



Test report No. : 32EE0264-HO-02-B-R1  
Page : 1 of 12  
Issued date : April 4, 2012  
Revised date : April 13, 2012  
FCC ID : CWTWC1U326

## EMI TEST REPORT

Test Report No. : 32EE0264-HO-02-B-R1

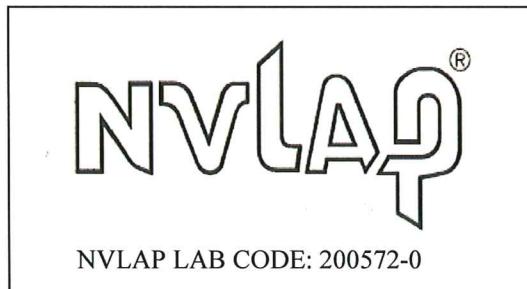
**Applicant** : Alps Electric Co., Ltd.  
**Type of Equipment** : Passive Entry System (Tuner)  
**Model No.** : TWC1U326  
**Test regulation** : FCC Part 15 Subpart B: 2012  
**FCC ID** : CWTWC1U326  
**Test Result** : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test 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 32EE0264-HO-02-B. 32EE0264-HO-02-B is replaced with this report.

**Date of test:** March 18, 2012

**Representative test engineer:**   
Tomotaka Sasagawa  
Engineer of WiSE Japan,  
UL Verification Service

**Approved by:**   
Masanori Nishiyama  
Leader of WiSE Japan,  
UL Verification Service



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://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

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13-EM-F0429

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## **SECTION 1: Customer information**

Company Name : Alps Electric Co., Ltd.  
Address : 6-3-36, Nakazato, Furukawa, Osaki-city, Miyagi-pref, 989-6181, Japan  
Telephone Number : +81-229-23-5111  
Facsimile Number : +81-229-22-3755  
Contact Person : Toru Kinoshita

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

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

Type of Equipment : Passive Entry System (Tuner)  
Model No. : TWC1U326 (Tuner)  
Serial No. : Refer to Section 4, Clause 4.2  
Receipt Date of Sample : January 28, 2012  
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: TWC1U326 (referred to as the EUT in this report) is the Passive Entry System (Tuner).

#### **General Specification**

Feature of EUT : The Tuner receives RF signal from a remote control, and performs locking and unlocking of a door and an engine start.  
Clock frequency in the system : 40.66027MHz (Oscillator circuit)

#### **Radio Specification**

Frequency of operation : 433.92MHz  
Oscillator Frequency : 40.66027MHz  
Local Oscillator Frequency : 433.7MHz  
Intermediate Frequency : 220kHz  
Type of modulation : FSK  
Operating voltage : DC 4.5 to 5.5V  
Antenna Type : Internal Antenna (Monopole)  
Operating Temperature : -40 to +85 deg. C

#### **FCC15.111(b)**

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

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

### **3.1 Test specification**

Test Specification : FCC Part 15 Subpart B: 2012, final revised on February 1, 2012

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

### **3.2 Procedures and results**

Item	Test Procedure	Limits	Deviation	Worst margin	Result
Conducted emission	FCC: ANSI C63.4: 2003 7. AC powerline conducted emission measurements	FCC:Part 15 Subpart B 15.107(a)	N/A *1)	N/A	N/A
	IC: RSS-Gen 7.2.4	IC: RSS-Gen 7.2.4			
Radiated emission	FCC: ANSI C63.4: 2003 8. Radiated emission measurements	FCC: Part 15 Subpart B 15.109(a)	N/A	18.5dB 867.44MHz Vertical, QP	Complied
	IC: RSS-Gen 4.10	IC: RSS-Gen 6.1			

\*Note: UL Japan, Inc's EMI Work Procedure 13-EM-W0420.

\*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 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						
	(3m*)(+dB)				(1m*)(+dB)		(0.5m*)(+dB)
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.2dB	5.0dB	5.1dB	4.7dB	5.7dB	4.4dB	4.3dB
No.2	4.1dB	5.2dB	5.1dB	4.8dB	5.6dB	4.3dB	4.2dB
No.3	4.5dB	5.0dB	5.2dB	4.8dB	5.6dB	4.5dB	4.2dB
No.4	4.7dB	5.2dB	5.2dB	4.8dB	5.6dB	5.1dB	4.2dB

\*3m/1m/0.5m = Measurement distance

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

Refer to APPENDIX.

