FCC PART 15 SUB-PART B & C
EMI TEST REPORT

on

Wireless Local Loop Extender (Digital Remote Phone Link)

model name

i-WLL 15

provided for evaluation by

Carlson Wireless Telephone, Incorporated
1150 Evergreen Road, Suite #1, PO Box 2400
Redway, California 95560-2400 USA

evaluated and prepared by

International Technology Company (ITC)
9959 Calaveras Road, Box 543
Sunol, California 94586-0543
Tel: (925) 862-2944
Fax: (925) 862-9013
Email: itcemc@aol.com
Web Site: www.itcemc.com

EN45001 Accredited Compliance Laboratory (RES-GmbH)
Registration number: TTI-P-G 159/98-00 (RES-GmbH)

TEST RESULT SUMMARY
FCC PART 15 SUB-PART B & C

General Information

Product Name	Wireless Local Loop Extender (Digital Remote Phone Link)
FCC ID	OPA-I-WLL
Model / Type	i-WLL-15
Manufacturer's Name: *Manufacturer's Address*	Carlson Wireless Telephone, Incorporated 1150 Evergreen Road, Suite #1, PO Box 2400 Redway, California 95560-2400 USA Tel: (707) 923-9593 • Fax: (707) 923-1913 http://www.wireless-telephone.com
Laboratory	International Technology Company (ITC) 9959 Calaveras Road, PO Box 543 Sunol, CA 94586-0543 Tel: (925) 862-2944 • Fax: (925) 862-9013 Email: itcemc@aol.com • Web Site: www.itcemc.com
Test Number	1990916-1
Test Report Number	9909RS116-1/F
Test Date	September 22 through October 12, 1999
Project Technician	Bruce Gordon

According to testing performed at International Technology Company (ITC); the above-mentioned unit is in compliance with the emissions requirements defined in FCC Part 15 B and C. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. Any modifications necessary for compliance made during testing on the above mentioned date(s) must be implemented in all production units for compliance to be maintained.

International Technology Company (ITC) as an independent testing laboratory, declares that the equipment tested as specified above conforms to the emissions requirements of FCC Part 15 B & C.

EMI Test Report

Product Type	Wireless Local Loop Extender (Digital Remote Phone Link)
Model	i-WLL-15
Applicant / Manufacturer	Carlson Wireless Telephone, Incorporated
Address	1150 Evergreen Road, Suite #1, PO Box 2400 Redway, California 95560-2400 USA Tel: (707) 923-9593 • Fax: (707) 923-1913 http://www.wireless-telephone.com
Client Contact	Mr. Jim Carlson Email: jcarlson@carlson-eng.com

Test Results		Pass ❑ Fail	
Total Number of Pages including Appendices	38 Pages		
Test Report File No.	9909RS116-1/F	***Date of Issue:***	Wednesday October 13, 1999

International Technology Company is:

Accepted by the Federal Communications Commission (FCC) for FCC Methods, CISPR Methods and AUSTEL Technical Standards (Ref: NVLAP Lab Code 200172-0)

Validated by the Chinese Taipei Bureau of Standards, Metrology, and Inspection (BSMI) under APEC MRA as a Conformity Assessment Body (CAB) under Appendix B, Phase 1 Procedures. BSMI # SL2-IN-E-024R

Approved by the Industry Canada for Telecom Testing

Certified by International Technology Company (ITC)GmbH for EMC Testing according to the European EMC Directive 89/336/EEC per EN45001

Certified by Reg. TP for EMC Testing according to the European EMC Directive 89/336/EEC per EN45001 for RES GmbH (DAR-Registration number: TTI-P-G 159/98-00)

Certified by the Voluntary Control Council for Interference by Information Technology Equipment (VCCI) for EMC testing, in accordance with the Regulations for Voluntary Control Measures, Article 8, Registration Numbers- Site 1: C-714 & R-696 and Site 2: C-715 & R-697

Engineering Services Offered by ITC

1) RELIABILITY CONSULTING AND SERVICES
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- MTTF Calculations
- Temperature Cycling Testing
- Thermal Shock Testing
- Vibration Shock testing

