



*Testing Tomorrow's Technology*

**Title 47 USC Part 2, Subpart J, Equipment Authorization Procedures,  
Verification per Section 2.902  
of a Digital Device under the Technical Requirements of  
Part 15, Subpart B, for Unintentional Radiators,  
Sections 15.207 for Conducted Emissions, Class B and 15.209(a) for Radiated  
Emissions, Class B  
And  
RSS-210,  
Low-power Licence-exempt Radiocommunication Devices  
(All Frequency Bands):  
Category I Equipment, Issue 8  
for the**

**Radio Systems Corporation's**

**PIF00-13651 Pet Containment System  
Model: 300-741**

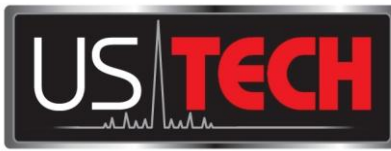
**FCC ID: KE3-300741  
IC: 2721A-300741**

**Test Date(s): August 29th and August 30, 2012**

**Issue Date: August 30, 2012  
UST Project No: 12-0364**

Total Number of Pages Contained Within This Report: 17

**3505 Francis Circle Alpharetta, GA 30004  
PH: 770-740-0717 Fax: 770-740-1508  
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I certify that I am authorized to sign for the test facility and that all of the statements in this report and in the Exhibits attached hereto are true and correct to the best of my knowledge and belief:

US Tech (Agent Responsible For Test):

By: 

Name: Alan Ghasiani

Title: Consulting Engineer, President

Date: August 30, 2012

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### MEASUREMENT TECHNICAL REPORT

**COMPANY NAME:** Radio Systems Corporation

**MODEL:** 300-741

**FCC ID:** KE3-300741

**IC ID:** 2721A-300741

**DATE:** August 30, 2012

This report concerns (check one): Original grant   
Class II change

Equipment type: Low frequency, 27.3 kHz and 27.72 kHz Transmitter Module

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? yes\_\_\_\_\_ No X

If yes, defer until: N/A  
date

agrees to notify the Commission by N/A  
date

of the intended date of announcement of the product so that the grant can be issued on that date.

Report prepared by:

US Tech  
3505 Francis Circle  
Alpharetta, GA 30004

Phone Number: (770) 740-0717  
Fax Number: (770) 740-1508

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## **1 General Information**

### **1.1 Characterization of Test Sample**

The test sample used was received by US Tech on August 17, 2012 in good operating condition.

### **1.2 Product Description**

The EUT is part of the PIF00-13651 Boundary System. The EUT is the Boundary System Transmitter, Model 300-741. The transmitter is a component of the complete containment system for pets which also includes a receiver and a handheld programmer. The Transmitter sends a radio signal 90 feet in all directions. The Boundary Programming Unit is used to collect boundary data information and then program this boundary information to the Receiver Collar. The pet wears the receiver collar. The receiver collar emits a warning tone or a harmless static correction if the pet attempts to leave the programmed boundary area.

The EUT operates at one of two frequencies, 27.30 kHz or 27.72 kHz, which can be selected by operator. The EUT uses BPSK modulation at a maximum rate of 30 Hz.

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**Table 1. EUT and Peripherals**

PERIPHERAL MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC/IC ID	CABLES P/D
Transmitter (EUT)	300-741 (Programmer)	Engineering sample	KE3-300741/ 2721A-300741 (PENDING)	1.5 m U P
Radio Systems AC/DC adapter	Various	Various	N/A	1.5 m U P

P = Power, D = Data, S = Shielded, U = Unshielded

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**Table 2. Details of I/O Cables Attached to EUT**

DESCRIPTION OF CABLE	DETAILS OF CABLE			CABLE LENGTH
AC/DC Adapter	Manufacturer and Part Number			1.5 m U
	Radio Systems Corporation			
	Shield Type	Shield Termination	Type of Backshell	
	N/A	N/A	N/A	

Shield Type

N/A = None

F = Foil

B = Braided

2B = Double Braided

CND = Could Not Determine

Shield Termination

N/A = None

360 = 360°

P = Pigtail/Drain Wire

CND = Could Not Determine

MU = Metal Unshielded

Type of Backshell

N/A = Not Applicable

PS = Plastic Shielded

PU = Plastic Unshielded

MS = Metal Shielded

**1.3 EUT Antenna Requirements (CFR 15.203)**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. Only the antenna(s) listed in Table 4 will be used with this module.