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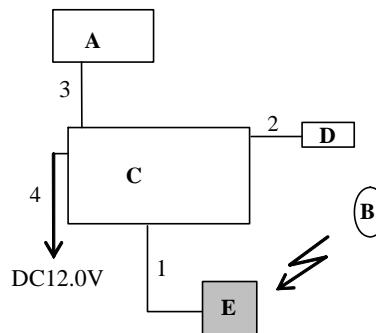
## SECTION 4: Operation of E.U.T. during testing

### 4.1 Operating modes

Mode	Remarks
Receiving mode	* Passive Entry System was operated manually by a test engineer and the test was performed with the EUT receiving 433.92MHz.

\*The test signal level was confirmed to be sufficient to stabilize the local oscillator of the EUT.

### 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	Remark
A	BCM	-	-	Alps Electric Co., Ltd.	-
B	Passive Entry System (Hand Unit)	TWB1G744	12012702	Alps Electric Co., Ltd.	-
C	Checker Box	-	-	Alps Electric Co., Ltd.	-
D	LF Antenna	-	-	Alps Electric Co., Ltd.	-
E	Passive Entry System (Tuner)	TWC1U326	12012708	Alps Electric Co., Ltd.	EUT

#### List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Signal cable	2.0	Unshielded	Unshielded	-
2	Signal cable	0.2	Unshielded	Unshielded	-
3	Signal cable	0.3	Unshielded	Unshielded	-
4	DC power cable	1.0	Unshielded	Unshielded	-

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## **SECTION 5: Radiated Emission**

### **5.1 Operating environment**

Test place : No.3 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 1.5m, raised 0.8m above the conducting ground plane. The EUT was set on the center/edge of the tabletop. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength. Photographs of the set up are shown in Appendix 3.

### **5.3 Test conditions**

Frequency range : 30MHz-300MHz (Biconical antenna) / 300MHz-1000MHz (Logperiodic antenna)  
1000MHz - 2000MHz (Horn antenna)  
Test distance : 3m  
EUT position : Table top  
EUT operation mode : See Clause 4.1

### **5.4 Test procedure**

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 intensity.

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

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

Frequency	Below 1GHz	Above 1GHz
Instrument used	Test Receiver	Spectrum Analyzer *1)
IF Bandwidth	QP: BW 120kHz	PK: RBW:1MHz/VBW: 3MHz AV *2): RBW:1MHz/VBW:10Hz

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

\*2) When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

The 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 representative X-axis since no difference was found among each position.

### **5.5 Test result**

Summary of the test results: Pass

Date: March 18, 2012

Test engineer: Tomotaka Sasagawa

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## APPENDIX 1: Data of EMI test

### Radiated Emission (Below 1GHz)

#### DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab No.3 Semi Anechoic Chamber

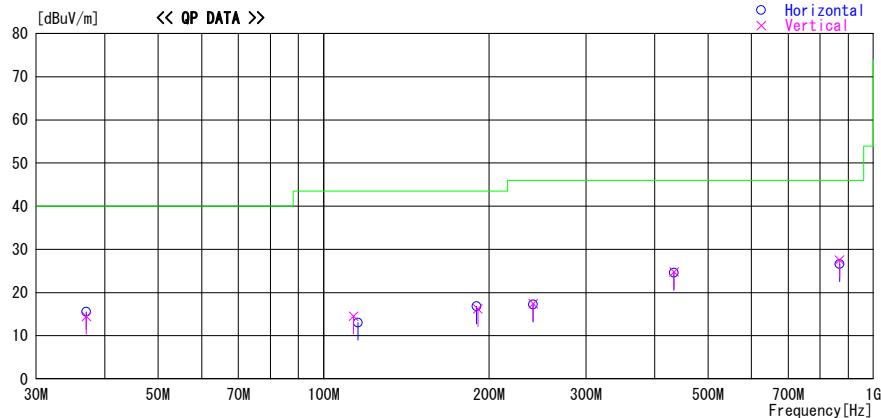
Report No. : 32EE0264-HO-02

Temp. /Hum. : 25deg. C / 32% RH  
Engineer : Tomotaka Sasagawa

Mode / Remarks : Rx 433.92MHz, Worst axis(Hor: X, Ver: Y)

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK  
All other spurious emissions were less than 20dB for the limit.

