC> -	Radiated	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	Section15.209, Section 15.225 (d) <IC>RSS-210 A2.6	Radiated	N/A	(V680-CH1D) 15.4dB 81.369MHz Vertical, QP	Complied
6	Frequency Tolerance	ANSI C63.4:2003 13. Measurement of intentional radiators <IC>RSS-Gen 4.7	Section15.225(e) <IC> RSS-210 A2.6	Radiated	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	RSS-Gen 4.6.1	RSS-Gen 4.6.1	Radiated	N/A	N/A	Complied

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### 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 report meets the limits unless the uncertainty is taken into consideration.

#### Spurious Emission (Radiated)

9kHz to 30MHz: The measurement uncertainty for this test using Loop antenna is  $\pm 4.41$ dB(3m)/  $\pm 4.39$ dB(10m).

30MHz to 300MHz: The measurement uncertainty for this test using Biconical antenna is  $\pm 4.59$ dB(3m)/  $\pm 4.58$ dB(10m).

300MHz to 1GHz: The measurement uncertainty for this test using Logperiodic antenna is  $\pm 4.62$ dB(3m)/  $\pm 4.60$ dB(10m).

Above 1GHz: The measurement uncertainty for this test using Horn antenna is  $\pm 5.27$ dB.

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

### 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	IC4247	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	IC4247-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	IC4247-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	IC4247-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
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

Test	Mode	Tag
Radiated emission	Transmitting (13.56MHz, Modulation, PN9)	Without Tag
Bandwidth and Conducted emission		With Tag
Frequency Tolerance	Transmitting (13.56MHz, None Modulation)	Without Tag

\* The test was confirmed with and without a tag in the preliminary test. As a result of preliminary test, since the worst levels for each test were as mentioned above, the formal test was performed under the above conditions.  
\* Although the radio specification of three models is identical, Conducted emission and Radiated emission tests were performed with three models. Bandwidth and Frequency Tolerance tests which were less affected by the chassis were performed with a representative model, V680-CH1D-PSI which had the worst carrier level.

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

Frequency Tolerance:

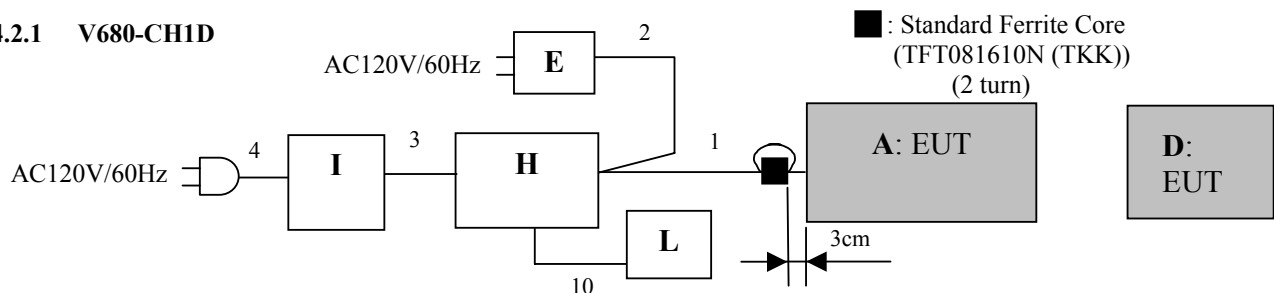
Temperature for the extreme tests : -30 deg.C.(minimum) to + 50deg.C.(maximum)  
(-30deg.C.: Reference, Step 10deg.C.)

Voltage for the extreme tests : DC 5.0V

\*This EUT provides stable voltage(DC5.0V) constantly to RF Module regardless of input voltage.