2) ENGINEERING EVALUATION & TESTING
- OSHA Third Party Evaluations
- SEMI S2 Reviews, 1993
- USB Specification Evaluations/Testing
- SAE Specification Evaluations/Testing
- EIA/TIA Specifications i.e. 571-A and 631
- MIL-STD i.e. 461,462,1541/EMC, 883/ESD

3) COMPLIANCE DESIGN CONSULTATION AND REGULATORY TESTING SERVICES

US: EMI/Telecom (FCC)	**Product Safety (UL/NRTL)**	**EU: EMI/EMC (EN)**
FCC 15 /Class A	**All UL Standards, Including:**	EN 50081-1 /50081-2
FCC 15 /Class B and B DoC	UL 1950 /ITE	EN 50082-1 /50082-2
FCC 15 /SubPart C	UL 2601/Medical	EN 55103-1/ 55103-2
FCC 24	UL 1459 /Telecom	EN 60601-1-2
FCC 68 (Analog and Digital)	UL 1411 /Audio, Radio, TV	EN 55011 /55013 /55014
FCC 90	UL 813 /Commercial Audio	EN 55015 /55020 /55022
FCC 95	UL 1604 /Hazard. Location	EN 60555-2 /60555-3
	UL 508 /Energy Mgmt. Equip.	EN 61000-3-2 /61000-3-3
		EN 61000-4-2 /61000-4-3
		EN 61000-4-4 /61000-4-5
		EN 61000-4-6 /61000-4-8 /61000-4-11

Canada: EMI, Safety, Telecom	**Asia - Australia/ International**	
RSS 210 & RSS 221	CISPR 11, 13, 14, 15, 16, 20, 22	
Industry Canada /IC CS-03	VCCI Class 1 & 2 /Japan	
All c-UL Standards for Canada	AS/NZ 3548: C-Tick Mark, EMC	EU: Safety/Machinery (EN)
All CSA Standards, including:	CNS 13438 - 1996/Taiwan	EN 60950 /61010-1
CSA No. 950/ ITE	ITU Standards	EN 60204 /60065
CSA No. 601-1/Medical	IEC /ETSI Standards	EN 60601-1-1
CSA No. 1010-1/ Lab, Measurement	BellCore Standards	TÜV
CSA No. 225/ Telecom	IEEE /ANSI Standards	*Competent Body Representation/EU

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Toll-Free: 1-888-336-7625 – **Internet:** http://www.itcemc.com – **E-mail:** itcemc@aol.com

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Part 6: FCC Part 15 SubPart C, RF Power Output

Part 7: Fundamental Harmonic and Spurious Emissions

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PART 1
GENERAL

1.1 Test Methodology

The electromagnetic interference tests which this report describes were performed by an independent electromagnetic compatibility consultant, International Technology Company, in accordance with the FCC test procedure ANSI C63.4-1992.

1.1.1 Test Facility

The open area test site, the conducted measurement facility, and the test equipment used to collect the emissions data is located in Sunol, California, and is fully described in site attenuation report. The approved site attenuation description is on file at the Federal Communications Commission.

1.1.2 Accuracy of Test Data

The test results contained in this report accurately represent Powerline Conducted Emissions, Open Field Radiated Emissions, Occupied Bandwidth, Frequency Stability, RF Power Output, Spurious and Harmonic Emissions and Modulation Characteristics tests generated by the sample equipment under test.

Equipment Tested	Wireless Local Loop Extender (Digital Remote Phone Link)
FCC ID	OPA-I-WLL
Date of Test	September 22 through October 12, 1999
Antenna Requirement	The equipment meets the requirement of FCC test procedure 47 CFR §15.203 because the antenna is permanently attached

Tests Performed:

1. Power Line Conducted Emissions in a shielded room utilizing two LISN's in accordance with the FCC test procedure 47 CFR §15.207. Part 2 of this report contains details.

2. Radiated Emissions in a 3-meter open area site in accordance with the FCC test procedure 47 CFR §15.209 and §15.31(m). Part 3 of this report contains details.

3. Occupied Bandwidth Test in accordance with the FCC test procedure 47 CFR §15.247(2). Part 4 of this report contains details.

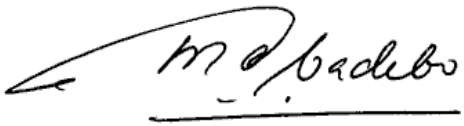
4. Frequency Stability Test requirements in accordance with 47CFR §2.1055. Part 5 of this report contains details.

