

# MEASUREMENT/TECHNICAL REPORT

COMPANY NAME: **Radio Systems Corporation**

MODEL: **IF100**

FCC ID: **KE3IF100**

DATE: **August 17, 1998**

This report concerns (check one): Original grant X

Class II change \_\_\_\_\_

Equipment type: **Low Power Transmitter**

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

If yes, defer until: \_\_\_\_\_  
date

N.A. 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:

United States Technologies, Inc.  
3505 Francis Circle  
Alpharetta, GA 30004

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

**TABLE OF CONTENTS**

**SECTION 1**

**GENERAL INFORMATION**

Product Description

**SECTION 2**

**TESTS AND MEASUREMENTS**

Configuration of Tested  
Test Facility  
Test Equipment  
Modifications  
Field Strength of Fundamental Emission  
Field Strength of Spurious Emissions  
Radiated Emissions  
Power Line Conducted Emissions

**SECTION 3**

**LABELING INFORMATION**

**SECTION 4**

**BLOCK DIAGRAM(S)**

**SECTION 5**

**PHOTOGRAPHS**

**SECTION 6**

**USER'S MANUAL**

**LIST OF FIGURES AND TABLES**

**FIGURES**

Test Configuration  
Photograph(s) for Spurious and Fundamental Emissions  
Field Strength of Fundamental Emission

**TABLES**

EUT And Peripherals  
Test Instruments  
Field Strength of Fundamental Emission  
Field Strength of Spurious Emissions  
Power Line Conducted Emissions

## **GENERAL INFORMATION**

### **Product Description**

The Equipment Under Test (EUT) is a Radio Systems Corporation, Model IF100 10.8 KHz Transmitter. The EUT is a localized electronic dog fence, and part of a system which uses a receiver mounted on a dog collar.

SECTION 1  
GENERAL INFORMATION

SECTION 2  
TESTS AND MEASUREMENTS

## TESTS AND MEASUREMENTS

### Configuration of Tested System

The sample was tested per ANSI C63.4, Methods of Measurement from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (1992). 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 associated with the spectrum analyzer was off throughout the evaluation process. Interconnecting cables were manipulated as necessary to maximize emissions. A block diagram of the tested system is shown in Figure 1. Test configuration photographs for spurious and fundamental emissions are shown in Figure 2.

Since the EUT may be used upright or laying on its back it was tested in both configurations. Measurements were taken at all three antenna polarities and the results corrected to 300 meters by using the following calculation :  $40 \log (300/10) = 59.1$

### Test Facility

Testing was performed at US Tech's measurement facility at 3505 Francis Circle, Alpharetta, GA. This site has been fully described and submitted to the FCC, and accepted in their letter marked 31040/SIT. Additionally this site has also been fully described and submitted to Industry Canada (IC), and has been approved under file number IC2982.

### Test Equipment

Table 2 describes test equipment used to evaluate this product.

### Modifications

No modifications were made to bring the EUT into compliance with FCC Part 15, Class B Requirements:

**FIGURE 1**  
**TEST CONFIGURATION**

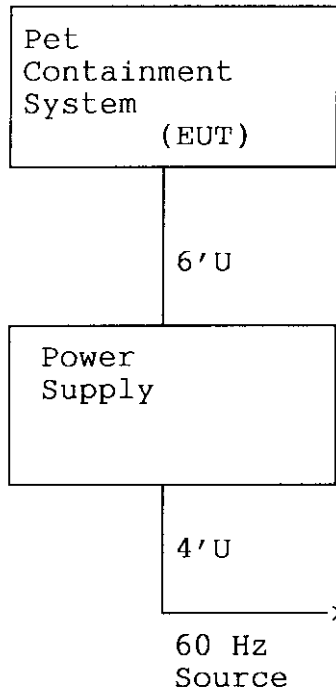




TABLE 1

EUT and Peripherals

PERIPHERAL MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID:	CABLES P/D
Pet Containment System Radio Systems Corporation (EUT)	IF100	1	KE3IF100 (Pending)	6'U
Power Supply Radio Systems Corporation	WPA513001A	1	None	4'U 60 Hz Source

