

RADIO TEST REPORT

Test Report No. : 29KE0168-HO-01-A-R1

Applicant : **OMRON Corporation**
Type of Equipment : **Keyless operation system**
Model No. : **G8D-841M-ECU-D**
Test regulation : **FCC Part 15 Subpart B 2010 Section 15.109**
FCC Part 15 Subpart C 2010 Section 15.209
FCC ID : **OUCG8D841MKOS**
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. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This report is a revised version of 29KE0168-HO-01-A. 29KE0168-HO-01-A is replaced with this report.

Date of test: January 21 and March 29, 2010

Tested by: T. Shimada
Takumi Shimada
Representative test Engineer of EMC
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Approved by: Makoto Kosaka
Makoto Kosaka
Engineer of EMC Services



NVLAP LAB CODE: 200572-0

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MF060b (06.08.09)

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SECTION 1: Customer information

Company Name : OMRON Corporation
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Telephone Number : +81-568-78-6159
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Contact Person : Masashi Matsuda

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

2.1 Identification of E.U.T.

Type of Equipment : Keyless operation system
Model No. : G8D-841M-ECU-D
Serial No. : See Clause 4.2
Receipt Date of Sample : January 20, 2010
Country of Mass-production : Japan
Condition of EUT : Production 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: G8D-841M-ECU-D is the Keyless operation system (hereafter referred to as KOS).
KOS consists of ECU, LF ANT, and FOB BOX.
ECU has the same model name, G8D-841M-ECU-D as KOS.

Keyless operation system is a system to lock/unlock (door entry function) a door /trunk by pressing Lock/Unlock SW on each door with holding the registered keyless operation key (hereafter referred to as FOB) and start up an engine (engine starter function) without using an existing mechanical key. These operations can be done without pulling FOB from a pocket or bag.

The keyless entry function to lock/unlock doors by pressing a button on FOB, immobilizer function for antitheft and remote engine starter function to start up/stop an engine by pressing a button of a separate transmitter (remote control engine starter) are installed.

General Specification

Operating Voltage : DC8 to 16V
Operating Temperature : -40 deg. C. to +85 deg. C

KOS has the following radio functions: Immobilizer system and Smart System (LF Transmitting/RF Receiving).

Immobilizer system function

Equipment Type : Transceiver
Frequency of Operation : 125kHz
Type of Modulation : BPLM
Mode of Operation : Simplex
Antenna Type : Coil Antenna
Method of Frequency Generation : Ceramic Resonator (8MHz)
Operating Voltage (inner) : DC5V (The stable voltage: DC5V is provided to RF part regardless of input voltage fluctuation (Car Battery).)

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Smart System: LF Transmitting function

Equipment Type : Transmitter
Frequency of Operation : 125kHz
Type of Modulation : ASK
Mode of Operation : Simplex
Antenna Type : Ferrite Antenna
Method of Frequency Generation : Crystal (8MHz) and CPU timer
Operating Voltage (inner) : DC8V (The stable voltage: DC8V is provided to RF part regardless of input voltage fluctuation (Car Battery).)

*KOS has 5 or 6 LF antennas depending on the vehicles on which the EUT is mounted, and all the antennas are same in specification. ECU controls the power for each antenna.

Smart System: RF Receiving function

Type of Receiver : Super Heterodyne
Receiving Frequency : 315MHz
Oscillator Frequency : 10.178125MHz (Crystal)
Local Oscillator Frequency : 325.7MHz(10.178125MHz*32)
Intermediate Frequency : 10.7MHz
Antenna Type : S type Antenna
Method of Frequency Generation : Crystal
Operating Voltage (inner) : DC5V (The stable voltage: DC5V is provided to RF part regardless of input voltage fluctuation (Car Battery).)

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart B 2010, final revised on January 22, 2010 and effective March 1, 2010

Title : FCC 47CFR Part15 Radio Frequency Device Subpart B Unintentional Radiators

Test Specification : FCC Part 15 Subpart C 2010, final revised on January 22, 2010 and effective March 1, 2010

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.209 Radiated emission limits, general requirements

*The revision on January 22, 2010 does not affect the test specification applied to the EUT.

FCC 15.31(e)

The EUT provides the stable voltage (DC8V for LF Transmitter, DC5V for Immobilizer) constantly to RF part regardless of input voltage. Therefore, the EUT complies with the requirement.

