



RADIO TEST REPORT

Test Report No. : 27EE0054-HO-B-2

Applicant : Omron Corporation Okayama Factory

Type of Equipment : DeviceNet Wireless Units

Model No. : WD30-ME

FCC ID : RXEWD30B

Test standard : FCC Part 15 Subpart C
Section 15.207, Section 15.247: 2006

Test Result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Apex Co., Ltd.
2. The results in this report apply only to the sample tested.
3. This equipment is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.

Date of test:

December,7, 2006 to February 28, 2007

Tested by:

T. Shimada

Takumi Shimada
EMC Services

N. Hashimoto

Norihisa Hashimoto
EMC Services

K. Adachi

Kenichi Adachi
EMC Services

Approved by :

H. Shimoji

Hironobu Shimoji
Assistant Manager of
EMC Services



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*As for the range of Accreditation in NVLAP, you may refer to the WEB address, <http://ulapex.jp/emc/nvlap.htm>

UL Apex Co., Ltd.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

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SECTION 1: Client information

Company Name : Omron Corporation Okayama Factory
Address : 2075 Miyoshi Okayama-city, Okayama, 703-8502, Japan
Telephone Number : +81-86-276-1797
Facsimile Number : +81-86-276-1520
Contact Person : Shinji Ueno

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. : ME-4
Rating : DC24V
Country of Manufacture : Japan
Receipt Date of Sample : December 5, 2006
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: 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 | Pencil antenna | Magnet-base antenna | Pencil antenna | Magnet-base antenna |

*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 | ½ λ Standing-wave type |
| | Pencil Antenna | ½ λ Standing-wave type |
| Antenna Connector Type | | SMA reverse connector |
| Antenna Gain | Magnet-base Antenna | 2.14 dBi |
| | Pencil Antenna | 0 dBi |
| Power Supply (inner) | | DC 3.3V +/- 5% |

UL Apex Co., Ltd.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part15 Subpart C : 2006
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits : 2006
Section 15.247 Operation within the bands 902-928MHz,
2400-2483.5MHz, and 5725-5850MHz : 2006

FCC 15.31 (e)

This EUT provides stable voltage(DC3.3V+/- 5%) constantly to RF Module 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

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Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Facsimile : +81 596 24 8124

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3.2 Procedures and results

[DSSS and other forms of modulation]

| 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 | 13.2dB, 16.0000MHz L/AV (Magnet-base Antenna) | Complied |
| 2 | 6dB Bandwidth | FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: RSS-Gen 4.4.2 | FCC: Section 15.247(a)(2) IC: RSS-210 A8.2(1) | Conducted | N/A | See data. | Complied |
| 3 | Maximum Peak Output Power | FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: RSS-Gen 4.6 | FCC: Section 15.247(b)(3) IC: RSS-210 A8.4(4) | Conducted | N/A | | Complied |
| 4 | Restricted Band Edges | FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: - | FCC: Section 15.247 (d) IC: RSS-210 A8.5 | Conducted/ Radiated | N/A | | Complied |
| 5 | Power Density | FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: - | FCC: Section 15.247 (e) IC: RSS-210 A8.2(2) | Conducted | N/A | | Complied |
| 6 | Spurious Emission | FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: RSS-Gen 4.7 RSS-Gen 4.8 | FCC: Section 15.247(d) IC: RSS-210 A8.5 RSS-Gen 7.2.1 and 7.2.3 | Conducted/ Radiated | N/A | | [TX] 1.4dB 105.474MHz, Ver. (QP) (Magnet-base Antenna) [RX] 3.1dB 98.654MHz, Ver. (QP) (Magnet-base Antenna) |

Note: UL Apex's EMI Work Procedures No.QPM05 and QPM15.
*0) The result is rounded off to the second decimal place. Therefore, there may be 0.1 difference for the result.
*These tests were also referred to "Guidance on Measurement of Digital Transmission Systems Operating under Section 15.247".
*These tests were also referred to FCC Public Notice DA 00-705 "Guidance on Measurement for Frequency Hopping Spread Spectrum Systems".
*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 4.4.1 | - | Conducted | N/A | N/A | N/A |

3.4 Uncertainty

Conducted Emission

The measurement uncertainty (with a 95% confidence level) for this test is ± 2.66 dB.

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

Spurious Emission (Radiated)

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is ± 4.59 dB(3m).

The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is ± 4.62 dB(3m).

The measurement uncertainty (with a 95% confidence level) for this test using Horn antenna is ± 5.27 dB.

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

Other test except Conducted Emission and Spurious Emission (Radiated)

The measurement uncertainty (with a 95% confidence level) for this test is ± 3.0 dB.

UL Apex Co., Ltd.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

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3.5 Test Location

UL Apex Co., Ltd. Head Office EMC Lab. *NVLAP Lab. code: 200572-0

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116 Facsimile : +81 596 24 8124

| | 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 | N/A | - |
| No.6 shielded room | - | - | 4.0 x 4.5 x 2.7m | 2.0 x 2.0 m | - |
| No.6 measurement room | - | - | 4.75 x 5.4 x 3.0m | 4.75 x 5.4 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.7 shielded room.

3.6 Test set up, Test instruments and Data of EMI

Refer to APPENDIX 1 to 3.