5. Maximum Peak Output Power and Transmitted Power Density Test Requirement in accordance with 47 CFR §15.247(b) and 47 CFR §15.247(d). Part 6 of this report contains details.

6. Harmonics and Spurious Emissions Test in accordance with the FCC test procedure 47 CFR §2.1053 and §15.249(a). Part 7 of this report contains details.

7. Modulation Frequency Characteristics in accordance with the FCC test procedure 47 CFR §2.1047. Part 8 of this report contains details.

The results show that the sample equipment tested as described in this report is in compliance with the FCC Rules Part 15, SubPart B Powerline Conducted and Open Field Radiated Emissions. Occupied Bandwidth, Frequency Stability, Maximum Peak Output Power and Transmitted Power Density, Harmonics and Spurious Emissions and Modulation Characteristics test requirement limits of, SubPart C.



Michael Gbadebo, PE
Chief Engineer/Principal Consultant

Prepared By: International Technology Company (ITC)
Tel: (925) 862-2944
Fax: (925) 862-9013
Email: itcemc@aol.com
Web: www.itcemc.com

1.2 Summary

1.2.1 Description of Equipment Under Test (EUT)

See Appendix D for more information

Model Name(s): i-WLL 15

Applicant: Carlson Wireless Telephone, Incorporated
Address: 1150 Evergreen Road, Suite #1, PO Box 2400
Redway, California 95560-2400 USA
http://www.wireless-telephone.com
- Tel: (707) 923-9593
- Fax: (707) 923-1913

Client Contact: Mr. Jim Carlson
Email: jcarlson@carlson-eng.com

Test Technician: Bruce Gordon

Test Number: 1990916-1
File Number: 9909RS116-1/F

1.2.2 Support Equipment included in the Tests:

The transmitter (FXO) was tested with its receiver (FXS) where applicable

PART 2
POWERLINE CONDUCTED EMISSIONS
per FCC PART 15 SUBPART B

2.1 Configuration and Procedure

2.1.1 EUT Configuration

Pre-scan measurements are first performed by collecting data with a spectrum analyzer. Significant peaks are marked and then quasi-peaked. Measurement range investigated was from 450KHz to 30MHz. The EUT was set up in accordance with the suggested configuration given in FCC Measurement Procedure ANSI C63.4-1992. The measurement instrumentation used was a receiver with bandwidth parameters as stipulated in ANSI C63.4-1992. The Transmitter (FXO) and Receiver (FXS) were set up on a wooden non conductive table top, 80 cm above the ground reference plane, in a shielded room. It transmitted continuously. The dimension of the table was 1.5m x 1.0m. EUT was powered by a +55 Vdc.

2.1.2 Test Procedure

The EUT was set up as described above, in live functional modes. The Transmitter (FXO) was transmitting to the Receiver (FXS). The powerline conducted EMI tests were run on the +55 Vdc power supply current carrying conductors of the power cords of the EUT. The highest emissions were also analyzed in detail by operating the spectrum analyzer in fixed tuned mode to determine the precise amplitude of the emissions. While doing so, interconnecting cables were moved around to maximize the emissions.

2.1.3 Data Table Legend and Field Strength Calculation

'Margin' indicates the degree of compliance with the applicable limit. For example, a margin of -8 dB means that the emission is 8 dB below the limit (in compliance). A margin of +4 dB means that the emission is 4 dB over the limit (out of compliance). The margin is calculated as follows:
Margin = Corrected Amplitude - Limit; where Corrected Amplitude = Amplitude + Cable Loss - Distance Factor, the amplitude measured in a quasi peak mode.

2.1.4 Spectrum Analyzer Configuration (during swept frequency scans)

Start Frequency.....450 KHz
Stop Frequency.....30MHz
Sweep Speed.....Manual
Resolution Bandwidth 10KHz
Video Bandwidth.....10KHz
Quasi Peak Adapter Bandwidth.....9KHz
Quasi Peak Adapter Mode.....Normal

2.2 Powerline Conducted Emissions per FCC Part 15 SubPart B

2.2.1 Administrative Details

Date(s) of Test: September 23, 1999
Emission Limits: Class B
Temperature/Humidity: $22.1^{0^{\circ}}$C / 67%
Test Technician(s): Bruce Gordon

Technician's Signature: .....

