

# RADIO TEST REPORT

**Test Report No. : 30CE0152-HO-03-A**

**Applicant** : **Omron Corporation Kusatsu Factory**

**Type of Equipment** : **DeviceNet Wireless Units**

**Model No.** : **WD30-ME**



**FCC ID** : **VM6WD30**


**Test regulation** : **FCC Part 15 Subpart C: 2009  
Section 15.207, Section 15.247  
(Permissive Change Class II Application)  
(Radiated Spurious Emission and Maximum Peak  
Output Power tests only)**

**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 the 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.

**Date of test:** December 3, 2009 and January 6, 2010

**Tested by:**    
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**Approved by :**   
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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.html>

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## **SECTION 1: Customer information**

Company Name : Omron Corporation Kusatsu Factory  
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Contact Person : Masaki Ouchi

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

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

Type of Equipment : DeviceNet Wireless Units  
Model No. : WD30-ME  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : DC24V  
Receipt Date of Sample : November 28, 2009  
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: WD30-ME (referred to as the EUT in this report) is the DeviceNet Wireless Units.

\*There are variant models such as WD30-ME, WD30-ME01, WD30-SE and WD30-SE01.

The radio characteristics of the model [WD30-ME] remains identical to the model [WD30-ME01], [WD30-SE], and [WD30-SE01].

The only difference between the model [WD30-ME], [WD30-ME01], and [WD30-SE], [WD30-SE01] is the software.

The model [WD30-ME]/[WD30-ME01] is the master, the model [WD30-SE]/[WD30-SE01] is the client.

The only difference between the model [WD30-ME], [WD30-SE], and [WD30-ME01], [WD30-SE01] is the antenna.

The difference is as follows;

Model No.	WD30-ME	WD30-ME01	WD30-SE	WD30-SE01
Antenna Type (Original)	Pencil antenna	Magnet-base antenna	Pencil antenna	Magnet-base antenna
Antenna Type (Additional)	Magnet-base antenna (WD30-AT002)	Magnet-base antenna (WD30-AT002)	Magnet-base antenna (WD30-AT002)	Magnet-base antenna (WD30-AT002)

\*The test was performed with Model No. WD30-ME.

Equipment Type	Transceiver
Clock frequency(ies) in the system	16MHz
IFLo	480MHz
TCXO	13.2MHz
Frequency of Operation	2402.2MHz(Ch51) - 2480.2MHz(Ch34)
Bandwidth & Channel spacing	2.2MHz or less & 1.2MHz
Number of Channels	66Channels
Type of Modulation	DSSS
Antenna Type	Magnet-base Antenna (WD30-AT002)
Antenna Connector Type	1/2 λ Standing-wave type
Antenna Gain	SMA reverse connector
Power Supply (inner)	1.83 dBi (Including cable loss)
	DC 3.3V +/- 5%

<Contents of the change from original model>

Original test report number of this report is 27EE0054-HO-B-2.

The specification of the EUT was changed from original model as below.

\* Magnet-base antenna (WD30-AT002) was added for the all models.

Therefore only Radiated Spurious Emission and Maximum Peak Output Power tests were performed in this report.

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

### **3.1 Test Specification**

Test Specification : FCC Part15 Subpart C: 2009, final revised on December 2, 2009

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.247 Operation within the bands 902-928MHz,  
2400-2483.5MHz, and 5725-5850MHz

### **3.2 Procedures and results**

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Maximum Peak Output Power	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: RSS-Gen 4.8	FCC: Section 15.247(b)(3) ----- IC: RSS-210 A8.4(4)	See data.	Complied	Conducted
Spurious Emission Restricted Band Edges	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: RSS-Gen 4.9 RSS-Gen 4.10	FCC: Section15.247(d) ----- IC: RSS-210 A8.5 RSS-Gen 7.2.1 and 7.2.3	[Tx] 1.9dB 108.921MHz, QP, Vert. 108.872MHz, QP, Vert. [Rx] 3.7dB 108.983MHz, QP, Vert.	Complied	Radiated

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

\* In case any questions arise about test procedure, ANSI C63.4: 2009 is also referred.

