

*FCC PART 15, SUBPART B & C
TEST REPORT*

for

ACCESS CONTROL SYSTEM
Model: RK-WM
FCC ID: NNHRKWM

Prepared for

SECURA KEY
a Division of Soundcraft, Inc.
20447 NORDHOFF STREET
CHATSWORTH, CA 91311

COMPATIBLE ELECTRONICS INC.
2337 TROUTDALE DRIVE
AGOURA, CALIFORNIA 91301
(818) 597-0600

DATE: JANUARY 18, 1999

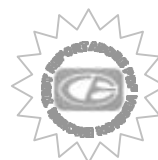
	REPORT BODY	APPENDICES				TOTAL
		A	B	C	D	
PAGES	18	2	2	9	6	37

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LIST OF APPENDICES

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GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced in any form unless done so in full with the written permission of Compatible Electronics.

This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government.

Device Tested: Access Control System
Model: RK-WM
S/N: none

Product Description: *This is an Access Control System low frequency transmitter used to access buildings. The Access Control System works in conjunction with passive encoded access tag(s).*

Modifications: The EUT was not modified during the testing.

Manufacturer: Secura Key, a Division of Soundcraft Corp.
20447 Nordhoff Street
Chatsworth, CA 91311

Test Date: January 8, 1999

Test Specifications: EMI requirements
FCC Title 47, Part 15 Subpart B & C
Test Procedure: ANSI C63.4: 1992.

Test Deviations: The test procedure was not deviated from during the testing.

SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Conducted RF Emissions, 450 kHz - 30 MHz.	This device is battery operated and does not draw power from public mains hence no conducted test was required.
2	Radiated RF Emissions, 30 MHz – 1000 GHz.	Complies with the Class B limits of FCC Title 47, Part 15 Subpart B.
3	Radiated RF Emissions, 125kHz to 1.250MHz.	Complies with the limits of FCC Title 47, Part 15 Subpart C.



1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Access Control System Model: RK-WM. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4: 1992. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the specification limits defined in FCC Title 47, Part 15, Subpart C, 15.109 and 15.209.



2. ADMINISTRATIVE DATA

2.1 Location of Testing

The EMI tests described herein were performed at the test facility of Compatible Electronics, 2337 Troutdale Drive, Agoura, California 91301.

2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

2.3 Cognizant Personnel

Secura Key a Division of Soundcraft Corp.

Frank Tajbakhsh	Electronic Design Engineer
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Compatible Electronics, Inc.

Ruby A. Hall	Test Engineer
Jeff S. Klinger	Lab Manager

2.4 Date Test Sample was Received

The test sample was received on January 8, 1999.

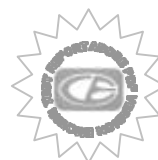
2.5 Disposition of the Test Sample

The test sample remains at Compatible Electronics.

2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network



3. APPLICABLE DOCUMENTS

The following documents are referenced or used in the preparation of this EMI Test Report.

SPEC	TITLE
FCC Title 47, Subpart C.	FCC Rules - Intentional Radiators.
FCC Title 47, Subpart B.	FCC Rules – Radio frequency devices (including digital devices).
CISPR 16 1993	Specification for radio disturbance and immunity measuring apparatus and methods.
ANSI C63.4 1992	Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz.

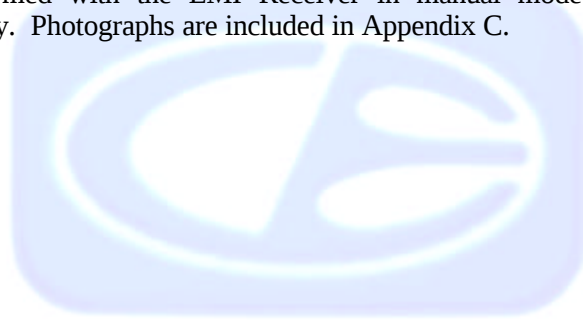


4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration - EMI

The EUT was set up in a tabletop configuration. The EUT was mounted on a stand which simulates a vertical installation. A 1 meter cable is connected to the back of the unit. Two of the wires in the cable connect to the power adapter. The remaining wires were unterminated but would normally go to a LED switch panel input and Wiegand output. The EUT was sending out 26 bit Wiegand signals every 10 seconds. Normally the EUT would only send a signal when a keytag is presented to it. The EUT was programmed to transmit every 10 seconds for worst case test levels.

It was determined that the highest emission levels were found in the above configuration. The final radiated and conducted data was taken in this mode of operation. All initial investigations were performed with the EMI Receiver in manual mode scanning the frequency range continuously. Photographs are included in Appendix C.



4.1.1

Cable Construction and Termination

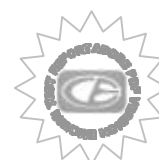
Cable 1

This is a 1 meter unshielded round 6 wire cable connected to the EUT at one end and is unterminated at the other end.



