Resolution Products, Inc.

RE200-5 5 Button Keyfob
FCC ID: U5X-RE200-5

Certification Test Report

January 25, 2017

Contents

1. Introduction

The RE200-5 is a small 5 button keyfob designed for controlling a wireless security system. The device is powered by a CR2032 lithium coin cell battery. It measures 2.2" x 1.5" x 0.6" and weighs approximately .66 ounces.

The device is manually activated when a user presses a valid button or button combination. A PIC16LF18323 microcontroller is used to monitor the state of these buttons. When a valid press is detected, the device transmits up to 16 packets. Upon completion of these packets, the device goes into sleep mode and will not transmit again until a new valid press is detected.

The RE200-5 transmitter circuit consists of a 10.78MHz crystal and a Micrel MICRF113YM6 PLL chip. This chip multiplies the crystal frequency to 345MHz. It also includes a circuit which allows ASK modulation of the 345MHz signal. The RF signal is radiated using a printed pcb antenna.

The transmitted packet is ASK modulated and has an on-time of 8.64mS. Precautions are taken in the firmware to ensure there is at least 100mS between packets, and that the transmissions cease within 5 seconds as required.

There will be two models listed under FCC ID: U5X-RE200-5. These two models are RE200-5 and RE200-5T. The models are identical in every respect except that the firmware uses a slightly different RF transmission format. The different RF transmission formats allow communication to two different types of security systems. This report, and other supporting documentation, will note the differences and similarities between the two models when it is relevant to the applicable requirement.

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 Products, Inc.
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.
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 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-RE200-5". See Exhibit B for a photograph showing the label and location on 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: 2009.
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 Parkway, Suite 1400
Herndon, VA 20170 USA
Contact: Rick McMurray
703-689-0368

Photographs of the test site are shown in Exhibit J.

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) The full name and mailing address of the manufacturer of the device and the applicant for certification:

Resolution Products, Inc.
1402 Heggen St.
Hudson, WI 54016

(2) FCC Identifier: U5X-RE200-5
(3) A 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 and C.
(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.
(13) Not applicable.
(14) Test setup photos are furnished in Exhibit J.

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 when a user presses a valid button or button combination. When a valid press is detected, the RE200-5 model transmits up to 16 packets. The RE200-5T model transmits up to 12 packets. The transmitted packets are 16.65mS in length. The spacing between each packet is randomized from 144mS to 240mS. The RE200-5T model uses a 1 second space between the 6th and 7th packets. Upon completion of these packets, the device goes into sleep mode and will not transmit again until a new valid press is detected.

The plots that follow (made using an Agilent Model N9340B Spectrum Analyzer) show the packet transmissions occurring in a 5 second window resulting from one activation. The packets are shown to conclude within a 5-second window as required.

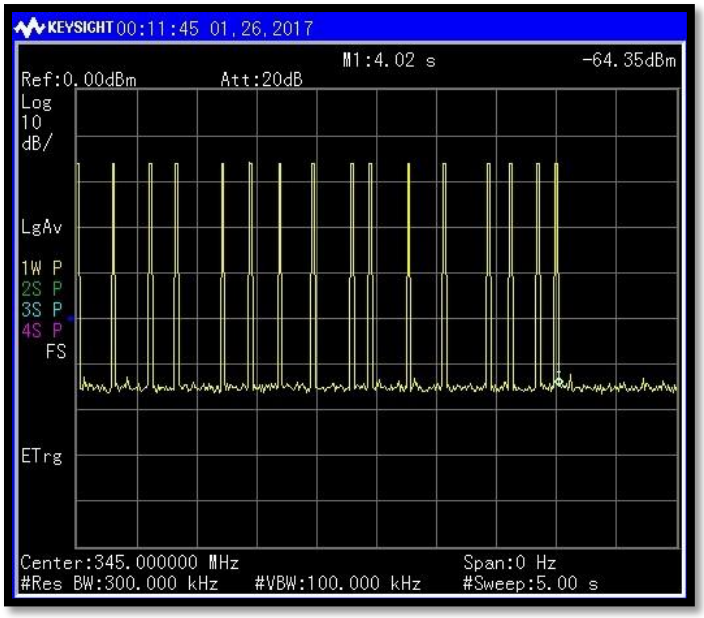

Figure 1: Packet Transmissions within a 5-Second Window (RE200-5)