— Horizontal  
— Vertical  
○ Horizontal  
× Vertical



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss& Factor [dB/m]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB]	Gain [dB]	Angle [Deg]						
37.034	24.5	QP	15.8	-24.8	15.5	123	100	Hori.	40.0	24.5	
37.034	23.4	QP	15.8	-24.8	14.4	22	100	Vert.	40.0	25.6	
113.327	26.2	QP	12.1	-23.8	14.5	49	100	Vert.	43.5	29.0	
115.491	24.3	QP	12.4	-23.7	13.0	233	100	Hori.	43.5	30.5	
189.619	23.4	QP	16.4	-23.0	16.8	341	100	Hori.	43.5	26.7	
190.701	22.8	QP	16.4	-23.0	16.2	0	100	Vert.	43.5	27.3	
240.480	23.1	QP	17.1	-22.8	17.4	0	100	Vert.	46.0	28.6	
240.480	22.9	QP	17.1	-22.8	17.2	351	100	Hori.	46.0	28.8	
433.720	27.9	QP	18.1	-21.4	24.6	244	100	Hori.	46.0	21.4	
433.720	28.1	QP	18.1	-21.4	24.8	0	100	Vert.	46.0	21.2	
867.440	22.1	QP	24.0	-18.6	27.5	0	100	Vert.	46.0	18.5	
867.440	21.2	QP	24.0	-18.6	26.6	351	100	Hori.	46.0	19.4	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP. 30-300MHz:BICONICAL. 300MHz-1000MHz:LOGPERIODIC. 1000MHz-:HORN  
CALCULATION:RESULT = READIND + ANT FACTOR + LOSS & GAIN(CABLE + ATTEN - GAIN(AMP))

\*The limit is rounded down to one decimal place.

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

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## Radiated Emission (Above 1GHz)

### DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab No.3 Semi Anechoic Chamber

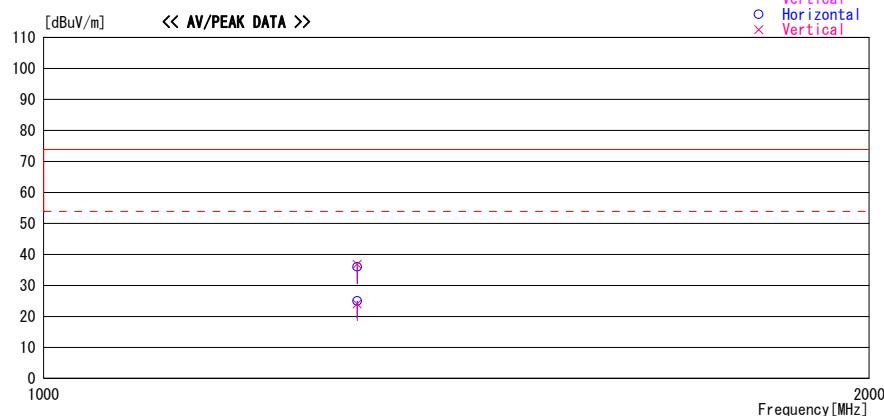
Report No. : 32EE0264-H0-02

Temp./Humi. : 25deg. C / 32% RH  
Engineer : Tomotaka Sasagawa

Mode / Remarks : Rx 433.92MHz, Worst axis(Hor: X, Ver: Y)

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK  
FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV

— Horizontal  
— Vertical  
○ Horizontal  
× Vertical



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss& Gain [dB/m]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB]	[dB]	[Deg]	[cm]					
1301.100	43.4	PK	24.8	-32.2	36.0	0	100	Hori.	73.9	37.9	
1301.100	44.2	PK	24.8	-32.2	36.8	0	100	Vert.	73.9	37.1	
1301.100	32.4	AV	24.8	-32.2	25.0	0	100	Hori.	53.9	28.9	
1301.100	31.5	AV	24.8	-32.2	24.1	0	100	Vert.	53.9	29.8	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-HORN  
CALCULATION:RESULT = READIND + ANT FACTOR + LOSS & GAIN(CABLE + ATTEN - GAIN(AMP))

\*The limit is rounded down to one decimal place.

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

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## **APPENDIX 2: Test instruments**

### **EMI test equipment**

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2012/02/24 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	-	RE	2012/02/06 * 12
MJM-06	Measure	PROMART	SEN1955	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-05	Spectrum Analyzer	Advantest	R3273	160400285	RE	2011/11/23 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2011/08/11 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2011/10/15 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2011/10/15 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2011/07/15 * 12
MAT-09	Attenuator(6dB)	Weinschel Corp	2	BK7973	RE	2011/11/02 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2012/03/16 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2012/02/29 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE	2012/02/06 * 12
MJM-07	Measure	PROMART	SEN1955	-	RE	-
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2011/08/11 * 12
MCC-56	Microwave Cable	Suhner	SUCOFLEX104	270875/4(1m) / 284655(5m)	RE	2011/03/02 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2011/03/10 * 12

**The expiration date of the calibration is the end of the expired month.**

**All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.**

**As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.**

### **Test Item:**

**RE: Radiated emission**

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