5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT**5.1 EUT and Accessory List**

EQUIPMENT TYPE	MANUFACTURER	MODEL	SERIAL NUMBER
ACCESS CONTROL SYSTEM	SECURA KEY	RK-WM	S/N: NONE FCC ID: NNHRKWM
9V POWER ADAPTER (Not sold with unit)	SECURA KEY	4897	NONE



5.2 EMI Test Equipment

EQUIPMENT TYPE	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
EMI Receiver	Hewlett Packard	8546A	3325A00140	Mar. 08, 1998	Mar. 08, 1999
Preamplifier	Com Power	PA-102	01249	Apr. 20, 1998	Apr. 20, 1999
RF Attenuator	Sertek	412-10	XX02	Sep. 14, 1998	Sep. 14, 1999
Biconical Antenna	Com Power	AB-100	01535	Apr. 17, 1998	Apr. 17, 1999
Log Periodic Antenna	Com Power	AL-100	A101	Apr. 16, 1998	Apr. 16, 1999
Active Loop Antenna	Com Power	AL-130	25309	Feb. 5, 1998	Feb. 5, 1999
LISN	Com Power	LI-200	01777	Jul. 15, 1998	Jul. 15, 1999
LISN	Com Power	LI-200	01778	Jul. 15, 1998	Jul. 15, 1999
LISN	Com Power	LI-200	01779	Jul. 15, 1998	Jul. 15, 1999
LISN	Com Power	LI-200	01781	Jul. 15, 1998	Jul. 15, 1999
Antenna Mast	Com Power	AM-400	N/A	N/A	N/A
Turntable	Com Power	TT-106A	N/A	N/A	N/A
Computer	Area Electronics	B1	5581	N/A	N/A
Printer	Hewlett Packard	C4568A	SG212S11903Q	N/A	N/A



6. TEST SITE DESCRIPTION

6.1 Test Facility Description

Please refer to section 2.1 and 7.1.2 of this report for EMI test location.

6.2 EUT Mounting, Bonding and Grounding

The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 0.8 meters above the ground plane.

The EUT was not grounded.



7. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

7.1 RF Emissions

7.1.1 Conducted Emissions Test

The EMI Receiver was used as a measuring meter. The data was collected with the EMI Receiver in the peak detect mode with the "Max Hold" feature activated. The quasi-peak was used only where indicated in the data sheets. A 10 dB attenuation pad was used for the protection of the spectrum analyzer input stage, and the EMI Receiver offset was adjusted accordingly to read the actual data measured. The LISN output was read by the EMI Receiver. The output of the second LISN was terminated by a 50 ohm termination. The effective measurement bandwidth used for the conducted emissions test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The EUT was powered through the LISN, which was bonded to the ground plane. The LISN power was filtered and the filter was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI C63.4: 1992. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The initial test data was taken in manual mode while scanning the frequency ranges of 0.15 MHz to 1.6 MHz, 1.6 MHz to 5 MHz and 5 MHz to 30 MHz. The conducted emissions from the EUT were maximized for operating mode as well as cable and peripheral placement. Once a predominant frequency (within 12 dB of the limit) was found, it was more closely examined with the EMI Receiver span adjusted to 1 MHz.

The final data was collected under program control by the computer in several overlapping sweeps by running the EMI Receiver at a minimum scan rate of 10 seconds per octave. The six highest emissions are listed in Table 1.



7.1.2 Radiated Emissions Test

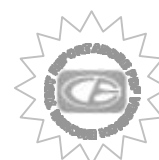
The EMI Receiver was used as a measuring meter. The Preamplifier was used to increase the sensitivity of the instrument. The EMI Receiver was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the receiver records the highest measured reading over all the sweeps. The quasi-peak was used only for those readings which are marked accordingly on the data sheets. The effective measurement bandwidth used for the radiated emissions test was 120 kHz for readings under 1GHz and 1MHz for readings over 1GHz.

Broadband antennas were used as transducers during the measurement. The Loop antenna was used from 125.0kHz to 1.250MHz, the biconical antenna was used from 30MHz to 300MHz, the Log Periodic antenna was used from 300MHz to 1GHz. The frequency spans were wide (134KHz to 1.340MHz, 30 to 300, 300 to 1 GHz, during preliminary investigations. The final data was taken with a frequency span of 1 MHz. Furthermore, the frequency span was reduced during the preliminary investigations as deemed necessary.

The open field test site of Compatible Electronics, Inc. was used for radiated emission testing. This test site is set up according to ANSI C63.4: 1992. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength).

Preliminary testing was done at a distance of 1 meter instead of 3 meters to determine the predominant harmonics and spurious emission frequencies. An open field test site was used for the preliminary investigations. If and when any frequency was found to be above 30 microvolts/meter level (at 1 meter distance), this frequency was recorded as a significant frequency. All significant frequencies are further examined carefully at a reduced frequency span on the EMI Receiver while changing the antenna height and EUT orientation. The bandwidth of the EMI Receiver was varied to ensure that pulse desensitization did not occur.