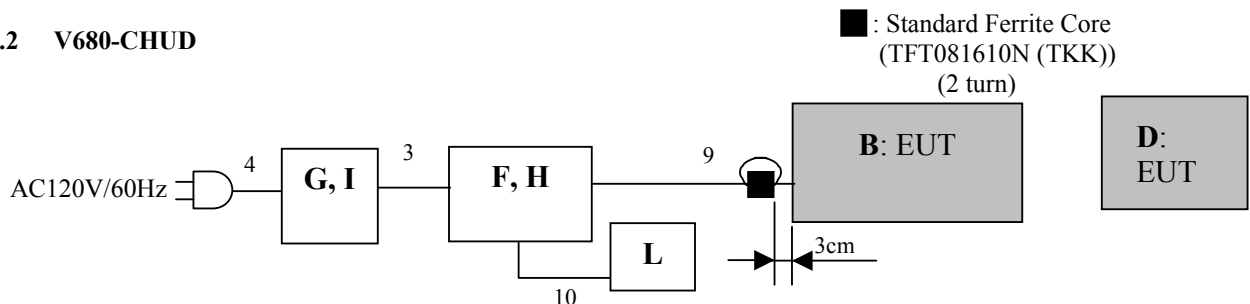
### 4.2 Configuration and peripherals

#### 4.2.1 V680-CH1D



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

#### 4.2.2 V680-CHUD



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

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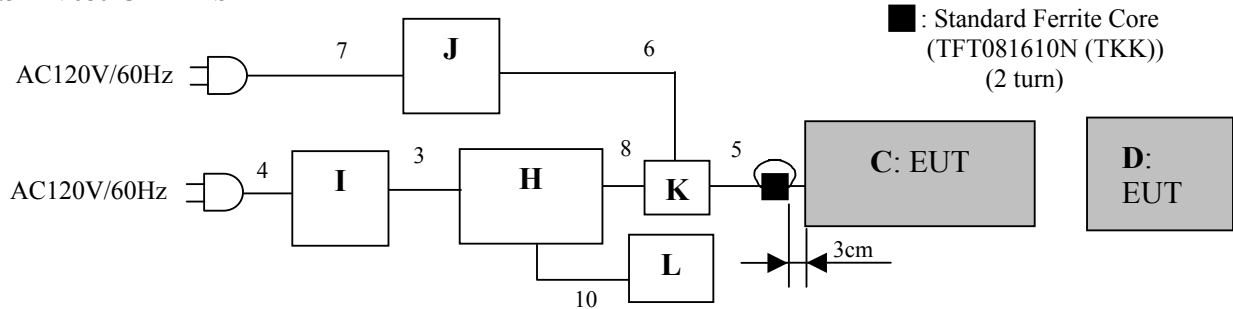
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#### 4.2.3 V680-CH1D-PSI



\* 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	RFID READER / WRITER	V680-CH1D	RF-DS-07011	OMRON	EUT
B	RFID READER / WRITER	V680-CHUD	RF-DS-07014	OMRON	EUT
C	RFID READER / WRITER	V680-CH1D-PSI	RF-DS-07012	OMRON	EUT
D	RFID Tag	V680-D2KF67	7	OMRON	EUT
E	AC Adapter	V600-A22	06GT35	OMRON	-
F	Personal Computer	TYPE 2652-93J	99-PWTVD	IBM	*1)
G	AC Adapter	02K6746	11S02K6746Z1Z2UF2C41MV	IBM	*1)
H	Personal Computer	nx-9040	CNF5201PRQ	HP	-
I	AC Adapter	PA-1650-02C	5425934606	HP	-
J	DC power supply	S82K-00705	0767YK		-
K	RS-232C Converter	-	-	OMRON	-
L	Mouse	M-UB48	830318-0000	Logitech	*2)

\*1) Used for Conducted emission test

\*2) Used for Radiated emission test

#### List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	RS232C cable	2.4	Shielded	Shielded	-
2	DC cable	2.0	Unshielded	Unshielded	-
3	DC cable	1.8	Unshielded	Unshielded	-
4	AC cable	1.8	Unshielded	Unshielded	-
5	RS232C cable	0.7	Shielded	Shielded	-
6	DC cable	0.4	Unshielded	Unshielded	-
7	AC cable	2.0	Unshielded	Unshielded	-
8	RS232C cable	0.1	Unshielded	Unshielded	-
9	USB cable	1.9	Shielded	Shielded	-
10	Mouse cable	0.8	Shielded	Shielded	*2)

\*2) Used for Radiated emission test

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## **SECTION 5: Conducted emission**

### **5.1 Operating environment**

Test place : No.2 semi anechoic chamber.  
Temperature : See data  
Humidity : See data

### **5.2 Test configuration**

EUT was placed on a urethane platform of nominal size, 1.0m by 0.5m, 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 carrier frequency was measured with an antenna terminal terminated.

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

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

**6.1 Operating environment**

The test was carried out in a No.1 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, by Loop antenna  
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 1GHz at distance 3m, by Biconical antenna and Logperiodic antenna  
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
Detector Type	PK/AV	QP	PK/AV	QP	QP
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz

- 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.

\* FCC Part 15 Section 15.31 (f)(2) / IC RSS-Gen 4.11 (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

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

### **Test Procedure**

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Test data : APPENDIX 2  
Test result : Pass

## **SECTION 8: Frequency Tolerance**

### **Test Procedure**

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Test data : APPENDIX 2  
Test result : Pass

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

### **Test Procedure**

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Test data : APPENDIX 2  
Test result : Pass