2.2.2 Test Results

The table below shows a summary of the highest conducted emissions on all current carrying conductors of the EUT power cord compared to the FCC Class B limit.

INDICATED FREQ MHz	AMPL dBuV/m	CORRECTION ANT dB	CAB dB	CORR AMPL dBuV/m	FCC 15 CLASS B LIMIT dBuV/m	MARGIN dB	NOTES
0.57	41.0	0.0	1.0	42.0	48.0	-6.0	Positive
2.24	38.8	0.0	1.0	39.8	48.0	-8.2	Negative
3.91	34.1	0.0	1.0	35.1	48.0	-12.9	Negative
3.97	38.0	0.0	1.0	39.0	48.0	-9.0	Positive
29.58	42.4	0.0	1.0	43.4	48.0	-4.6	Positive
29.97	38.4	0.0	1.0	39.4	48.0	-8.6	Negative

Table 2.2.2 Power line Conducted Emissions for i-Will 15

No emissions of significant levels were observed between 450 KHz and the lowest frequencies shown in the above data. No emissions of significant levels were observed between the highest frequencies shown in the above data and 30 MHz.

Conclusion: The Wireless Local Loop Extender (Digital Remote Phone Link) meets the requirements of the test reference for Power line Conducted Emissions.

Prepared By: International Technology Company (ITC)
Tel: (925) 862-2944
Fax: (925) 862-9013
Email: itcemc@aol.com
Web: www.itcemc.com

PART 3
OPEN FIELD RADIATED EMISSIONS per FCC PART 15 SUBPART B

3.1 Configuration and Procedure

3.1.1 EUT Configuration

Pre-scan measurements are first performed by collecting data with a spectrum analyzer. Significant peaks are marked and then quasi-peaked. Measurement range investigated was from 30 MHz to 1 GHz. The EUT was set up in accordance with the suggested configuration given in FCC Measurement Procedure ANSI C63.4-1992. The measurement instrumentation used was a receiver with bandwidth parameters as stipulated in ANSI C63.4-1992. The Transmitter (FXO) and Receiver (FXS) were set up on a wooden non conductive table top, 80 cm above the ground reference plane, in an open field. It transmitted continuously. The dimension of the table was 1.5m x 1.0m. EUT was powered by a +55 Vdc adapter.

3.1.2 Test Procedure

The EUT was set up as described above, in live functional modes. The Transmitter (FXO) was transmitting to the Receiver (FXS). The EUT was rotated 360 degrees azimuth and the search antenna height varied 1 to 4 m in order to maximize the emissions from the EUT. The highest emissions were also analyzed in detail by operating the spectrum analyzer in fixed tuned mode to determine the precise amplitude of the emissions. While doing so, interconnecting cables were moved around to maximize the emissions.

Prepared By: International Technology Company (ITC)
Tel: (925) 862-2944
Fax: (925) 862-9013
Email: itcemc@aol.com
Web: www.itcemc.com

3.1.3 Data Table Legend and Field Strength Calculation

'Margin' indicates the degree of compliance with the applicable limit. For example, a margin of -8 dB means that the emissions are 8 dB below the limit (in compliance); +a margin of +4 dB means that the emission is 4 dB over the limit (out of compliance). The margin calculated as follows:
Margin = Corrected Amplitude - Limit, where Corrected Amplitude = Amplitude + Antenna Correction Factor + Cable Loss - Distance Factor, measured in quasi peak mode.

3.1.4 Spectrum Analyzer Configuration (during swept frequency scans)

Start Frequency 30MHz
Stop Frequency.....1000MHz
Sweep Speed..... Manual
Measurements below 1GHz
RES Bandwidth .....100 KHz
Video Bandwidth.....100 KHz
Quasi Peak Adapter Mode.....Normal
Quasi peak Adapter Bandwidth.....120 KHz
Measurements above 1GHz (unless stated otherwise)
Analyzer Mode .....Video Filter
RES Bandwidth 1MHz
Video Bandwidth.....1MHz
Freq. Span.....3MHz
Offset 0dB
Quasi Peak Adapter Mode.....Disabled

