

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

for

REMOTE CONTROL
Model: RP-RF2 (TX)
FCC ID: IE3VP48XX00

Prepared for

INTERLINK ELECTRONICS
546 FLYNN ROAD
CAMARILLO, CA 93012

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

DATE: OCTOBER 6, 2000

	REPORT BODY	APPENDICES					TOTAL
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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 except in full, without 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: Remote Control
Model: RP-RF2 (TX)
S/N: 001

Product Description: *This is a hand held remote control device used with PC based computers.*

Modifications: No modifications were made to the EUT.

Manufacturer: Interlink Electronics
546 Flynn Road
Camarillo, CA 93012

Test Date: Sep. 27, 2000

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.	The EUT does not connect to the AC mains; therefore this test was not performed.
2	Radiated RF Emissions, 30 MHz – 1000 MHz.	Complies with the Class B limits of FCC Title 47, Part 15 Subpart B 15.109.
3	Radiated RF Emissions, 10kHz to 1GHz.	Complies with the limits of FCC Title 47, Part 15 Subpart C 15.205, 15.209 and 15.249.



1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Remote Control Model: RP-RF2 (TX). 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 B, 15.109 and Subpart C 15.205, 15.209 and 15.249.



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

Interlink Electronics, Inc.

Daniel Grieder Member Technical Staff

Compatible Electronics, Inc.

Andre D. Khan	Test Technician
Reynald O. Ramirez	Test Technician
Ruby A. Hall	Test Engineer
Jeff S. Klinger	Lab Manager

2.4 Date Test Sample was Received

The test sample was received on Sep. 27, 2000.

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 while transmitting in the frequency range. The EUT was tested while continuously transmitting a signal within the EUT output frequency.

The EUT was tested in all three axis while transmitting.

It was determined that the highest emission levels were found in the above configuration. The final radiated data was taken in this mode of operation. All initial investigations were performed with the Spectrum Analyzer in manual mode scanning the frequency range continuously. Photographs and data sheets are included in Appendices D and E.



4.1.1 Cable Construction and Termination

The EUT does not have any external cables.



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

EQUIPMENT TYPE	MANUFACTURER	MODEL	SERIAL NUMBER
REMOTE CONTROL (EUT)	INTERLINK ELECTRONICS, INC.	RP-RF2 (TX)	S/N: 001 FCC ID: IE3VP48XX00



5.2 EMI Test Equipment

EQUIPMENT TYPE	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Spectrum Analyzer	Hewlett Packard	8566A	1904A00188	Jun. 17, 2000	Jun. 17, 2001
Quasi-Peak Adapter	Hewlett Packard	85650A	2043A00276	Jun. 17, 2000	Jun. 17, 2001
Preamplifier	Com Power	PA-102	01249	Apr. 10, 2000	Apr. 10, 2001
Microwave Amplifier	Com Power	PA-122	25137	Aug. 02, 2000	Aug. 02, 2001
Horn Antenna	Amplifier Research Associates	DRG 118/A	1015	Dec. 2, 1993	N.C.R.
Biconical Antenna	Com Power	AB-100	01535	Apr. 11, 2000	Apr. 11, 2001
Log Periodic Antenna	Com Power	AL-100	A101	Apr. 11, 2000	Apr. 11, 2001
Powered Loop Antenna	Com Power	AL-130	17054	Mar. 30, 2000	Mar. 30, 2001
Antenna Mast	Com Power	AM-400	N/A	N/A	N/A
Turntable	Com Power	TT-106A	N/A	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 Spectrum Analyzer was used as a measuring meter along with the Quasi-Peak Adapter. The data was collected with the Spectrum Analyzer 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 Spectrum Analyzer offset was adjusted accordingly to read the actual data measured. The LISN output was read by the Spectrum Analyzer. 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 Spectrum Analyzer span adjusted to 1 MHz.

The EUT is a battery powered device, therefore this test was not required.



7.1.2 Radiated Emissions Test

The Spectrum Analyzer was used as a measuring meter along with the Quasi-Peak Adapter. The preamplifier was used to increase the sensitivity of the instrument. The Spectrum Analyzer was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the Spectrum Analyzer 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.