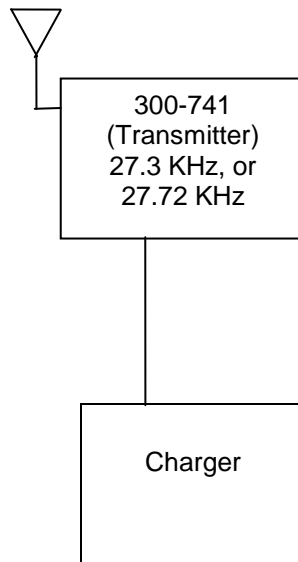
**Table 3 - Allowed Antenna(s)**

MANUFACTURER	TYPE OF ANTENNA	MODEL	REPORT REFERENCE	GAIN dB <sub>i</sub>	TYPE OF CONNECTOR
Radio Systems Corp	Inductor, Loop (x3)	ASM inductor Transmitter antenna	N/A	0	Integrated

Note: The EUT is transmitting a magnetic signal from three multi-turn loop inductor antennas that are part of L/C tank circuits tuned to the operating frequency. The antennas are oriented in three mutually orthogonal axes.

## 1.4 Configuration of Tested System

Note: The EUT will not operate while it is being charged by the charger.



**Figure 1. Configuration of Tested System**

## 1.5 Related Submittals

There are no related submittals with this product; however the Receiver Collar and Boundary Programming Units, which can be sold with the Transmitter as part of a system, are subject to separate FCC and IC Approvals. The appropriate approvals for this additional equipment have been completed.



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## 2 Tests and Measurement

### 2.1 Test Facility

Testing was performed at US Tech's measurement facility at 3505 Francis Circle, Alpharetta, GA, 30004. This site has been fully described and registered with the FCC under designation Number US5117. Additionally this site has also been fully described and submitted to Industry Canada (IC), and has been approved under file number 2982A-1.

### 2.2 Test Equipment

A list of Test Equipment used for these measurements is found in Table 3 below.

**Table 4. Test Instruments and Accessories**

INSTRUMENT	MODEL NUMBER	MANUFACTURER	SERIAL NUMBER	DATE OF LAST CALIBRATION
SPECTRUM ANALYZER	8566B	HEWLETT-PACKARD	2410A00109	11/04/11
BICONICAL ANTENNA	3110B	EMCO	9306-1708	07/02/12
LOOP ANTENNA	SAS-200/562	AH Systems	142	08/09/11 2 yr cal cycle
LOG PERIODIC ANTENNA	3146	EMCO	9110-3236	11/22/11
PRE-AMPLIFIER	8447D	HEWLETT-PACKARD	2944A07436	10/06/11
LISN x 2 9247	9247-50-TS-50-N	SOLAR ELECTRONICS	955824	01/27/12
CALCULATION PROGRAM	N/A	N/A	EMCCALC	N/A

Note: The calibration interval of the above test instruments is 12 months unless stated otherwise and all calibrations are traceable to NIST/USA.

### 2.3 EUT Electrical Mode of Operation

The EUT is powered by an AC/DC power adapter rated input: 120VAC/60Hz output: 16VDC, 1.5A.

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## 2.4 Test Software and /or Exercising of the EUT

The EUT was pre-programmed with test software which exercised the transmitter radio module. The EUT was in a constant-transmit state for testing.