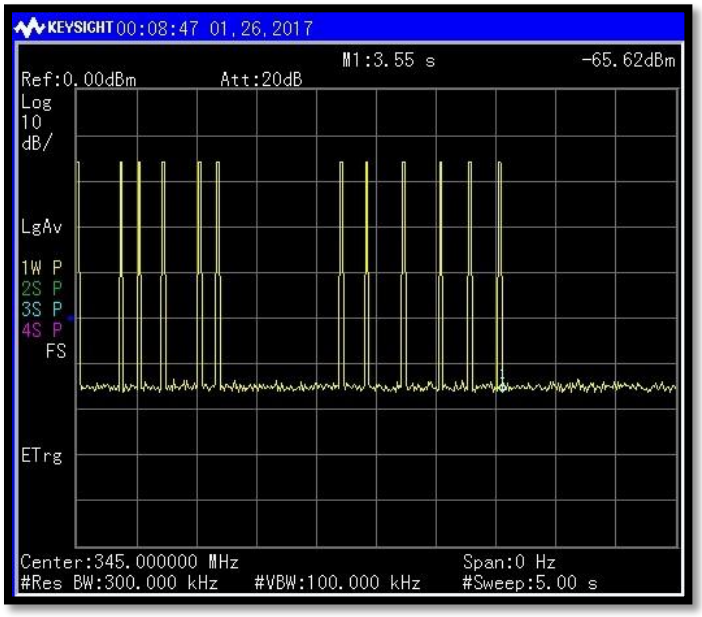

Figure 2: Packet Transmissions within a 5-Second Window (RE200-5T)

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)

This device does not continue transmitting beyond the packets resulting from each activation.

3.4. FCC Part 15 §15.231(a)(5)

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: **77.25 dBuV/m**
Spurious: **57.25 dBuV/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 = 54dBuV/m.

3.5.2. Duty Cycle Correction Factor and Resulting Limits

This transmitter uses ASK modulation. 64 bits are transmitted in each packet, and the "on" time for each bit is 135uS. The resulting "on" time per packet is 8.64mS. The transmitted packets are limited to one packet in a 100mS period. The transmitter duty cycle over a 100ms time period is therefore 8.64/100 = 8.64%.

The plot that follows (made using an Agilent Model N9340B Spectrum Analyzer) shows the packet width measurement. Note, the RE200-5 and RE200-5T models have identical packet characteristics.

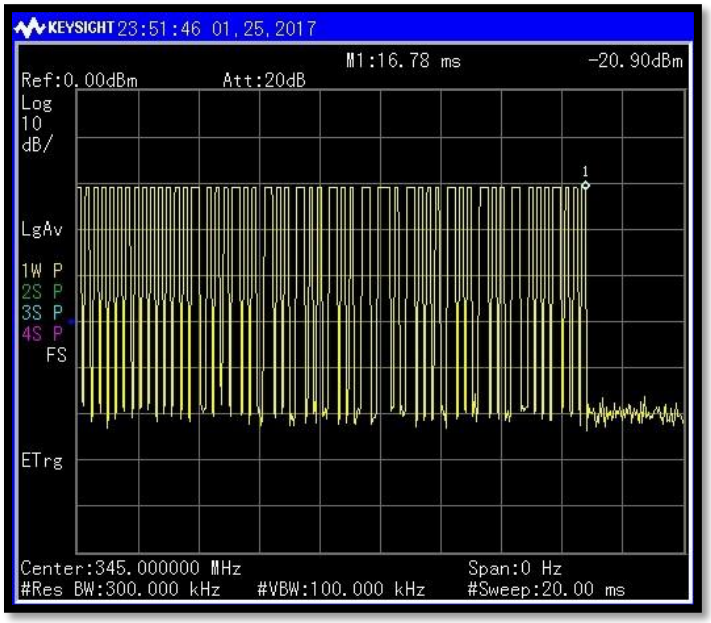

Figure 3: Packet Width

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

20log(8.64/100) = -21.27dB

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 calculated as follows:

Fundamental:	77.25 dBuV/m + 20 dBuV/m	= **97.25 dBuV/m**
Spurious:	57.25 dBuV/m + 20 dBuV/m	= **77.25 dBuV/m**
Restricted Band:	54.00 dBuV/m + 20 dBuV/m	= **74.00 dBuV/m**

3.5.3. Measured Radiated Field Strength Data

Radiated fundamental and spurious emissions were tested at three meters. The EUT was tested in the three orthogonal planes with the receive antenna in both polarities. The emissions were maximized per ANSI C63.4:2003 8.3.1.2; that is, the measurement antenna height was varied between 1 and 4m, and the EUT was rotated through 360 degrees on a rotating turntable until the maximum emissions were found. Both horizontal and vertical measurement antenna polarizations were used. A resolution bandwidth of 100kHz was used for frequencies less than 1000MHz, and a resolution bandwidth of 1MHz was used for frequencies greater than or equal to 1000MHz. The video bandwidth was set to a value at least three times greater than the resolution bandwidth.

All spurious emissions in the applicable frequency range were investigated.

The EUT was adapted to continuously transmit for testing purposes.

The fundamental signal, at 86.6dBuV/m, passed by 10.7dB.
The highest spurious signal was the second harmonic, which passed by 23dB.

Further measured radiated field strength data is shown in Exhibit I

3.6. FCC Part 15 §15.231(c)

3.6.1. Bandwidth Requirements - Limits and Measured Data

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

BW Limit = 0.0025 * 345 MHz
BW Limit = 0.8625 MHz

The plot that follows (made using an Agilent Model N9340B Spectrum Analyzer) shows the bandwidth of the modulated signal is 132 kHz or 0.132 MHz. These measurements show compliance with the bandwidth requirements by a margin of 730.5 kHz or .7305 MHz. Note, the RE200-5 and RE200-5T models have identical packet, and thus bandwidth, characteristics.

Figure 4: Measured Bandwidth