

Resolution Engineering, LLC

Wireless Keychain Transmitter
FCC ID: U5X-RF245

Certification Test Report

September 6, 2007

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1. Introduction

This device is a handheld wireless keychain transmitter for use in controlling a wireless security system. The unit is powered by a 12V alkaline battery. The transmitter is centered at 345MHz and is controlled by a SAW resonator. The device measures 1.3 x 2.35 x 0.5" and weighs approximately half an ounce.

Certification is requested under FCC Rules, Part 15, Subpart C, Paragraph 15.231.

2. Statement of Compliance

Specific sections of FCC Rules Part 2 that require information or listing are given below.

2.1. FCC Part 2 §2.907

This is an application for certification of original equipment

2.2. FCC Part 2 §2.911

- a) This application has been filed electronically using form 731.
- b) All required information has been supplied in this application and its attachments.
- c) This application has been electronically signed by an officer of Resolution Engineering, LLC.
- d) The technical test data has been signed by the agency performing the testing.
- e) Signature supplied in appropriate block on form 731.
- f) Processing fee has been paid by credit card.
- g) Signatures have been supplied electronically.

2.3. FCC Part 2 §2.913

- a) This application has been filed electronically.
- b) Appropriate fees have been filed electronically.
- c) Equipment samples, if requested, shall be supplied as requested.

2.4. FCC Part 2 §2.915

We are requesting a grant of certification. This application shows compliance with the technical standards.

2.5. FCC Part 2 §2.925

A label shall be affixed to each piece of equipment, showing the FCC identifier. The label shall read "FCC ID: U5X-RF245". See Exhibit A for a photograph showing the label and location on the back of the device.

2.6. FCC Part 2 §2.943, 2.945

Sample production equipment shall be submitted to the FCC upon request.

2.7. FCC Part 2 §2.947

- a) Measurement procedure follows ANSI C63.4.
- b) A description of utilized test equipment is contained in the report.

2.8. FCC Part 2 §2.948

Radiated measurements were taken at the following FCC-approved facility:

Rhein Tech Laboratories, Inc.

360 Herndon Pkwy, Suite 1400

Herndon, VA 20170

Contact: Rick McMurray 703-689-0368

A photograph of the test site is shown below:



2.9. FCC Part 2 §2.1033

- a) Form 731 has been filed electronically.
- b) The technical report, along with its exhibits, contains the information as follows:
 - (1) full name and mailing address of the manufacturer of the device and the applicant for certification:
Resolution Engineering, LLC
226 Locust Street, Suite 4
Hudson, WI 54016
 - (2) FCC Identifier is U5X-RF245
 - (3) Copy of the installation/user instructions is furnished as Exhibit E.
 - (4) A brief description of the device and operation is furnished in Exhibit F. Schematic is furnished in Exhibit G.
 - (5) Block diagram furnished in Exhibit H.
 - (6) This document constitutes a technical test report.
 - (7) Internal and external photographs have been furnished in Exhibits A - D.
 - (8) Not applicable. There are no peripheral or accessory devices used with this device. It is a standalone device.
 - (9) This application not pursuant to the transition rules of section 15.37
 - (10) Not applicable. This device does not include a scanning receiver.
 - (11) Not applicable.
 - (12) Not applicable.
- c) Not applicable. This device shall operate under Part 15 of the rules.
- d) Not applicable.
- e) Not applicable. This is not a composite system.

3. Discussion of Laboratory Measurements and Rules Compliance

3.1. FCC Part 15 §15.231(a)(1)

This transmitter is manually activated via pushbutton switch. Two transmission packets are sent by the device upon valid keypress activation. These packets are 19.1ms in length and are sent with a spacing of 125ms. Upon completion of these packets, the device goes into sleep mode and will not transmit again until all switches are released and another valid keypress is detected.

A plot of the transmissions is shown in Exhibit I. This plot shows the transmissions occurring in a 5 second window as a result of one keypress. The packets are shown to conclude within the 5-second window.

3.2. FCC Part 15 §15.231(a)(3)

This device does not send periodic or automatic transmissions of any kind.

3.3. FCC Part 15 §15.231(a)(4)

While this device is used in a security application, it does not continue transmitting beyond the packets resulting from each individual keypress.

3.4. FCC Part 15 §15.231(a)(5)

While this device is used in a security application, there is no setup information transmitted with this device.

3.5. FCC Part 15 §15.231(b)

3.5.1. Raw Field Strength Limits

Interpolation performed on the data in the §15.231(b) table yields raw field strength limits as follows:

Fundamental: 77.25dB_uV/m

Spurious: : 57.25dB_uV/m

Certain harmonics of the transmitted signal fall in the restricted bands of §15.205. These harmonics are all above 960MHz and have the following limit as given in §15.209:

Restricted band limit = 500uV/m = 54dB_uV/m.

3.5.2. Duty Cycle Correction Factor and Resulting Limits

This transmitter uses ASK modulation with a duty cycle of 50%. The transmitted packets are 19.1ms in length, and are limited to one packet in a 125ms period. The transmitter duty cycle in a 100ms period is therefore $19.1/2/100 = 9.55\%$.

Packet width measurements were made using Hewlett Packard Model 8594E Spectrum Analyzer.

Plot in Exhibit J shows duration of a single packet in a 100ms window.

Plot in Exhibit K shows an expanded view of the transmitted packet.

Calculating the allowed duty cycle correction factor as given in §15.35(c):

$$20\log(9.55/100) = -20.4\text{dB}$$

This transmitter therefore qualifies for the maximum duty cycle correction factor allowed in §15.35(c). The maximum duty cycle correction factor allowed is 20dB. Resulting radiated field strength limits are as follows:

| | |
|-------------------------|-------------------------------|
| Fundamental: | 97.25dB_uV/m |
| Spurious: | 77.25dB_uV/m |
| Restricted Band: | 74dB_uV/m |

3.5.3. Measured Radiated Field Strength Data

Measured radiated field strength data is shown in Exhibit L. Emissions from 0.009 MHz to the tenth harmonic were measured as per §15.33(a). Appropriate correction factors were applied to account for cable and other site-specific losses. The highest measurements are shown in the table for each frequency showing measurable signal.

The fundamental signal, at 90.2dB_uV/m, passed by 7.1dB

The highest spurious signal was the second harmonic, which passed by 23.2dB.

The highest restricted band signal was the third harmonic, which passed by 22.2dB.

3.6. FCC Part 15 §15.231(c)

Allowed 20dB bandwidth of the transmitted signal is 0.25% of the carrier frequency.

BW Limit = $0.0025 * 345\text{MHz}$

BW Limit = 0.8625MHz

Bandwidth measurements were made using Hewlett Packard Model 8594E Spectrum Analyzer.

Exhibit M shows the unmodulated carrier signal

Exhibit N shows the modulated signal. Bandwidth of the modulated signal is 60.5kHz or .0605MHz.

These measurements show compliance with the bandwidth requirements.