Broadband loop, biconical, log periodic and horn antennas were used as transducers during the measurement. The loop antenna was used from 10kHz to 30 MHz, the biconical antenna was used from 30 MHz to 300 MHz, the log periodic antenna was used from 300 MHz to 1 GHz and the horn antenna was used above 1 GHz. The frequency spans were wide (30 MHz to 88 MHz, 88 MHz to 216 MHz, 216 to 300 MHz and 300 MHz 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).

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 EUT was tested at a 3 meter test distance to obtain final test data.



7.1.3 RF Emissions Test Results

The fundamental and up to the 10th harmonic emissions are within the specifications.

RADIATED EMISSIONS - SPURIOUS REMOTE CONTROL

The following bands were specifically scanned.

Frequency Band 6 – 10076Mhz

No spurious emissions were found.

RF Energy From Remote Control
in MHz at 3 meters (μV/m)

6.215-6.218	<70	37.5-38.25	<100
6.26775-6.26825	<70	73-74.6	<100
6.31175-6.31225	<70	74.8-75.2	<100
8.291-8.294	<70	108-121.94	<100
8.362-8.366	<70	123-138	<150
8.37625-8.38675	<70	149.9-150.05	<150
8.41425-8.41475	<70	156.52-156.52	<150
12.29-12.293	<70	162.01-167.17	<150
12.51975-12.52025	<70	167.72-173.2	<150
12.57675-12.57725	<70	240-285	<200
13.36-13.41	<70	322-335.4	<200
16.42-16.423	<70	399.9-410	<200
16.69475-16.69525	<70	608-614	<200
16.80425-16.80475	<70	960-1240	<500
25.5-25.67	<70	1300-1427	<500
		1435-1626.5	<500
		1645.5-1646.5	<500
		1660-1710	<500
		1718.8-1722.2	<500



7.1.4 RF Emissions Test Results Continued

RF Energy From Remote Control
in MHz at 3 meters ($\mu\text{V}/\text{m}$)
(CONTINUED)

MHz	
2200-2300	<500
2310-2390	<500
2483.5-2500	<500
2655-2900	<500
3260-3267	<500
3332-3339	<500
3345.8-3358	<500
3600-4400	<500
GHz	
4.5-5.15	<500
5.35-5.46	<500
7.25-7.75	<500
8.025-8.5	<500
9.0-9.2	<500



8. CONCLUSION

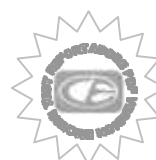
The Remote Control Model: RP-RF2 (TX) meets all of the requirements of the FCC Title 47, Part 15, Subpart B & C.





APPENDIX A

LAB RECOGNITIONS



LAB RECOGNITIONS

Compatible Electronics has the following agency accreditations:

National Voluntary Laboratory Accreditation Program - Lab Code: 200063-0

Voluntary Control Council for Interference - Registration Numbers: R-826, C-862, R-653 and C-669

Bureau of Standards and Metrology Inspection - Reference Number: SL2-IN-E-1031

Compatible Electronics is recognized or on file with the following agencies:

Federal Communications Commission

Industry Canada

Radio-Frequency Technologies (Competent Body)

Technology International (Europe) Ltd.