The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT. The test results are listed in table 2.



7.1.3 RF Emissions Test Results

Table 1.0 CONDUCTED EMISSION RESULTS
ACCESS CONTROL SYSTEM Model: RK-WM

Frequency MHz	Emission Level* dBuV	Specification Limit dBuV	Delta dB
.4943	34.55	48	-13.45
.5563	34.29	48	-13.71
12.00	35.83	48	-9.17
20.00	35.28	48	-12.72
26.96	34.91	48	-13.09
27.99	34.63	48	-13.37

Table 2.0 RADIATED EMISSION RESULTS
ACCESS CONTROL SYSTEM Model: RK-WM

Frequency MHz	Meter* Reading dBuV/m	Effective Gain ** dB	Antenna Factor ** dB/m	Distance Factor dB	Corrected Reading dBuV/m	Spec. Limit dBuV/m	Delta dB
31.95	49.9	34.7	15.2	0	30.4	40	-9.6
36.02	57.7	34.8	13.8	0	36.7	40	-3.3
37.99	48.6	34.8	12.7	0	26.5	40	-13.5
63.99	58.0	35.4	10.7	0	33.3	40	-6.7
71.99	60.8#	35.3	10.2	0	35.7	40	-4.3
75.98	57.7	35.4	9.7	0	32.0	40	-8.0

Notes:

* The complete emissions data is given in Appendix D of this report.

** The effective factor includes the cable loss. The correction factors for the antenna and effective gain are attached in [Appendix C](#) of this report.

Quasi-Peak Readings

R Restricted Band



7.1.4 RF Emissions Test Results (continued)

Table 2.0 **RADIATED EMISSIONS - SPURIOUS
ACCESS CONTROL SYSTEM**

The following bands were specifically scanned.

Frequency Band in MHz	RF Energy From Access Control System at 3 meters (uV/m)
0.490 to 0.510	< 100
37.5 to 38.25	< 100
73 to 74.6	< 100
74.8 to 75.2	< 100
108 to 121.94	< 150
123 to 138	< 150
149.9 to 150.05	< 150
156.7 to 156.9	< 150
162.0125 to 167.17	< 150
167.72 to 173.2	< 150
240 to 285	< 200
322 to 335.4	< 200
399.9 to 410	< 200
608 to 614	< 200
960 to 1000	< 500



7.1.5 Sample Calculations

The Preamplifier was used to increase the sensitivity of the EMI Receiver. A correction factor for the antenna, preamplifier, cable loss and a distance factor (if any), must be applied to the meter reading before a true field strength reading can be obtained. For greater efficiency and convenience, instead of using these correction factors for each meter reading, the specification limit was modified to reflect these correction factors at each frequency, so that the meter readings can be compared directly to the modified specification limit, referred to henceforth as the corrected meter reading limit (CML).

The equation can be derived in the following manner:

$$\text{Corrected Meter Reading} = \text{meter reading} + F - G$$

where: F = antenna factor
G = effective gain (amplifier gain - cable loss)

Therefore, the equation for determining the corrected meter reading limit is:

$$\text{CML} = \text{spec. limit} - F + G$$

A table of corrected meter reading limits was used to permit immediate comparison of the meter reading and determine if the emission level exceeded the specification limit at that frequency. The correction factors for the antenna and the effective gain are attached in Appendix C of this report. The data sheets are attached in Appendix D.

The distance factor D is 0 when the test is performed at a distance of 3 meters.



8. CONCLUSIONS

The Access Control System Model: RK-WM meets all of the requirements of the FCC Title 47, Part 15, Subpart B & C.





MODIFICATIONS TO THE EUT



MODIFICATIONS TO THE EUT

There were no modifications made to the EUT during the test.





APPENDIX B

***ADDITIONAL MODELS COVERED
UNDER THIS REPORT***



ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST

ACCESS CONTROL SYSTEM

Model: RK-WM

S/N: none

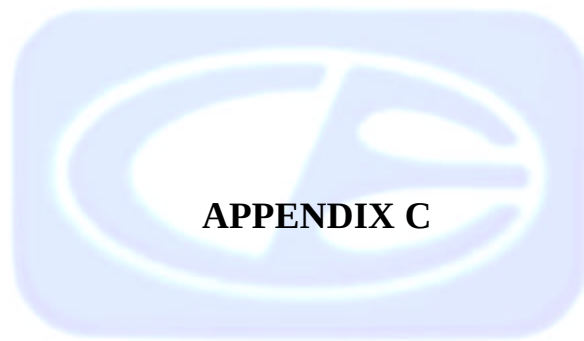
Also covered under this report

Model: RK-25

Model: RK-XM

The three models listed utilize the same PCB. The differences between the models are:
The RK-25 has a relay whereas the RK-XM has RS485 communication capability. The RK-WM which is the model tested, is the proxy reader that sends out information in the Wiegand format when a passive tag is presented to it.