## 2.5 Test Procedure

The EUT was configured as shown in the following block diagram(s) and photograph(s). The Test Sample was tested per ANSI C63.4, *Methods of Measurement of Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (2003)* paragraph 7 for conducted emissions and paragraph 8 for radiated emissions. Conducted and radiated emissions data were taken with the test receiver or spectrum analyzer's resolution bandwidth adjusted to 9 kHz and 120 kHz, respectively. All measurements are peak unless stated otherwise. The video filter on the spectrum analyzer was OFF throughout the evaluation process. Interconnecting cables were manipulated as necessary to maximize emissions. The EUT and Peripherals Table describe other instruments and accessories used to evaluate this product.

For radiated measurements in the frequency range of 9 kHz to 30 MHz a calibrated loop antenna was used.

Radiated emissions disturbance measurements were performed with an instrument having both peak and quasi-peak detectors over the frequency range of 9 kHz to 1000 MHz. Measurements of the radiated emissions were made with the receiver antenna at distance of 3 m from the boundary of the test unit. If measurements were made at 1 m the data was extrapolated back to 3 m using an extrapolation factor of -9.5 dB.

For measurements from 30 MHz to 1000 MHz, the test antenna was varied from 1 m to 4 m in height while watching the analyzers' display for the maximum magnitude of the signal at the test frequency. The antenna polarization (horizontal or vertical) and test sample azimuth were varied during the measurements to find the maximum field strength readings to record.

## 2.6 Equipment Hardware Modifications

No modification was necessary to bring the EUT into compliance with FCC Part 15, Class B, paragraph 15.207 and 15.209 (a) requirements.

## 2.7 Deviation(s) or Additions to the Test Methods

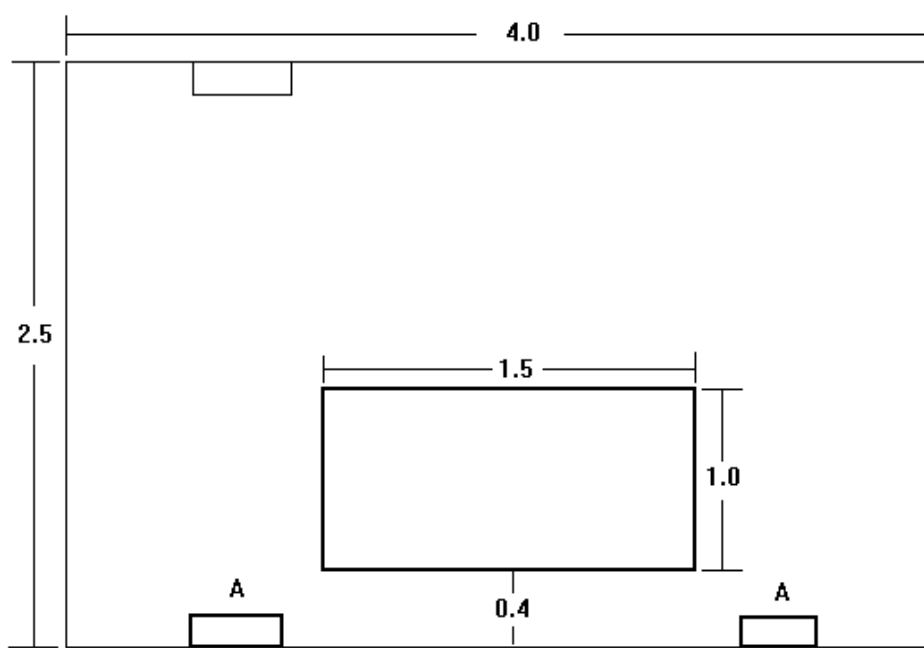
There were no deviations from or additions to the published test methods.