APPENDIX B

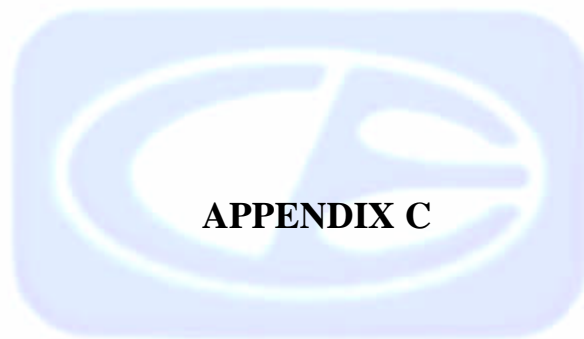
MODIFICATIONS TO THE EUT



MODIFICATIONS TO THE EUT

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





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



ADDITIONAL MODELS COVERED UNDER THIS REPORT

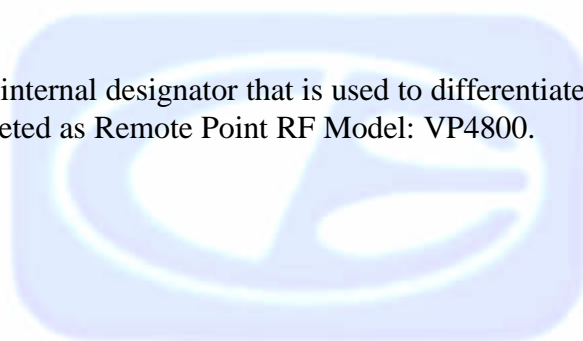
USED FOR THE PRIMARY TEST

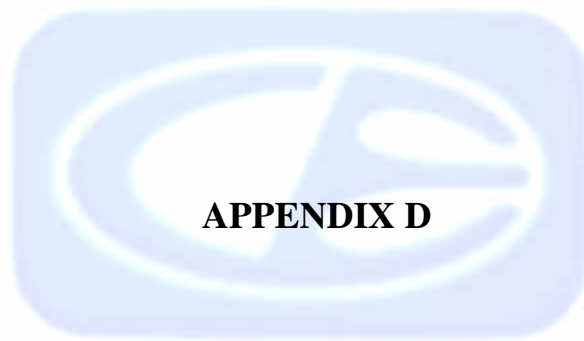
REMOTE CONTROL

Model: RP-RF2 (TX)

S/N: 001

Note: RP-RF2 (RX) is an internal designator that is used to differentiate this product from another. This product will be marketed as Remote Point RF Model: VP4800.