APPENDIX C

DIAGRAMS, CHARTS AND PHOTOS



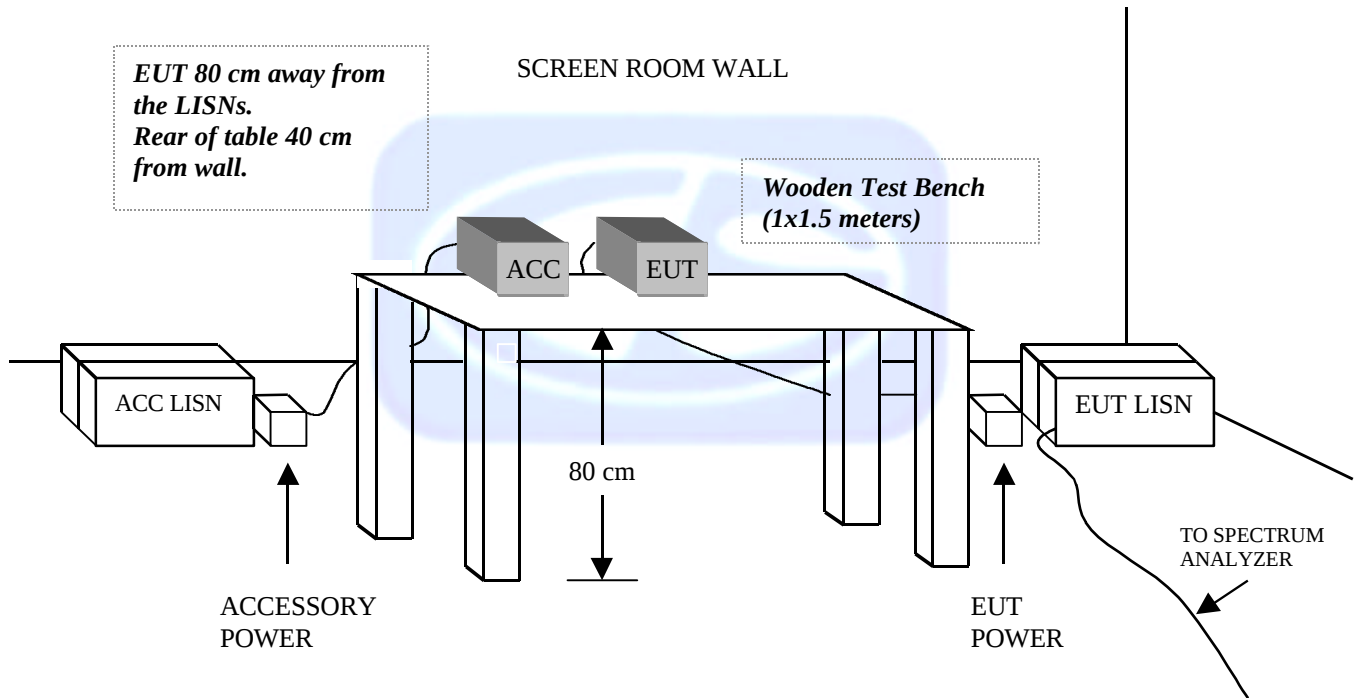
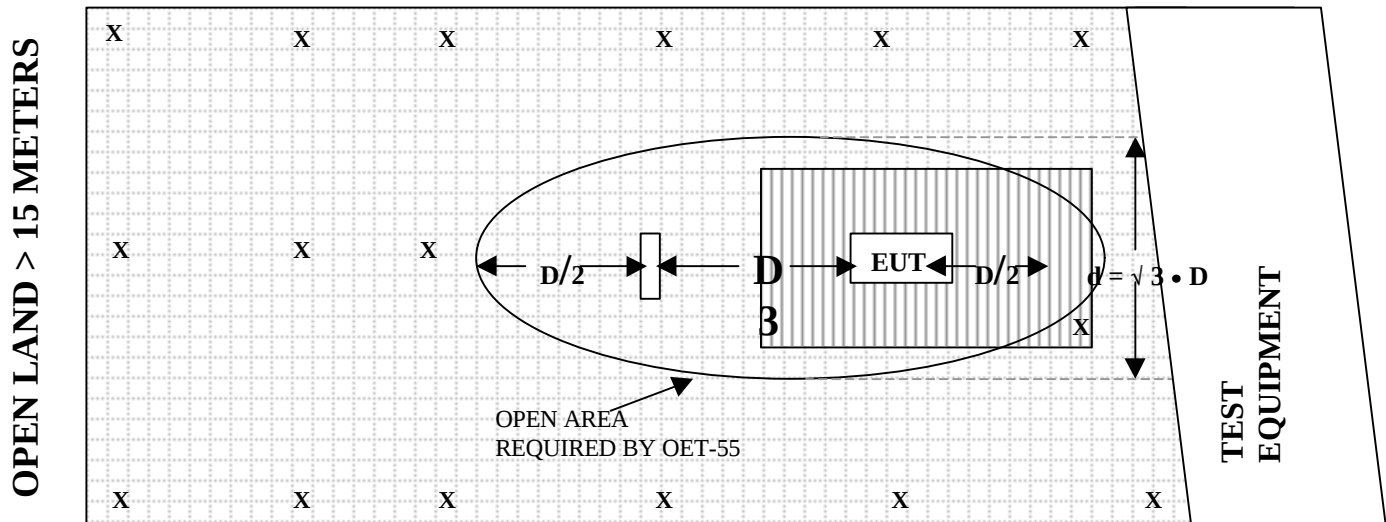
FIGURE 1: CONDUCTED EMISSIONS TEST SETUP