## 2.8 Test Results

### 2.8.1 Conducted Emissions Test Results

The conducted disturbance measurement facility is a shielded enclosure (LectroMagnetics, Inc., type LDC6-0812-8-2793) 4.0 m deep by 2.5 m wide by 2.5 m high. Power for the shielded room is filtered (Lectroline, EMX-1020-2, rated 125/250 V, 20 A, 50/60 Hz).

A nonconductive table 1.5 m deep by 1.0 m wide by 0.8 m high is used for tabletop equipment. All grounded conducting surfaces including the case or cases of one or more artificial mains networks is at least 0.8 m from any surface of the EUT. The artificial mains networks, Figure 3, items A, are Solar Electronics models 8012, 8028, or 9247.



**Figure 2. Conducted Emissions Disturbance Measurement Facility**

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The worst-case conducted emission from 150 kHz to 30 MHz was 6.2 dB below the limit at 6.75 MHz on the Neutral line. All other conducted emissions in this frequency range were at least 6.5 dB below the FCC Part 15 Class B limit.

**Table 5. Conducted Emissions Data**

Conducted Emissions								
Test By: JCW	Test:	FCC Part 15.107			Client: Radio Systems Corporation			
		Project: 12-0364	Class: B		Model: 300-741			
Frequency (MHz)	LISN	Test Data (dBuV)	AF+CA-AMP (dB)	Corrected results (dBuV)	AVG Limits (dBuV)	Polarity	Margin Detector (dB) PK/QP/AVG	
PHASE LINE								
0.1656	LISN102	54.10	1.46	55.56	*65.2	POS	9.6	<b>PK</b>
0.1656	LISN102	35.10	1.46	36.56	55.2	POS	18.6	<b>AVG</b>
0.6379	LISN102	34.90	0.49	35.39	46.0	POS	10.6	<b>PK</b>
4.3880	LISN102	38.10	0.55	38.65	46.0	POS	7.3	<b>PK</b>
5.5550	LISN102	39.80	0.59	40.39	50.0	POS	9.6	<b>PK</b>
10.0200	LISN102	35.40	0.72	36.12	50.0	POS	13.9	<b>PK</b>
26.4700	LISN102	34.50	1.13	35.63	50.0	POS	14.4	<b>PK</b>
NEUTRAL LINE								
0.2406	LISN103	51.40	0.91	52.31	*62.1	NEG	9.8	<b>PK</b>
0.2406	LISN103	35.10	0.91	36.01	52.1	NEG	16.1	<b>AVG</b>
0.5018	LISN103	35.00	0.52	35.52	46.0	NEG	10.5	<b>PK</b>
4.9560	LISN103	38.90	0.56	39.46	46.0	NEG	6.5	<b>PK</b>
6.7500	LISN103	43.20	0.62	43.82	50.0	NEG	6.2	<b>PK</b>
10.6000	LISN103	36.00	0.73	36.73	50.0	NEG	13.3	<b>PK</b>
26.8000	LISN103	37.00	1.13	38.13	50.0	NEG	11.9	<b>PK</b>

Note: (\*) denotes Quasi-Peak limit used.  
 Sample Calculations: at 0.1656 MHz (54.10 dBuV + 1.46 dB/m) = 55.56 dBuV/m

Test Date: August 27, 2012

Tested by

Signature:  Name: John Wynn

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## 2.8.2 Radiated Emissions Test Results

The radiated emissions disturbance measurement facility consists of a 22.0 meters long by 12.0 meter wide concrete pad covered with galvanized hardware cloth providing an overall ground plane of 24.0 m by 13.0 m. The galvanized wire hardware cloth is constructed of 23 gauge galvanized wire with a 0.6 cm mesh and a width of 122.0 cm. The hardware cloth is electrically connected by solder (Kester "44" Rosin Core, Flux "44", Alloy, SN60PB40, Cat. # 26-6040-0066, Core # 66) at 30 cm intervals.