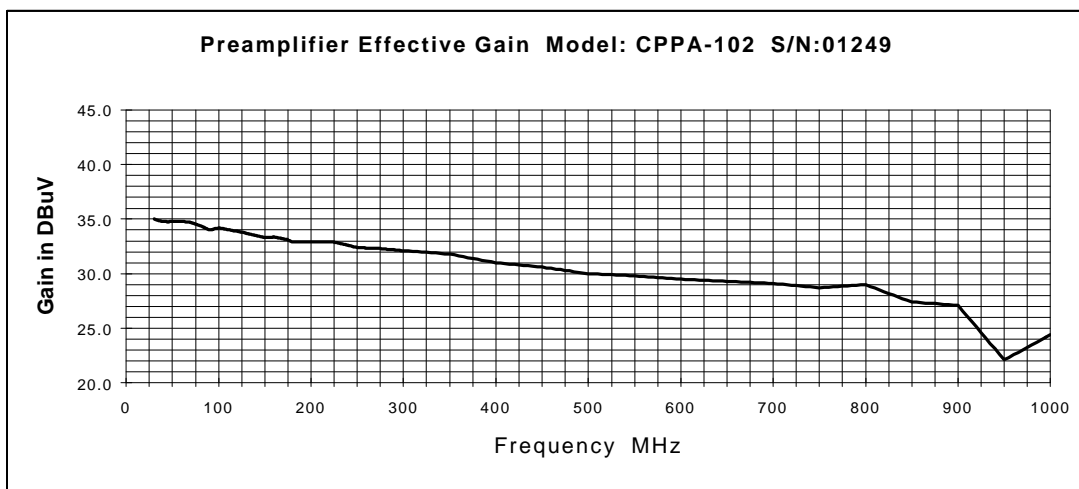
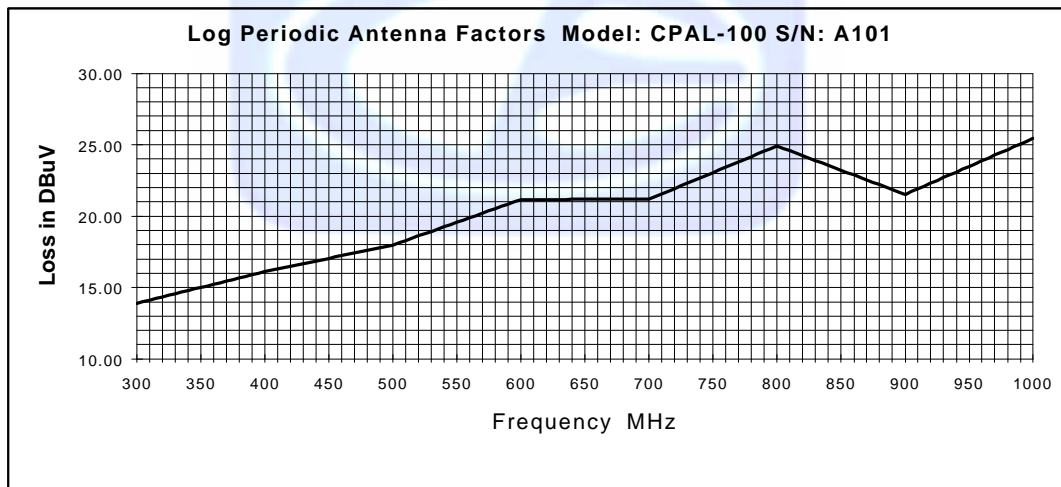
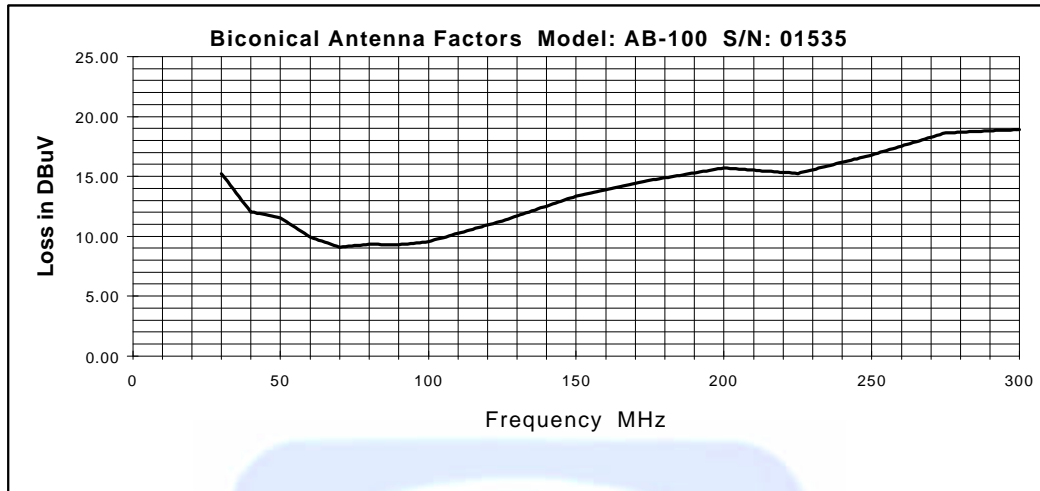