Prepared By: International Technology Company (ITC)
Tel: (925) 862-2944
Fax: (925) 862-9013
Email: itcemc@aol.com
Web: www.itcemc.com

3.2 Open Field Radiated Emissions per FCC Part 15 SubPart B

3.2.1 Administrative Details

Date(s) of Test: September 22, 1999
Emission Limits: Class B
Temperature/Humidity: $19.8^{0^{\circ}}$C / 64%
ATM Pressure: 1010 Mbar
Test Technician(s): Bruce Gordon
Antenna Used: Biconical Antenna, model # 3104, S/N 3459 and Log Periodic Antenna, model # 3146, S/N 2075 (calibrated June 25, 1999, next calibration due date is June 25, 2000)

Technician's Signature: .....

3.2.2 Test Results

The table below shows a summary of the highest amplitudes of the radiated emissions from the equipment under test at various antenna heights, antenna polarization, and EUT orientations.

INDICATED		CORRECTION		CORR	T/TAB		ANT	FCC 15	CLASS B
FREQ	AMPL	ANT	CAB	AMPL	ANG	HT	POL	LIMIT	MARG
MHz	dBuV/m	dB	dB	dBuV/m	DEG	m	-	dBuV/m	dB
45.09	18.0	7.5	2.7	28.2	90	1.0	HB	40.0	-11.8
45.82	23.9	7.9	2.7	34.5	180	1.0	VB	40.0	-5.5
131.08	12.5	11.0	4.2	27.7	90	2.0	HB	43.0	-15.3
131.09	15.8	10.9	4.2	30.9	180	1.0	VB	43.0	-12.1
139.30	5.6	10.4	4.3	20.3	90	2.0	HB	43.0	-22.7
200.01	7.3	13.6	5.2	26.1	180	1.0	VB	43.0	-16.9
204.84	14.1	9.3	5.3	28.7	90	1.0	HL	43.0	-14.3
227.39	13.0	9.8	5.5	28.4	90	3.0	HL	46.0	-17.6
235.55	18.5	10.8	5.7	34.9	90	3.0	HL	46.0	-11.1
239.65	21.6	11.3	5.7	38.5	90	1.0	HL	46.0	-7.5
250.30	11.3	12.5	5.7	29.5	270	1.0	VL	46.0	-16.5
352.07	18.4	12.5	7.5	38.5	90	2.0	HL	46.0	-7.5

Table 3.2.2 Open Field Radiated Emissions for i-WLL 15

No emissions of significant levels were observed between 30 MHz and the lowest frequencies shown in the above data. No emissions of significant levels were observed between the highest frequency shown in the above data and 1000MHz.

Conclusion: The Wireless Local Loop Extender (Digital Remote Phone Link) meets the requirements of the test reference for Open Field Radiated Emissions.

Prepared By: International Technology Company (ITC)
Tel: (925) 862-2944
Fax: (925) 862-9013
Email: itcemc@aol.com
Web: www.itcemc.com

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Web: www.itcemc.com

PART 4
OCCUPIED BANDWIDTH
per FCC PART 15 SECTION 47 CFR §15.247(2)

4.1 Configuration and Procedure

4.1.1 EUT Configuration

The EUT is set up in accordance with the suggested configuration given in FCC Measurement Procedure ANSI C63.4-1992. The measurement instrumentation used was an Hewlett Packard 8566B Spectrum Analyzer with detector and bandwidth parameters as stipulated in C63.4-1992. EUT was +55 Vdc powered.

4.1.2 Test Procedure

The Transmitter was placed on the test table. The EUT was configured for maximum response and was set up as described above and configured to transmit continuously. Signal was monitored with an HP 8566B Spectrum Analyzer, using the EMCO Double-Ridged Waveguide Horn Antenna, model #3115. Unless stated otherwise, the antenna to EUT distance was 1 meter.