FIGURE 2: PLOT MAP AND LAYOUT OF RADIATED SITE**OPEN LAND > 15 METERS****OPEN LAND > 15 METERS**

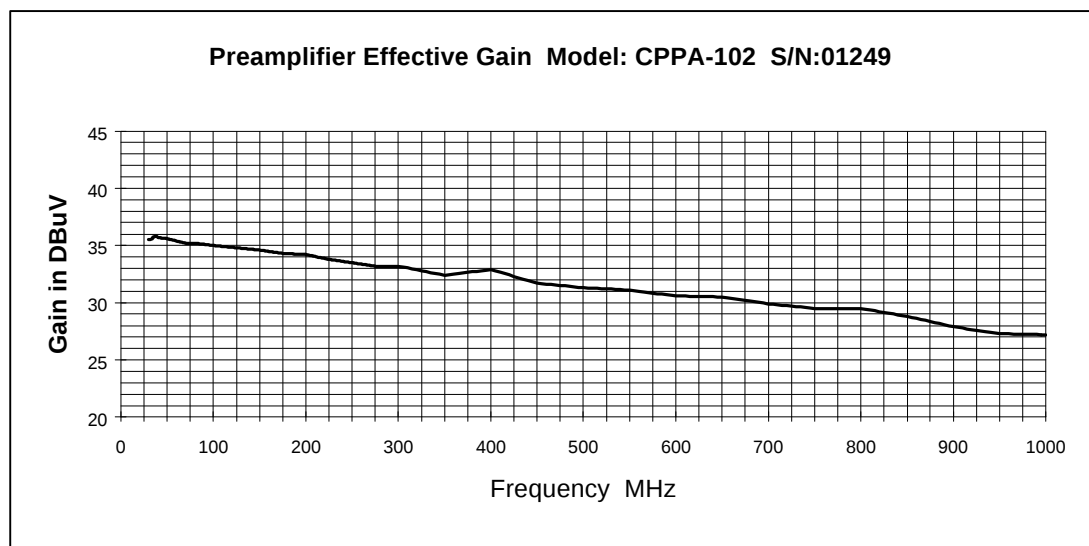
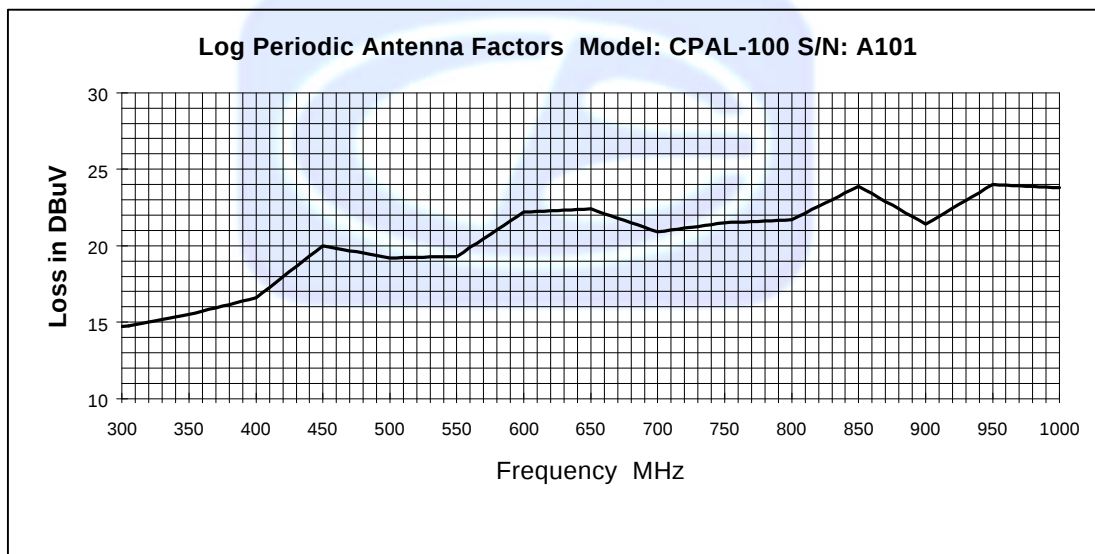
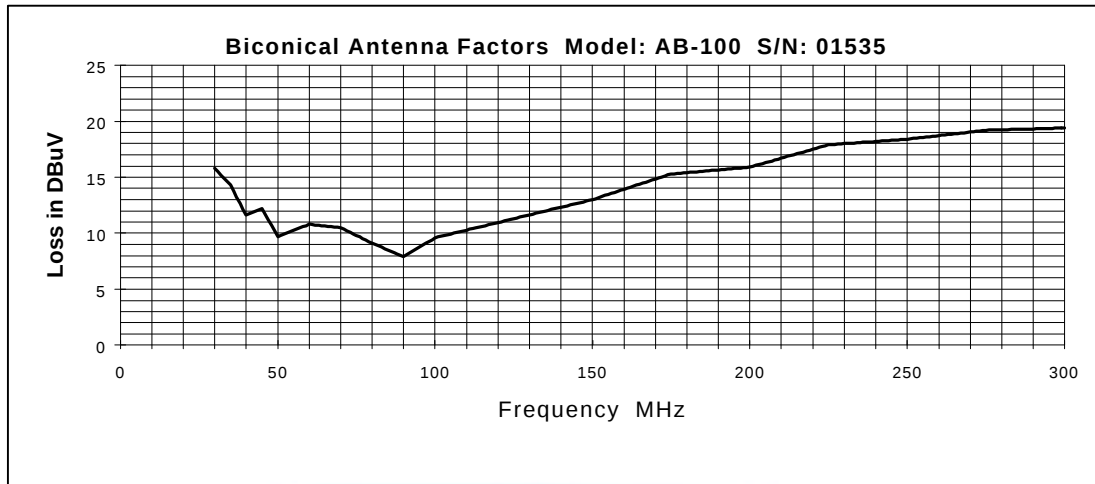
X = GROUND RODS