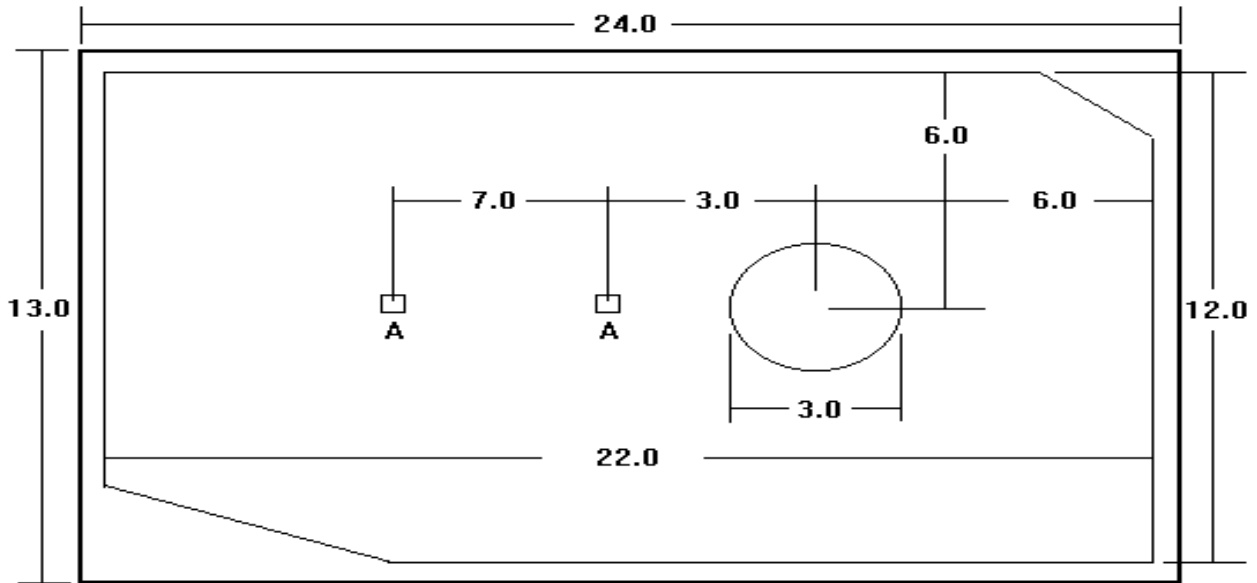
The test facility layout is shown in the figure below. A remotely controlled 3.0 m diameter flush-mounted turntable is provided for rotating (through at least 360 degrees) the EUT. A nonconductive table, 1.5 m long by 1.0 m wide by 0.8 m high is used in conjunction with the turntable for tabletop equipment. Electrical service for the EUT is provided through openings at the center of the turntable.

Provision for receiving antenna power and data wires is provided by junction boxes (radiated interference facility diagram, item A) at 3 m and 10 m from the center of the turntable. The receive antenna mast is remotely controlled and can be varied in height from 1 m to 4 m.

All power and data cables for the radiated disturbance measurement facility are ran through PVC tubing under the concrete pad or are laid directly upon the ground plane.

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**Figure 3. Radiated Emissions Disturbance Measurement Facility Diagram**

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The worst-case radiated emission from 9 kHz to 1000 MHz was 3.9 dB below the limit at 419.884 MHz. All other radiated emissions in this frequency range were at least 4.0 dB below the FCC Part 15 Class B limit.

**Table 6. Radiated Emissions Test Data, Class B. 9 kHz to 30 MHz**

Radiated Emissions							
Test By: JCW	Test: Part 15	Client: Radio Systems					
	Project: 12-0364	Class: B		Model: 300-741 Transmitter			
Frequency (MHz)	Test Data (dBuV)	AF+CA-AMP (dB/m)	Results (dBuV/m)	Average Limits (dBuV/m)	Application Test Distance/ Polarization	Margin (dB)	Detector Used
Measurements were made over the frequency range of 9kHz – 1 GHz							
0.0273	64.10	72.00	56.10	98.9	3 meter/Loop	42.8	PK
0.0546	27.40	64.00	11.40	92.9	3 meter/Loop	81.5	PK
0.0819	22.60	59.80	2.40	89.3	3 meter/Loop	86.9	PK
8.42	20.40	18.40	38.80	69.5	3 meter/Loop	30.7	PK
9.56	34.80	16.90	51.70	69.5	3 meter/Loop	17.8	PK
All other emissions were more than 20 dB from the limit.							