**TABLE 2**  
**TEST INSTRUMENTS**

TYPE	MANUFACTURER	MODEL	SN.
SPECTRUM ANALYZER	HEWLETT-PACKARD	8593E	3205A00124
SPECTRUM ANALYZER	HEWLETT-PACKARD	8558B	2332A09900
S A DISPLAY	HEWLETT-PACKARD	853A	2404A02387
COMB GENERATOR	HEWLETT-PACKARD	8406A	1632A01519
RF PREAMP	HEWLETT-PACKARD	8447D	1937A03355
RF PREAMP	HEWLETT-PACKARD	8449B	3008A00480
HORN ANTENNA	EMCO	3115	3723
ROBERTS ANTENNAS	COMPLIANCE DESIGN	A100	167
BICONICAL ANTENNA	EMCO	3110	9307-1431
LOOP ANTENNA	AH SYSTEMS	SAS200/562	148
LOG PERIODIC ANTENNA	EMCO	3146	9110-3600
LISN	SOLAR ELE.	8012-50	N/A
THERMOMETER	FLUKE	52	5215250
MULTIMETER	FLUKE	85	53710469
FUNCTION GENERATOR	TEKTRONIX	CFG250	CFG250TW15059
PLOTTER	HEWLETT-PACKARD	7475A	2325A65394
BILOG	CHASE	CBL6112A	2238

**Field Strength of Fundamental Emission (47 CFR 15.209)**

Measurements were made using a peak and average detector. Field strength of the fundamental emission is shown in Tables 3-4 and Figures 3a and 3b.

TABLE 3

## FIELD STRENGTH OF FUNDAMENTAL EMISSION

Test Date: July 27, 1998  
 UST Project: 98-347  
 Customer: Radio Systems Corporation  
 Model: IF100

FREQ. (KHz)	TEST DATA (dBm) @ 10m	ANTENNA FACTOR + CABLE ATTENUATION	RESULTS (uV/m) @ 300m	PEAK FCC LIMITS (uV/m) @ 300m
18.7	-77.0	73.1	158.5	1283.4