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

This EUT provides stable voltage (DC3.3V+/- 5%) constantly to RF Part regardless of input voltage. Therefore, this EUT complies with the requirement.

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

The EUT has a unique coupling antenna connector (SMA reverse connector). Therefore the equipment complies with the requirement of 15.203.

### 3.3 Addition to standard

No addition, exclusion nor deviation has been made from the standard.

### 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

Power meter (±dB)	
Below 1GHz	Above 1GHz
1.0dB	1.0dB

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

### 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.

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

### 4.1 Operating Mode(s)

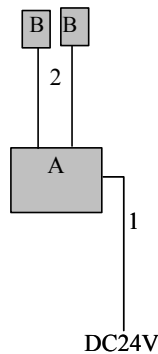
Mode	Remarks*
DSSS	PN9
*Transmitting duty was 100% on all tests.	

\*The details of Operating modes

Test Item	Operating Mode	Tested Antenna	Tested frequency
Radiated Spurious Emission	Tx	2 *1)	2402.2MHz 2441.8MHz 2480.2MHz
	Rx	2 *1)	2441.8MHz
Maximum Peak Output Power	Tx	1	2402.2MHz 2441.8MHz 2480.2MHz
		2	2402.2MHz 2441.8MHz 2480.2MHz

\*1) As a result of preliminary check of Radiated Spurious Emission test, the formal test was performed with the worst condition.

### 4.2 Configuration and peripherals



\* 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	DeviceNet Wireless Units	WD30-ME	1	Omron	EUT
B	Magnet-base Antenna	WD30-AT002	1	Omron	EUT

#### List of cables used

No.	Name	Length (m)	Shield	
			Cable	Connector
1	DC Line cable	3.0*	Unshielded	Unshielded
2	Antenna cable	2.0	Shielded	Shielded

\*The length of DC line cable for sale (supplied with the EUT on the market) is less than 3m.

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## **SECTION 5: Radiated Spurious Emission**

### **Test Procedure**

It was measured based on "2. Radiated emission test" of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247".

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

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

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

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

### **Test Antennas are used as below;**

Frequency	Below 30MHz	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	Loop	Biconical	Logperiodic	Horn

In any 100kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

**20dBc was applied to the frequency over the limit of FCC 15.209 / Table 2 of RSS-210 2.7 (IC) and outside the restricted band of FCC15.205 / Table 1 of RSS-210 2.7 (IC).**

Frequency	Below 1GHz	Above 1GHz	
Instrument used	Test Receiver / Spectrum Analyzer	Spectrum Analyzer *1)	
Detector	QP	PK	AV
IF Bandwidth	BW 120kHz(T/R)	RBW: 1MHz VBW: 1MHz	RBW: 1MHz VBW: 10Hz
	20dBc : RBW: 100kHz VBW: 300kHz (S/A)	20dBc : RBW:100kHz/VBW:300kHz	
Test Distance	3m	3m (below 10GHz), 1m*2) (above 10GHz)	

\*1) The Spectrum Analyzer was used in 3dB resolution bandwidth.

\*2) Distance Factor:  $20 \times \log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$

- 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.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

**Measurement range : 30M-26.5GHz**  
**Test data : APPENDIX**  
**Test result : Pass**

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## **SECTION 6: Antenna Terminal Conducted Tests**

### **Test Procedure**

The tests were made with below setting connected to the antenna port.

<b>Test</b>	<b>Span</b>	<b>RBW</b>	<b>VBW</b>	<b>Sweep time</b>	<b>Detector</b>	<b>Trace</b>	<b>Instrument used</b>
Maximum Peak Output Power	-	-	-	Auto	Peak	-	Power Meter (Sensor: 50MHz BW)

The test results and limit are rounded off to two decimals place, so some differences might be observed.

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