Sample Calculations: at 8.42 MHz (20.40 dBuV + 18.40 dB/m) = 38.80 dBuV/m  
 Extrapolation factor of -80.00 dB for 300 m to 3 m has also been applied.

Test Date: August 27, 2012

Tested by  
 Signature: John C. Wynn

Name: John C. Wynn

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**Table 7. Radiated Emissions Test Data, Class B. 30 MHz to 1000 MHz**

Radiated Emissions							
Test By: JCW	Test: Part 15	Client: Radio Systems					
	Project: 12-0364	Class: B	Model: 300-741 Transmitter				
Frequency (MHz)	Test Data (dBuV)	AF+CA-AMP (dB/m)	Results (dBuV/m)	Average Limits (dBuV/m)	Application Test Distance/ Polarization	Margin (dB)	Detector Used
Measurements were made over the frequency range of 30 MHz – 1 GHz							
35.1270	44.30	-13.23	31.07	40.0	1BI3mH	8.9	PK
68.8280	46.90	-16.33	30.57	40.0	1BI3mH	9.4	QP
110.0100	52.00	-14.62	37.38	43.5	1BI3mH	6.1	PK
146.6080	46.00	-12.33	33.67	43.5	1BI3mH	9.8	QP
34.6200	45.70	-14.53	31.17	40.0	1BI3mV	8.8	QP
61.3100	40.40	-16.93	23.47	40.0	1BI3mV	16.5	QP
109.9470	42.80	-14.18	28.62	43.5	1BI3mV	14.9	QP
146.3000	45.80	-11.83	33.97	43.5	1BI3mV	9.5	QP
205.3000	48.70	-12.39	36.31	43.5	1LP3mH	7.2	QP
435.4000	49.10	-7.13	41.97	46.0	1LP3mH	4.0	PK
545.7600	41.70	-5.19	36.51	46.0	1LP3mH	9.5	PK
212.2000	40.40	-12.59	27.81	43.5	1LP3mV	15.7	QP
419.8840	49.30	-7.25	42.05	46.0	1LP3mV	3.9	PK

Sample Calculations: at 35.127 MHz (44.30 dBuV + -13.23 dB/m) = 31.07 dBuV/m

Test Date: August 27, 2012

Tested by  
 Signature: John C. Wynn

Name: John C. Wynn



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## **2.8.3 Measurement Uncertainty**

### **2.8.3.1 Conducted Emissions Measurement Uncertainty**

Measurement Uncertainty (within a 95% confidence level) for this test is  $\pm 2.8$  dB.

The data listed in this test report does have sufficient margin to negate the effects of uncertainty. The EUT unconditionally passes this requirement.

### **2.8.3.2 Radiated Emissions Measurement Uncertainty**

For a measurement distance of 10 m, the measurement uncertainty (with a 95% confidence level) for this test using a Biconical Antenna (30 MHz to 200 MHz) is  $\pm 5.3$  dB. This value includes all elements of measurement.

The measurement uncertainty (with a 95% confidence level) for this test using a Log Periodic Antenna (200 MHz to 1000 MHz) is  $\pm 5.1$  dB.

The measurement uncertainty (with a 95% confidence level) for this test using a Bilog Antenna is  $\pm 5.1$  dB.

The data listed in this test report does not have sufficient margin to negate the effects of uncertainty. The EUT conditionally passes this requirement