## SAMPLE CALCULATIONS:

RESULTS uV/m @ 3m = Antilog  $((-77.0 + 73.1 + 107 - 59.1)/20) = 158.5$

CONVERSION FROM dBm TO dBuV = 107 dB

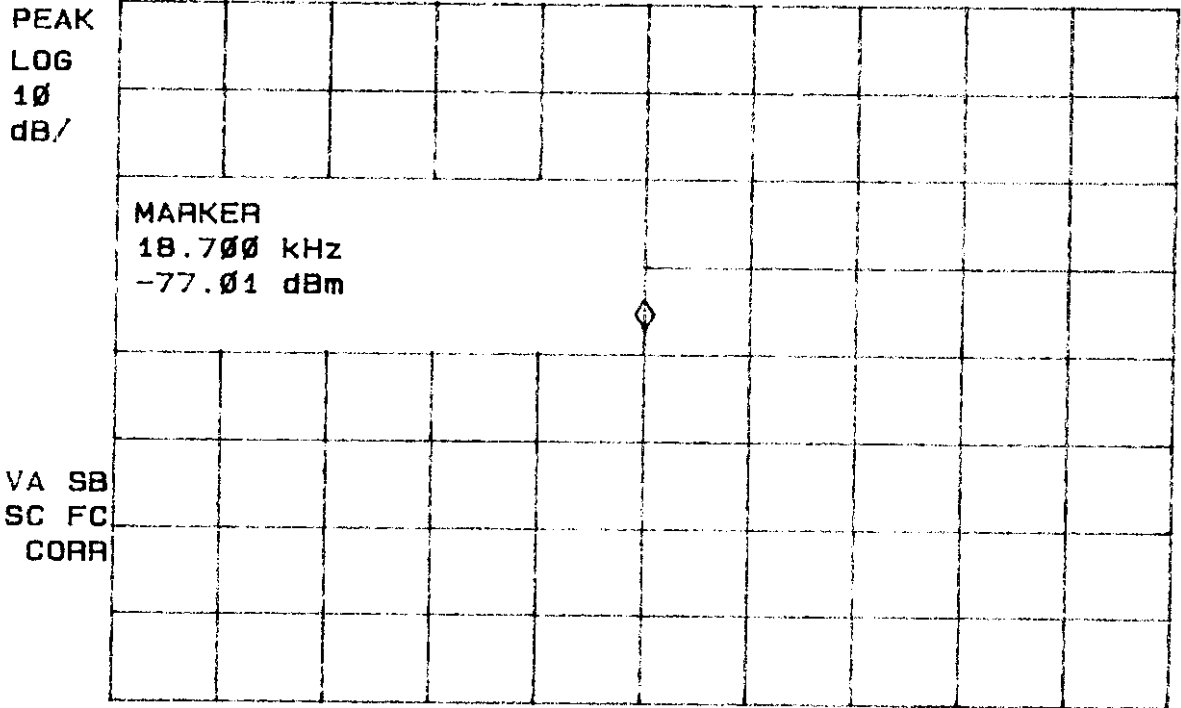
CORRECTION FROM 10m TO 300m = -59.1 dB

Tested By: 

Name: Erik Collins

**Figure 3a**  
**Peak Field Strength of Fundamental Emission (47 CFR 15.209)**

22:30:27 JUL 27, 1998  
RSC IF100 - PEAK  
REF -40.0 dBm AT 10 dB  
MKR 18.700 kHz  
-77.01 dBm



CENTER 18.700 kHz SPAN 1.000 kHz  
#RES BW 100 Hz VBW 100 Hz SWP 1.00 sec

TABLE 4

## FIELD STRENGTH OF FUNDAMENTAL EMISSION

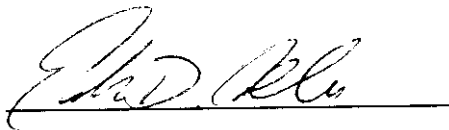
Test Date: July 27, 1998  
 UST Project: 98-347  
 Customer: Radio Systems Corporation  
 Model: IF100

FREQ. (KHz)	TEST DATA (dBm) @ 10m	ANTENNA FACTOR + CABLE ATTENUATION	RESULTS (uV/m) @ 300m	AVERAGE FCC LIMITS (uV/m) @ 300m
18.7	-80.6	73.1	104.7	128.3

## SAMPLE CALCULATIONS:

RESULTS uV/m @ 3m = Antilog  $((-80.6 + 73.1 + 107 - 59.1)/20) = 104.7$   
 CONVERSION FROM dBm TO dBuV = 107 dB  
 CORRECTION FROM 10m TO 300m = -59.1 dB

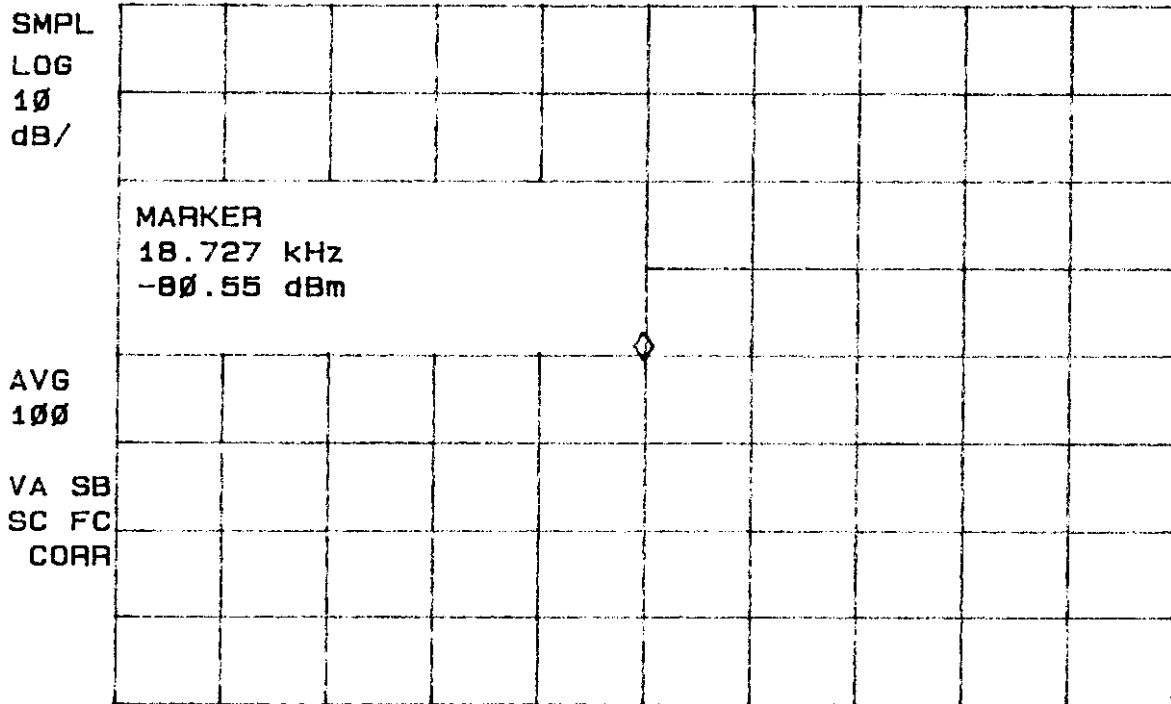
Tested By:



Name: Erik Collins

**Figure 3b**  
**Average Field Strength of Fundamental Emission (47 CFR 15.209)**

22:27:07 JUL 27, 1998  
 RSC IF100 - AVERAGE  
 REF -40.0 dBm AT 10 dB  
 MKR 18.727 kHz  
 -80.55 dBm



CENTER 18.729 kHz  
 #RES BW 100 Hz  
 VBW 100 Hz  
 SPAN 1.000 kHz  
 SWP 1.00 sec

### **Field Strength Of Spurious Emissions (47 CFR 15.209)**

Measurements were made using an average and peak detector. Field strength of Spurious Emissions are shown in Table 5. Any emission less than 1000 MHz, not falling within the bands 9-90 kHz and 110-490 kHz, and falling within the restricted bands of 15.205 were not adjusted for averaging and the limits of 15.209 were applied.



## TABLE 5

## FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Date: July 27, 1998  
UST Project: 98-347  
Customer: Radio Systems Corporation  
Model: IF100

FREQ. (KHz.)	TEST DATA (dBm) @ 10m	ANTENNA FACTOR + CABLE ATTENUATION	RESULTS (uV/m) @ 300m	PEAK FCC LIMITS (uV/m) @ 300m
NO EMISSIONS DETECTED WITHIN 10 dB OF THE FCC LIMIT				

Tested By: Name: Erik Collins

**Radiated Emissions (47 CFR 15.109a)**

Radiated emissions were evaluated from 30 to 1000 MHz. Measurements were made with the analyzer's bandwidth set to 120 kHz, emissions are shown in Table 6.

**TABLE 6 RADIATED EMISSIONS DATA**

**CLASS B**

**Test Date:** July 27, 1998  
**UST Project:** 98-347  
**Customer:** Radio Systems Corporation  
**Model:** IF100

<b>FREQUENCY (MHz)</b>	<b>TEST DATA (dBm) @3m</b>	<b>ANTENNA FACTOR + CABLE ATTENUATION</b>	<b>RESULTS (uVm) @3m</b>	<b>FCC LIMITS (uVm) @3m</b>
<b>NO EMISSION DETECTED WITHIN 10 dB OF THE FCC LIMIT</b>				

**Tested By:** 
**Name:** Erik Collins

**Power Line Conducted Emissions (47 CFR 15.107a)**

Conducted Emissions were evaluated from 450 KHz to 30 MHz. Measurements were made with the analyzer's bandwidth set to 9 KHz, emissions are shown in Table 7.

**TABLE 7 CONDUCTED EMISSIONS DATA**

**CLASS B**

Test Date: July 27, 1998  
 UST Project: 98-347  
 Customer: Radio Systems Corporation  
 Model: IF100

FREQUENCY (MHz)	TEST DATA (dBm)		RESULTS (uV)		FCC LIMITS (uV)
	PHASE	NEUTRAL	PHASE	NEUTRAL	
0.45	-63.0	-63.0	158.5	158.5	250
9.9	-85.0	-82.0	12.6	17.8	250
11.7	-79.0	-72.0	25.1	56.2	250
13.7	-78.0	-68.0	28.2	89.1	250
25.0	-85.0	-78.0	12.6	28.2	250
29.3	-87.0	-82.0	10.0	17.8	250

**SAMPLE CALCULATIONS:**

RESULTS uV = Antilog  $((-63.0 + 107)/20) = 158.5$   
 CONVERSION FROM dBm TO dBuV = 107 dB

Tested By:  Name: Erik Collins