 = GROUND SCREEN

D = TEST DISTANCE (meters)

 = WOOD COVER





Com-Power Corporation

(714) 587-9800

Antenna Calibration		
Antenna Type: Loop Antenna	Transmit Antenna Height: 2 meters	
Model: AL-130	Receive Antenna Height: 2 meters	
Serial Number: 25309		
Calibration Date: 2-5/98		
Frequency MHz	Magnetic (dB/m)	Electric (dB/m)
0.01	-40.5	11.0
0.02	-41.6	9.9
0.03	-40.0	11.5
0.04	-40.3	11.2
0.05	-41.6	9.9
0.06	-41.1	10.4
0.07	-41.3	10.2
0.08	-41.6	9.9
0.09	-41.7	9.8
0.1	-41.8	9.7
0.2	-44.0	7.5
0.3	-41.6	9.9
0.4	-41.7	9.8
0.5	-41.7	9.8
0.6	-41.5	10.0
0.7	-41.5	10.0
0.8	-41.6	9.9
0.9	-41.6	9.9
1	-41.1	10.4
2	-40.7	10.8
3	-40.7	10.8
4	-40.9	10.6
5	-40.1	11.4
6	-40.0	11.5
7	-40.3	11.2
8	-39.8	11.7
9	-38.8	12.7
10	-40.8	10.7
12	-41.4	10.1
14	-41.4	10.1
15	-40.9	10.6
16	-40.8	10.7
18	-41.5	10.0
20	-41.5	10.0
25	-41.2	10.3
30	-41.4	10.1





FRONT VIEW

SECURA KEY A DIVISION OF SOUNDCRAFT CORP.

ACCESS CONTROL SYSTEM

Model: RK-WM

FCC PART 15 SUBPART B & C - RADIATED EMISSIONS – 1-8-99

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**





BACK VIEW

SECURA KEY A DIVISION OF SOUNDCRAFT CORP.

ACCESS CONTROL SYSTEM

Model: RK-WM

FCC PART 15 SUBPART B & C - RADIATED EMISSIONS – 1-8-99

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**





FRONT VIEW

SECURA KEY A DIVISION OF SOUNDCRAFT CORP.
ACCESS CONTROL SYSTEM

Model: RK-WM

FCC PART 15 SUBPART B & C - CONDUCTED EMISSIONS – 1-8-99

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**





REAR VIEW

SECURA KEY A DIVISION OF SOUNDCRAFT CORP.
ACCESS CONTROL SYSTEM

Model: RK-WM

FCC PART 15 SUBPART B & C - CONDUCTED EMISSIONS – 1-8-99

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**



APPENDIX D



**RADIATED EMISSIONS**COMPANY NAME: SECURA KEY DATE: 1-8-99EUT: ACCESS CONTROL SYSTEM EUT S/N: NONEEUT MODEL: RK-WM LOCATION: ☐ BREA ☐ SILVERADO ☒ AGOURASPECIFICATION: FCC CLASS: B TEST DISTANCE: 3m LAB: FANTENNA: ☐ LOOP ☒ BICONICAL ☒ LOG ☐ HORN POLARIZATION: ☒ VERT ☐ HORIZ☒ QUALIFICATION ☐ ENGINEERING ☐ MFG. AUDIT ENGINEER: R. HALLNOTES: 4 MHz (RK-25, RK-XM)
125 KHzTEMP 70°
HUMIDITY 11%