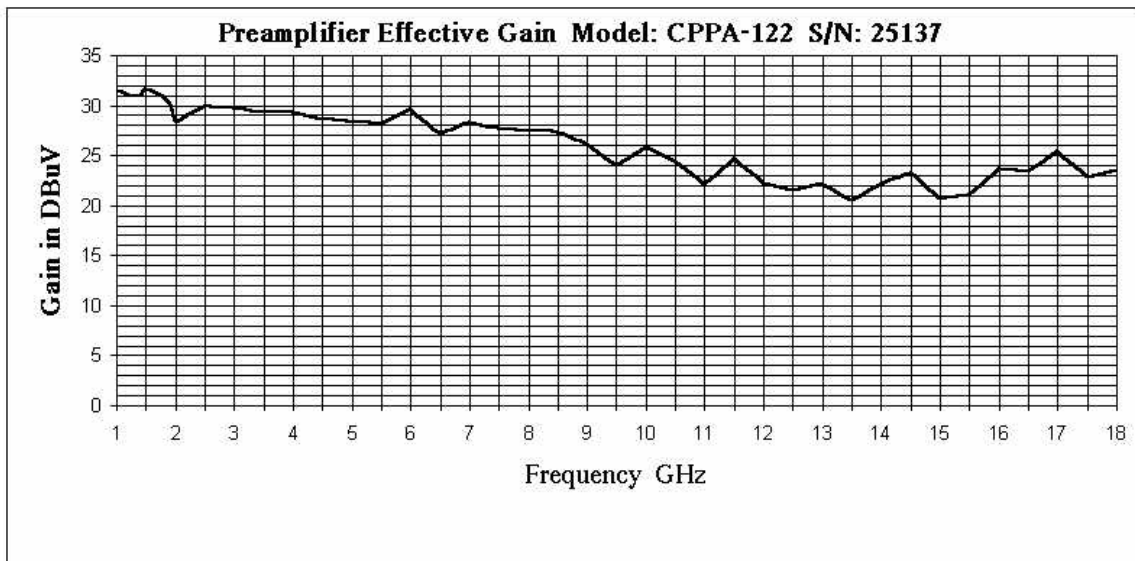
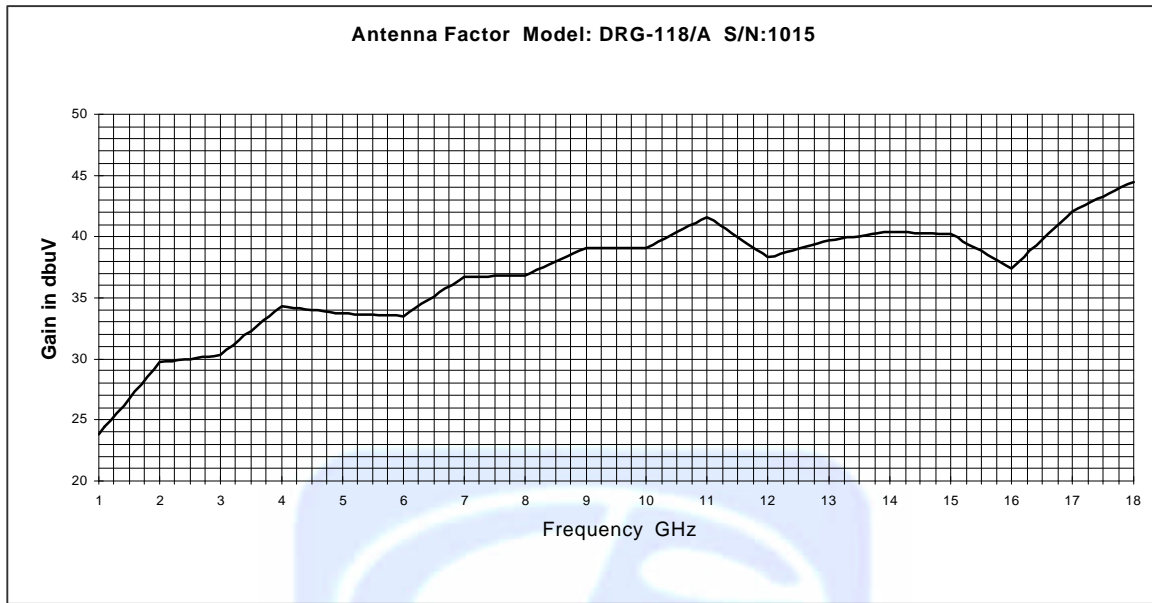