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Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Facsimile : +81 596 24 8124

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

4.1 Operating Modes

The mode used for test :

[DSSS and other forms of modulation]
Transmitting mode (DATA rate 100kbps , Packet type: Maximum, Payload: PN9)
Low Channel : 2402.2MHz(Ch51)
Mid Channel : 2441.8MHz(Ch18)
High Channel : 2480.2MHz(Ch34)
Receiving mode
- Mid Channel : 2441.8MHz(Ch18)

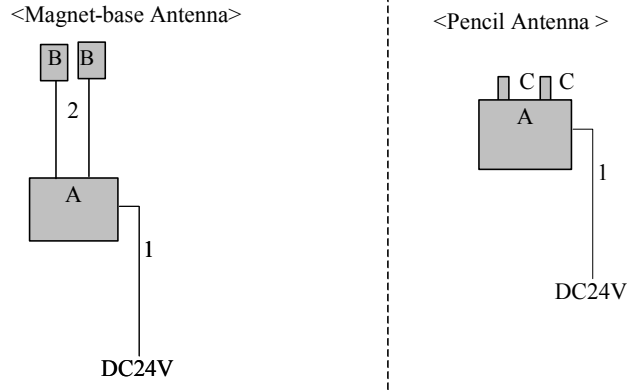
Conditions: Antenna Terminal (same type : Ant.1/Ant.2)
Antenna type (Magnet-base antenna / Pencil antenna)

[Worst condition determination]

| | Antenna terminal | Antenna type |
|---------------------------------|-------------------------|-----------------------|
| Antenna terminal conducted test | Ant.1*1 | - |
| Radiated test | Ant.1*1 | Magnet-base Antenna*2 |
| | Ant.1*1 | Pencil Antenna*3 |

- *1: The worst condition of Antenna terminal was determined based on the result of Maximum Peak Output Power.
*2: Radiated Emission test was performed at all the three channels (Low/Mid/High) with the Magnet base antenna, since the antenna has the worst result among two kinds of antennas at preliminary test (Mid channel only).
*3 As for Pencil Antenna, only the tests for Mid channel evaluation and Band edge at Low/High channels were performed.

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 | ME-4 | Omron | EUT |
| B | Magnet-base Antenna | WD30-AT001 | - | Omron | EUT |
| C | Pencil Antenna | TK-1755 | - | 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.

SECTION 5: Conducted Emission

Test Procedure and conditions

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, including peripherals 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 a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center.

1) For the tests on EUT with other peripherals (as a whole system)

I/O cable and AC 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. All unused 50ohm connectors of the LISN(AMN) were resistivity terminated in 50ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber or a Measurement Room.

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

Detector : CISPR quasi-peak and average detector (IF BW 9 kHz)
Measurement range : 0.15-30MHz
Test data : APPENDIX 2
Test result : Pass

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Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

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SECTION 6: Spurious Emission

[Conducted]

Test Procedure

The Out of Band Emission was measured with a spectrum analyzer connected to the antenna port.

Test data : APPENDIX 2

Test result : Pass

[Radiated]

Test Procedure

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 80cm above the conducting ground plane. The Radiated Electric Field Strength intensity has been measured in a Semi Anechoic Chamber with a ground plane and at a distance of 3m(Below 10GHz) and 1m(Upper 10GHz).

The height of the measuring 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 with the Test Receiver, or 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.

*** Marker Delta Method (Measurement for Band-edge)**

STEP 1) Perform an in-band field strength measurement of the fundamental emission using the RBW table below.

STEP 2) Choose a spectrum analyzer span that encompasses both the peak of the fundamental emission and the band-edge emission under investigation. Set the analyzer RBW to 1% of the total span, and measure the amplitude delta between the peak of the fundamental and the peak of the band-edge emission.

STEP 3) Subtract the delta measured in STEP 2) from the field strengths measured in STEP 1). The result is the field strength of band-edge.

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4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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In any 100kHz bandwidth outside the frequency 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 and outside the restricted band of FCC15.205. 20dBc was applied to the frequency over the limit specified in Table 2 of RSS-210 2.7 and outside the restricted band specified in Table 1 of RSS-210 2.7 (IC)

| Frequency | Below 1GHz | Above 1GHz |
|--------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------|
| Instrument used | Test Receiver / Spectrum Analyzer | Spectrum Analyzer |
| Detector IF Bandwidth | QP: BW 120kHz(T/R) 20dBc : RBW: 100kHz VBW: 300kHz (S/A) | PK: RBW:1MHz/VBW: 1MHz AV: RBW:1MHz/VBW:10Hz 20dBc : RBW:100kHz/VBW:300kHz |

- 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.

Test data : APPENDIX 2

Test result : Pass

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Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

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SECTION 7: Bandwidth

Test Procedure

The bandwidth was measured with a spectrum analyzer connected to the antenna port.

Test data : APPENDIX 2
Test result : Pass

SECTION 8: Maximum Peak Output Power

Test Procedure

The Maximum Peak Output Power was measured with a power meter (tested bandwidth: 50MHz) connected to the antenna port.

Test data : APPENDIX 2
Test result : Pass

SECTION 9: Peak Power Density

[Conducted]

Test Procedure

The Peak Power Density was measured with a spectrum analyzer connected to the antenna port.

It was measured based on "PSD option 1 " of Guidance on Measurement of Digital Transmission Systems Operating under Section15.247 ".

Test data : APPENDIX 2
Test result : Pass

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Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Facsimile : +81 596 24 8124

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