Frequency (MHz)	Peak Reading (dBuV/m)	Quasi- Peak (dBuV/m)	Antenna Height (meters)	Azimuth (degrees)	Delta * (dB)	Corrected Limit (dBuV/m)	Comments
31.95	49.9		1.0	0°	-9.6	59.5	
36.02	57.7		1.0	270°	-3.3	61.0	
37.99	48.6		1.0	0°	-13.5	62.1	
48.04	50.1		1.5	45°	-14.4	64.5	
51.99	51.4		1.0	315°	-14.0	65.4	
63.99	62.1	53.1	1.0	180°	-11.0	64.7	
71.99	62.5	60.8	1.0	270°	-4.3	65.1	
75.98	57.7		1.0	270°	-8.0	65.7	
83.98	52.4		1.0	270°	-14.4	66.8	
NO EMISSIONS FOUND ABOVE 84 MHz							

* DELTA = METER READING - CORRECTED LIMIT



RADIATED EMISSIONS

COMPANY NAME: SECURA KEY DATE: 1-8-99

EUT: ACCESS CONTROL SYSTEM EUT S/N: NONE

EUT MODEL: RK-WM LOCATION: ☐ BREA ☐ SILVERADO ☒ AGOURA

SPECIFICATION: FCC CLASS: B TEST DISTANCE: 3m LAB: F

ANTENNA: ☐ LOOP ☒ BICONICAL ☒ LOG ☐ HORN POLARIZATION: ☐ VERT ☒ HORIZ

☒ QUALIFICATION ☐ ENGINEERING ☐ MFG. AUDIT ENGINEER: R. HALL

NOTES:

Frequency (MHz)	Peak Reading (dBuV/m)	Quasi- Peak (dBuV/m)	Antenna Height (meters)	Azimuth (degrees)	Delta * (dB)	Corrected Limit (dBuV/m)	Comments
36.00	51.9		3.0	0°	-9.1	61.0	
63.99	58.0		3.0	270°	-6.7	64.7	
72.00	53.0		3.0	180°	-12.1	65.1	
115.98	46.7		4.0	180°	-21.9	67.9	
NO EMISSIONS FOUND ABOVE 115.98 MHZ							

* DELTA = METER READING - CORRECTED LIMIT



RADIATED EMISSIONS

COMPANY NAME: SECURA KEY DATE: 1-8-99

EUT: ACCESS CONTROL SYSTEM EUT S/N: NONE

EUT MODEL: RK-WM LOCATION: ☐ BREA ☐ SILVERADO ☒ AGOURA

SPECIFICATION: FCC PT. 15 C CLASS: TEST DISTANCE: 3m LAB: F

ANTENNA: ☒ LOOP ☐ BICONICAL ☐ LOG ☐ HORN POLARIZATION: ☐ VERT ☐ HORIZ

☒ QUALIFICATION ☐ ENGINEERING ☐ MFG. AUDIT ENGINEER: R. HALL

NOTES: NO EMISSIONS FOUND ABOVE 500.5 KHz TO 10TH HARMONIC



Frequency KHz (MHz)	Peak Reading (dBuV/m)	Quasi- Peak (dBuV/m)	Antenna Height (meters)	Azimuth (degrees)	Delta * (dB)	Corrected Limit (dBuV/m)	Comments
126.8	20.44		1.0	180°	-75.53	95.97	
250.5	12.07		1.0	180°	-80.08	92.15	
375.5	11.22		1.0	180°	-75.00	86.22	
500.5	11.10		1.0	180°	-52.72	63.82	

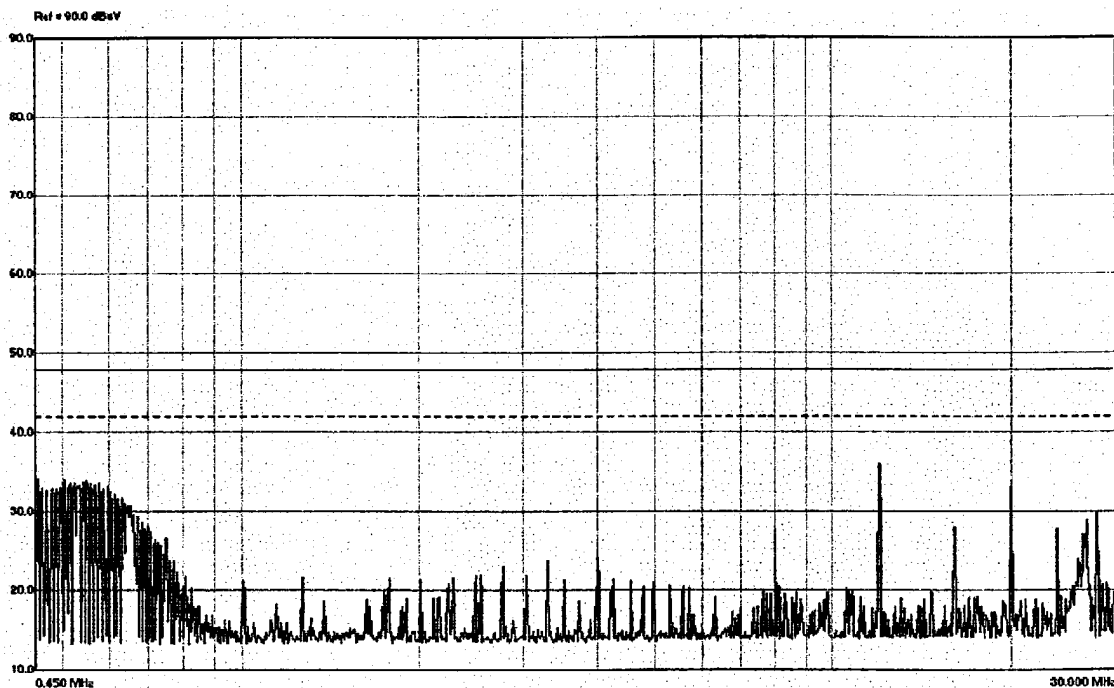
* DELTA = METER READING - CORRECTED LIMIT