APPENDIX D

DIAGRAMS, CHARTS AND PHOTOS







Com-Power Corporation

(949) 587-9800

Antenna Calibration		
Antenna Type: Loop Antenna	Transmit Antenna Height: 2 meters	
Model: AL-130	Receive Antenna Height: 2 meters	
Serial Number: 17054		
Calibration Date: 3/30/00		
Frequency MHz	Magnetic (dB/m)	Electric (dB/m)
0.01	-41.3	10.2
0.02	-42.2	9.3
0.03	-40.5	11.0
0.04	-40.8	10.7
0.05	-42.1	9.4
0.06	-41.7	9.8
0.07	-41.8	9.7
0.08	-42.1	9.4
0.09	-42.3	9.2
0.1	-42.3	9.2
0.2	-44.6	6.9
0.3	-42.1	9.4
0.4	-42.2	9.3
0.5	-42.2	9.3
0.6	-42.1	9.4
0.7	-42.0	9.5
0.8	-42.0	9.5
0.9	-41.9	9.6
1	-41.4	10.1
2	-40.6	10.9
3	-40.9	10.6
4	-41.1	10.4
5	-40.5	11.0
6	-40.5	11.0
7	-40.9	10.6
8	-41.1	10.4
9	-40.6	10.9
10	-40.9	10.6
12	-41.6	9.9
14	-41.9	9.6
15	-42.1	9.4
16	-42.3	9.2
18	-42.1	9.4
20	-42.4	9.1
25	-43.4	8.1
30	-45.6	5.9





X-AXIS

INTERLINK ELECTRONICS, INC.

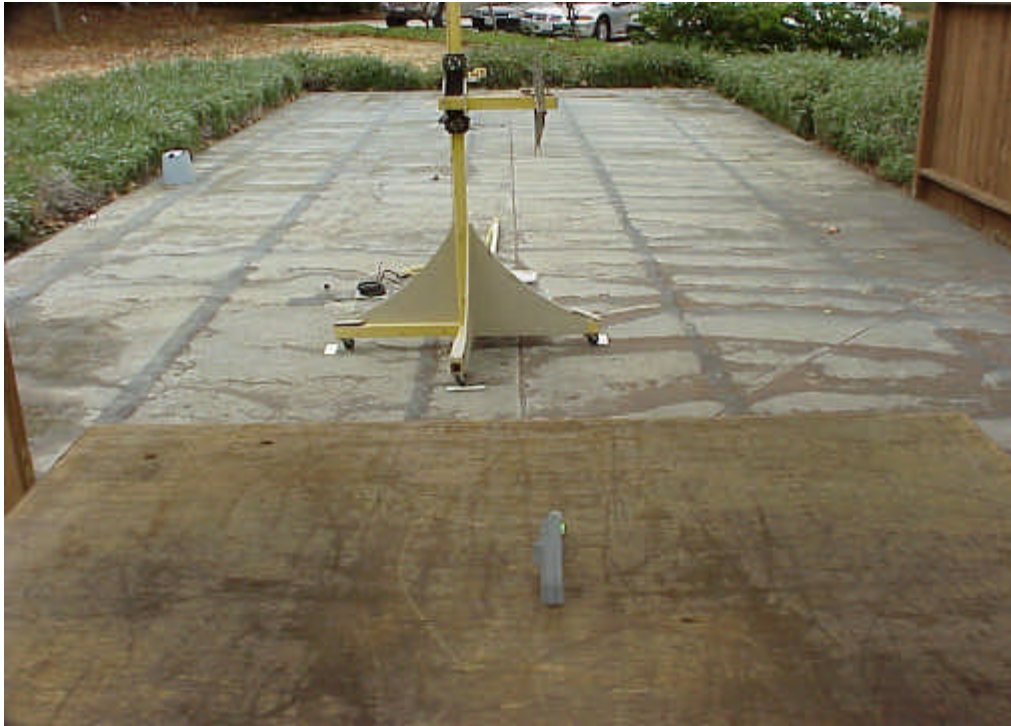
REMOTE CONTROL

Model: RP-RF2 (TX)

FCC PART 15 SUBPART B & C - RADIATED EMISSIONS – 9-27-00

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





Y-AXIS

INTERLINK ELCTRONICS, INC.