4.1.3 Spectrum Analyzer Configuration (During Swept Frequency Scans)

Start Frequency .....2.419, 2.428, 2.458 GHz
Stop Frequency.....2.439, 2.448, 2.478 GHz
Sweep Speed.....Manual
RES Bandwidth .....100 kHz
Video Bandwidth.....100 kHz
Quasi Peak Adapter Mode.....Bypass
Quasi Peak Adapter Bandwidth.....Disabled

4.2 Bandwidth Test per FCC Part 15 Section 47 CFR §15.247(2)

6dB Bandwidth Plot Performed at 1 Meter Distance
Low Frequency

Prepared By: International Technology Company (ITC)
Tel: (925) 862-2944
Fax: (925) 862-9013
Email: itcemc@aol.com
Web: www.itcemc.com

4.2 Bandwidth Test per FCC Part 15 Section 47 CFR §15.247(2)

6dB Bandwidth Plot Performed at 1 Meter Distance
Middle Frequency

Prepared By: International Technology Company (ITC)
Tel: (925) 862-2944
Fax: (925) 862-9013
Email: itcemc@aol.com
Web: www.itcemc.com

4.2 Bandwidth Test per FCC Part 15 Section 47 CFR §15.247(2)

6dB Bandwidth Plot Performed at 1 Meter Distance
Middle Frequency
High Frequency

Prepared By: International Technology Company (ITC)
Tel: (925) 862-2944
Fax: (925) 862-9013
Email: itcemc@aol.com
Web: www.itcemc.com

PART 5
FREQUENCY STABILITY TEST
per FCC PART 2 SECTION 47 CFR §2.1055

5.1. Configuration and Procedure

5.1.1 EUT Configuration

The EUT is set up in accordance with the suggested configuration given in FCC Measurement Procedure ANSI C63.4-1992. The measurement instrumentation used was an Hewlett Packard 8569A Spectrum Analyzer with detector and bandwidth parameters as stipulated in C63.4-1992. EUT was powered by a +55 Vdc power supply.

5.1.2 Test Procedure

The Transmitter was placed in the temperature control chamber. The EUT was configured for maximum response and was set up as described above and configured to transmit continuously. For frequency stability with respect to temperature, the temperature in the chamber was varied from –20 degrees Centigrade to +50 degrees Centigrade and with respect to voltage the input voltage was varied from 10.2 Vdc to 63.3 Vdc. Frequency stability was monitored with the HP 8566B Spectrum Analyzer, below and above the center frequencies using an appropriate receiving antenna.

5.1.3 Data Table Legend and Field Strength Calculation

'Margin' indicates the degree of compliance with the applicable limit. For example, a margin of -8 dB means that the emissions is 8 dB below the limit (in compliance); a margin of +4 dB means that the emission is 4 dB over the limit (out of compliance). The margin calculated as follows:
Margin = Corrected Amplitude - Limit; where Corrected Amplitude = Amplitude + Antenna Correction Factor + Cable Loss

A	=	Average
P	=	Peak
Q	=	Quasi Peak

5.1.4 Spectrum Analyzer Configuration (During Swept Frequency Scans)

Start Frequency .....2.419, 2.428, 2.458 GHz
Stop Frequency.....2.439, 2.448, 2.478 GHz
Sweep Speed.....Manual
RES Bandwidth .....100 kHz
Video Bandwidth.....100 kHz
Quasi Peak Adapter Mode.....Bypass

5.2 Frequency Stability Test per FCC Part 2 Section 47 CFR §2.1055

5.2.1 Administrative Details

Date(s) of Test: September 27, 1999
Emission Limits: Class C
Test Technician(s): Bruce Gordon

Technician's Signature: .....