DATE: 1/08/99

GENERAL COMMENTS:

FCC pt. 15 CLASS B
Secura Key
Access Control System
M/N: RK-WM
110VAC BLACK LEAD



SIX HIGHEST READINGS:

Frequency (MHz)	Peak (dBuV)	DelLim-Pk (dB)
0.476595	32.85	-15.15
0.503190	33.96	-14.04
0.547515	33.87	-14.13
0.574110	33.42	-14.58
12.001095	36.01	-11.99
20.000280	32.91	-15.09

Test Engineer's Signature:

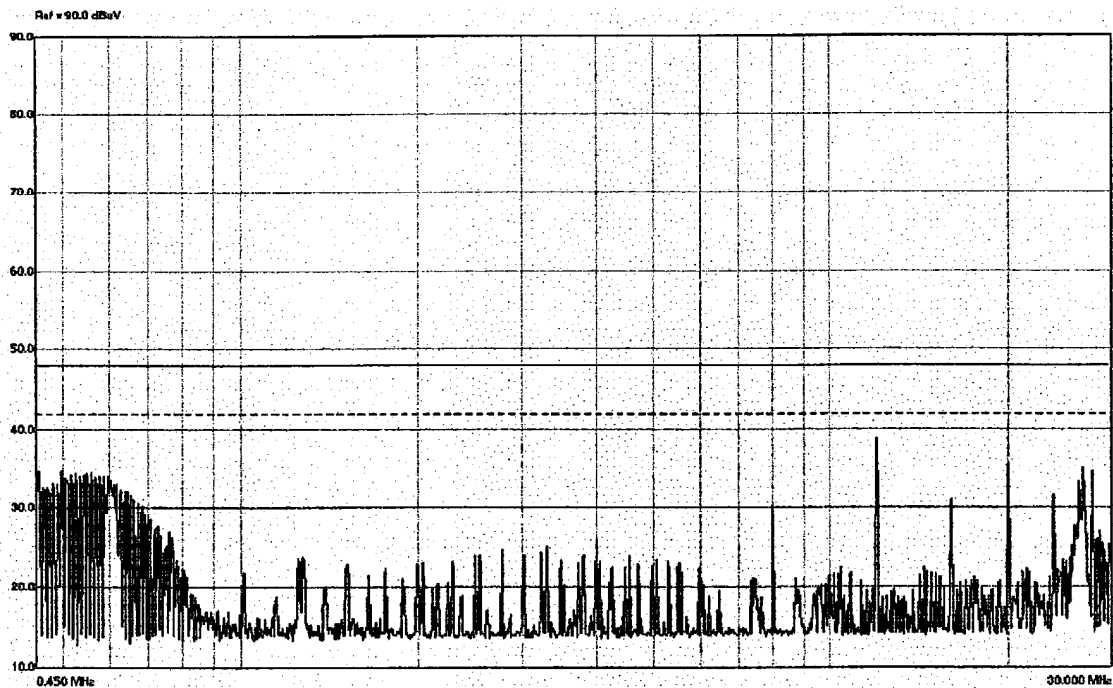
Paul A. Hall



DATE: 1/08/99

GENERAL COMMENTS:

FCC pt. 15 CLASS B
Secura Key
Access Control System
M/N: RK-WM
110VAC WHITE LEAD



SIX HIGHEST READINGS:

Frequency (MHz)	Peak (dBuV)	DelLim-Pk (dB)
0.494325	34.55	-13.45
0.556380	34.29	-13.71
12.001095	38.83	-9.17
20.000280	35.28	-12.72
26.965215	34.91	-13.09
27.999465	34.63	-13.37

Test Engineer's Signature: Ruby A. Hall