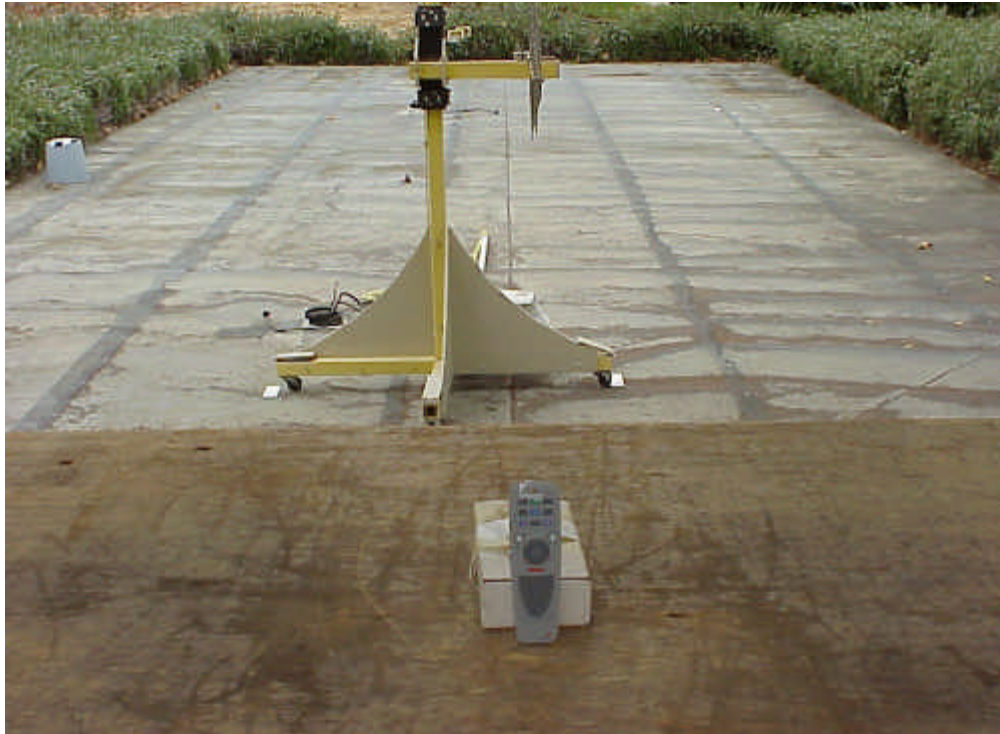
REMOTE CONTROL

Model: RP-RF2 (TX)

FCC PART 15 SUBPART B & C - RADIATED EMISSIONS – 9-27-00

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





Z-AXIS

INTERLINK ELECTRONICS, INC.

REMOTE CONTROL

Model: RP-RF2 (TX)

FCC PART 15 SUBPART B & C - RADIATED EMISSIONS – 9-27-00

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



APPENDIX E





RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.249)

COMPANY	Interlink Electronics	DATE	9/27/00
EUT	RF Remote Control	DUTY CYCLE	7.00 %
MODEL	RP-RF2	PEAK TO AVG	-23.10 dB
S/N	1	TEST DIST.	3 METERS
TEST ENGINEER	Andre Khan	LAB	F

[illegible]

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS + AMPLIFIER GAIN

*** DELTA = SPEC LIMIT - CORRECTED READING

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN
 * DELTA = SPEC LIMIT - CORRECTED READING

PAGE 3[illegible]

PAGES

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN
 ** DELTA = SPEC LIMIT - CORRECTED READING

[illegible]

** DELTA = SPEC LIMIT - CORRECTED READING

PAGE 8

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN
 ** DELTA = SPEC LIMIT - CORRECTED READING

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN
** DELTA = SPEC LIMIT - CORRECTED READING



RADIATED EMISSIONS

COMPANY NAME: InterLink Electronics DATE: 9-27-00

EUT: RF Remote Control A Receiver EUT S/N: 001

EUT MODEL: RP-RF2 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: A. Khan

NOTES: PART 15.209

NO SPURIOUS EMISSION FOUND

[illegible]