FCC15.111(b)

The receiving antenna (of the EUT) is installed inside the EUT and cannot be removed (permanently attached). Therefore, Radiated emission test was performed.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the LF transmitting antenna, because it is mounted inside of the vehicle and users cannot access it. Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.2 Procedures and results

<FCC Part15 Subpart B (315MHz Receiving part)>

No	Item	Test Procedure	Limits	Deviation	Worst margin	Results
1	Conducted emission	<FCC> ANSI C63.4: 2003 7. AC powerline conducted emission measurements <IC> RSS-Gen 7.2.	Receiver	N/A *1)	N/A	N/A
2	Radiated emission	<FCC> ANSI C63.4: 2003 8. Radiated emission measurements <IC> RSS-Gen 4.10	Receiver	N/A	Not detected (Noise Floor only)	Complied

*Note: UL Japan, Inc's EMI Work Procedure QPM05.

*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.

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<FCC Part15 Subpart C (125kHz Transmitting part)>

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Conducted Emission	<FCC> ANSI C63.4:2003 7. AC powerline conducted emission measurements <IC> RSS-Gen 7.2.2	<FCC> Section 15.207 <IC> RSS-Gen 7.2.2	-	N/A *1)	N/A	N/A
2	Electric Field Strength of Fundamental Emission	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> RSS-Gen 4.8, 4.11	<FCC> Section 15.209 <IC> RSS-210 2.6, 2.7	Radiated	N/A	19.9dB 0.12500MHz AV (Max Ant.)	Complied
3	Electric Field Strength of Spurious Emission	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> RSS-Gen 4.9, 4.11	<FCC> Section 15.209 <IC> RSS-210 2.6, 2.7	Radiated	N/A	17.4dB 51.274MHz Horizontal Immobilizer Tx (*Excluding Noise Floor)	Complied
4	-26dB Bandwidth	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> -	<FCC> Reference data <IC> -	Radiated	N/A	N/A	N/A

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

*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.

3.3 Addition to standard

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	Radiated	N/A	N/A	N/A

Other than above, no addition, exclusion nor deviation has been made from the standard.

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3.4 Uncertainty

EMI

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

Test room (semi-anechoic chamber)	Radiated emission (10m*)(±dB)			Radiated emission					
				(3m*)(±dB)					(1m*)(±dB)
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	2.7dB	4.8dB	5.0dB	2.9dB	4.8dB	5.0dB	3.9dB	4.5dB	4.4dB
No.2	-	-	-	3.5dB	4.8dB	5.1dB	4.0dB	4.3dB	4.2dB
No.3	-	-	-	3.8dB	4.6dB	4.7dB	4.0dB	4.5dB	4.4dB
No.4	-	-	-	3.5dB	4.4dB	4.9dB	4.0dB	4.6dB	4.5dB

*10m/3m/1m = Measurement distance

Antenna terminal conducted emission and Power density (±dB)			Antenna terminal conducted emission (±dB)		Channel power (±dB)
Below 1GHz	1GHz-3GHz	3GHz-18GHz	18GHz-26.5GHz	26.5GHz-40GHz	
1.0dB	1.1dB	2.7dB	3.2dB	3.3dB	1.5dB

Radiated emission test(3m)

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

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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	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	2973C-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	2973C-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	-
No.9 measurement room	-	-	8.0 x 4.5 x 2.8m	2.0 x 2.0m	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 x 3.0m	2.4 x 3.4m	-

* 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, Data of EMI, and Test instruments

Refer to APPENDIX 1 to 3.

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

4.1 Operating Modes

The mode is used :

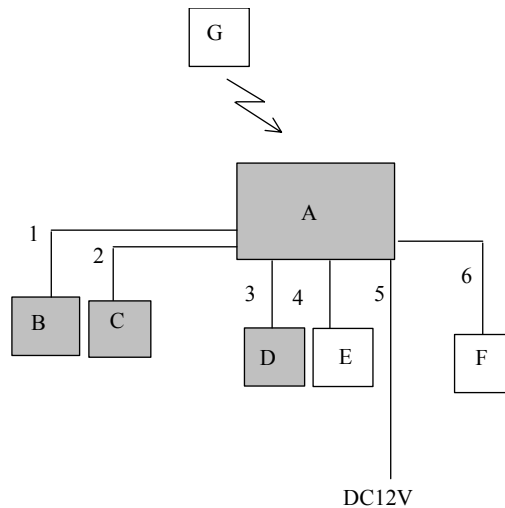
1. LF Transmitting 125kHz (Max Antenna) *1)
2. LF Transmitting 125kHz (Min Antenna) *1)
3. Immobilizer Transmitting 125kHz
4. RF Receiving 315MHz *2)

*1) KOS has 5 or 6 LF antennas (depending on the vehicles on which the EUT is mounted) and they are same in specification. ECU controls the power for each antenna.
Test was performed only with an antenna to which ECU supplied maximum power (Max antenna power) and with an antenna to which ECU supplied minimum power (Min Antenna power) as a representative.