* DELTA = METER READING - CORRECTED LIMIT



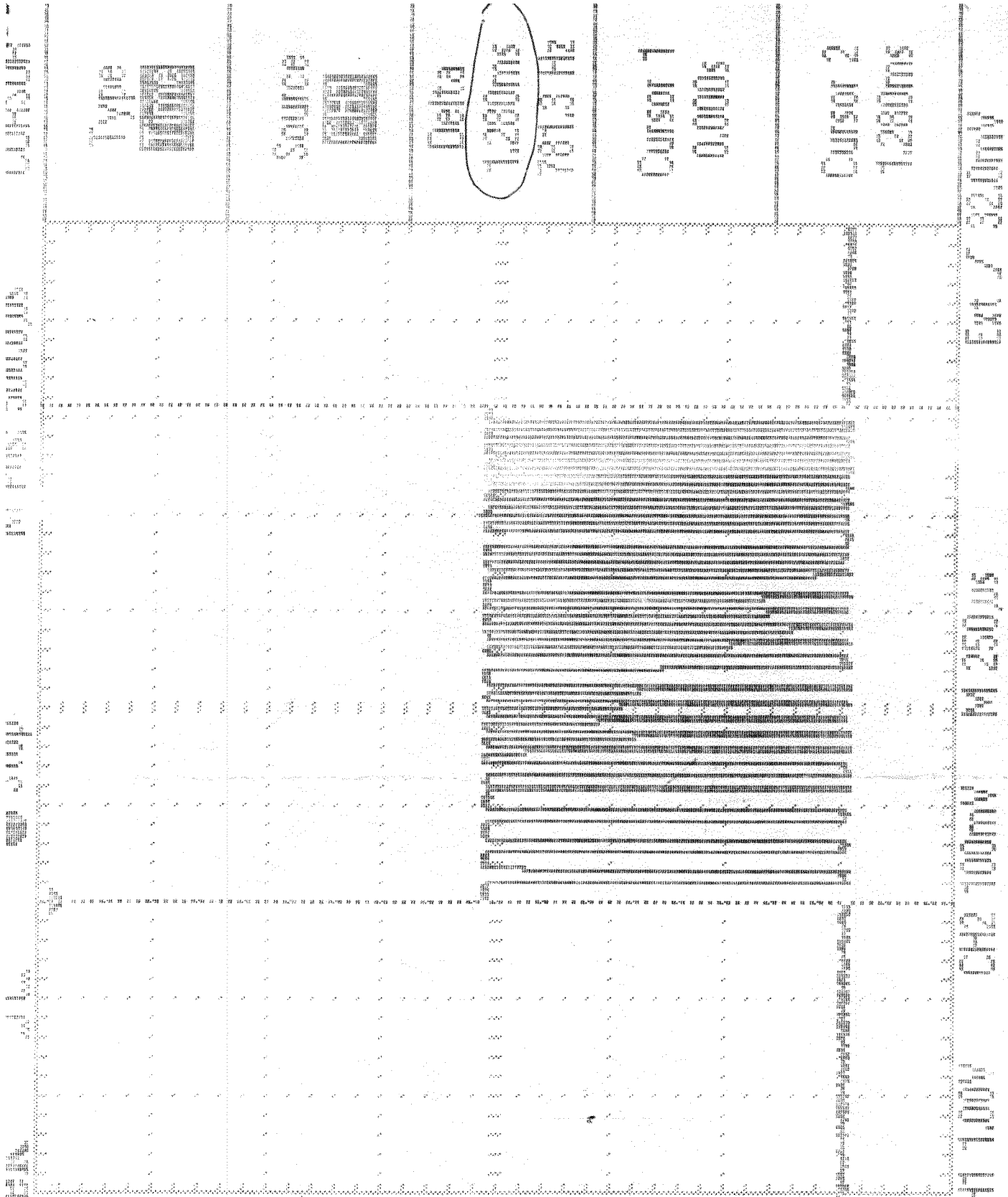
INTERLINK ELECTRONICS

10-3-00

RP-RF

PACKET → PACKET
TIMING

TRANSMITTER
DUTY CYCLE PLOT
1 OF 2



INTERLINK ELECTRONICS
10-3-00

RP-RF

PACKET TIMING

TRANSMITTER
DUTY CYCLE PLOT
2 OF 2