*2) FOB (G8D-644M-KEY-N 4T) was operated manually by a test engineer and the test was performed with the EUT receiving 315MHz.

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

4.2 Configuration and peripherals



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

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Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	ECU	G8D-841M-ECU-D	1 *1) 2 *2)	OMRON	EUT
B	LF ANT	G8D-841M-ANT-A	1-244 *1) 1-243 *2)	OMRON	EUT Max Antenna
C	LF ANT	G8D-841M-ANT-A	1-248 *1) 1-245 *2)	OMRON	EUT Min Antenna
D	FOB BOX	C8Z-F116M	75 *1) 76 *2)	OMRON	EUT
E	SIM	GBN-B100N	-	OMRON	-
F	JIG	-	-	OMRON	-
G	FOB	G8D-644M-KEY-N 4T	-	OMRON	*2)

*1) Used for Test modes 1, 2, and 3

*2) Used for Test mode 4.

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Antenna Cable	1.5	Unshielded	Unshielded	-
2	Antenna Cable	1.5	Unshielded	Unshielded	-
3	Signal Cable	1.5	Unshielded	Unshielded	-
4	Signal Cable	1.5	Unshielded	Unshielded	-
5	DC Cable	2.0	Unshielded	Unshielded	-
6	Signal Cable	1.5	Unshielded	Unshielded	-

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SECTION 5: Radiated emission (Fundamental and Spurious Emission)

The Radiated Electric Field Strength intensity has been measured on No 1 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 vertical polarization (rotate 0deg. to 360 deg.) and horizontal polarization.

*Refer to Figure 1 about Direction of the Loop Antenna.

Frequency : From 30MHz to 1GHz at distance 3m

The measuring antenna height 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 (below 1GHz) and the spectrum analyzer (above 1GHz).

	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*1)
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz	1MHz

*1) When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

- The carrier level (or, noise levels) was (or were) measured at each position of all three axes X, Y and Z of ECU, Max /Min Antenna, and Immobilizer, and the position that has the maximum noise was determined. With the position, the noise levels of all the frequencies were measured.

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

[Limit at 3m]=[Limit at 300m]-40 x log (3[m]/300[m])

[Limit at 3m]=[Limit at 30m]-40 x log (3[m]/30[m])

Test data : **APPENDIX 2**
Test result : **Pass**

Date: January 21, 2010

Test engineer: Takumi Shimada and Kazufumi Nakai

UL Japan, Inc.

Head Office EMC Lab.

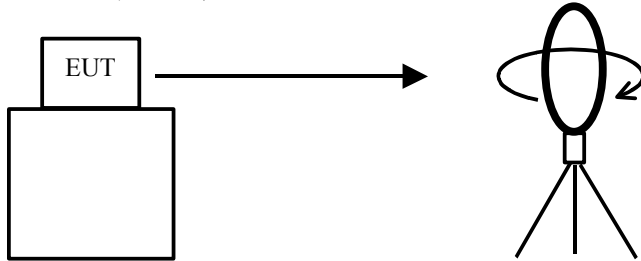
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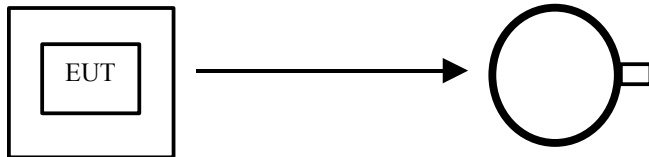
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Figure 1: Direction of the Loop Antenna

Side View (Vertical)

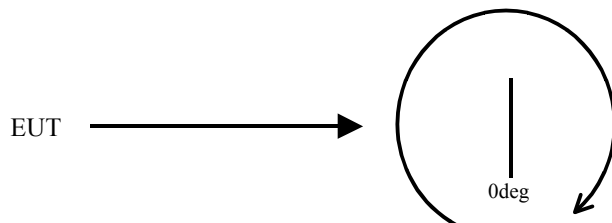


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



Front side: 0 deg.
Forward direction: clockwise

SECTION 6: -26dB 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 7: 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