5.2.2 Test Results

Time	Start Up	2 minutes	5 minutes	10 minutes
Temperature	**-20^{0}C**	**-20^{0}C**	**-20^{0}C**	**-20^{0}C**
Frequency (GHz)	2.428010	2.428010	2.428000	2.428000
Frequency (GHz)	2.437990	2.437990	2.437990	2.437990
Frequency (GHz)	2.468010	2.468010	2.468010	2.468010
Temperature	**-10^{0}C**	**-10^{0}C**	**-10^{0}C**	**-10^{0}C**
Frequency (GHz)	2.428010	2.428000	2.428000	2.428000
Frequency (GHz)	2.437990	2.438000	2.437800	2.437800
Frequency (GHz)	2.468010	2.468000	2.468000	2.468010
Temperature	**0^{0}C**	**0^{0}C**	**0^{0}C**	**0^{0}C**
Frequency (GHz)	2.427990	2.427990	2.428000	2.428000
Frequency (GHz)	2.438000	2.437800	2.438000	2.438000
Frequency (GHz)	2.467990	2.467990	2.467990	2.467990
Temperature	**10^{0}C**	**10^{0}C**	**10^{0}C**	**10^{0}C**
Frequency (GHz)	2.428000	2.428000	2.428000	2.428000
Frequency (GHz)	2.437990	2.437990	2.437990	2.438000
Frequency (GHz)	2.468010	2.468000	2.468010	2.468000
Temperature	**20^{0}C**	**20^{0}C**	**20^{0}C**	**20^{0}C**
Frequency (GHz)	2.428010	2.428000	2.428000	2.428000
Frequency (GHz)	2.437990	2.438000	2.437990	2.437990
Frequency (GHz)	2.467990	2.468000	2.468000	2.468000
Temperature	**30^{0}C**	**30^{0}C**	**30^{0}C**	**30^{0}C**
Frequency (GHz)	2.428010	2.428010	2.428010	2.428010
Frequency (GHz)	2.438000	2.437990	2.437990	2.437990
Frequency (GHz)	2.468000	2.468000	2.468010	2.468010
Temperature	**40^{0}C**	**40^{0}C**	**40^{0}C**	**40^{0}C**
Frequency (GHz)	2.428010	2.428010	2.428010	2.428010
Frequency (GHz)	2.437990	2.437990	2.437990	2.438000
Frequency (GHz)	2.468010	2.468000	2.468000	2.468000

Frequency Stability Test
per FCC Part 2 Section 47 CFR §2.1055.....

Test Results.....

Temperature	**50^{0}C**	**50^{0}C**	**50^{0}C**	**50^{0}C**
Frequency (GHz)	2.428010	2.428010	2.428010	2.428010
Frequency (GHz)	2.438000	2.438010	2.438010	2.438010
Frequency (GHz)	2.467990	2.468010	2.468010	2.468010
Time	Start Up	2 minutes	5 minutes	10 minutes
Voltage	**55 Vdc**	**55 Vdc**	**55 Vdc**	**55 Vdc**
Frequency (GHz)	2.428010	2.428010	2.428010	2.428010
Frequency (GHz)	2.438000	2.438000	2.438000	2.438000
Frequency (GHz)	2.467990	2.467990	2.468000	2.468000
Voltage	**10.2 Vdc**	**10.2 Vdc**	**10.2 Vdc**	**10.2 Vdc**
Frequency (GHz)	2.428010	2.428010	2.428010	2.428010
Frequency (GHz)	2.437990	2.437990	2.437990	2.437990
Frequency (GHz)	2.468000	2.468001	2.468002	2.468002
Voltage	**63.3 Vdc**	**63.3 Vdc**	**63.3 Vdc**	**63.3 Vdc**
Frequency (GHz)	2.428010	2.428010	2.428010	2.428010
Frequency (GHz)	2.438010	2.438010	2.438010	2.438010
Frequency (GHz)	2.468000	2.468000	2.468000	2.468000

Stability Test for i-WLL 15

Conclusion: The Wireless Local Loop Extender (Digital Remote Phone Link) meets the requirements of the test reference for Frequency Stability.

Prepared By: International Technology Company (ITC)
Tel: (925) 862-2944
Fax: (925) 862-9013
Email: itcemc@aol.com
Web: www.itcemc.com

PART 6
MAXIMUM PEAK OUTPUT POWER & TRANSMITTED POWER DENSITY per FCC PART 15 SECTION 47 CFR §15.247 (b) & (d)

6.1. Configuration and Procedure

6.1.1 EUT Configuration

The EUT is set up in accordance with the suggested configuration given in FCC Measurement Procedure ANSI C63.4-1992. The measurement instrumentation used was an Hewlett Packard 8569A Spectrum Analyzer with detector and bandwidth parameters as stipulated in C63.4-1992. EUT was +55 Vdc powered.

6.1.2 Test Procedure

The Transmitter was placed on the test table. The EUT was configured for maximum response and was set up as described above and configured to transmit continuously. Signal was monitored with an HP 8566B Spectrum Analyzer, using the EMCO Double-Ridged Waveguide Horn Antenna, model 3115. Unless stated otherwise, the antenna to EUT distance was 1 meter. The RF power output = Measured value + antenna correction + cable correction + distance correction factor, or (i) -18.3 dBm + 28.8 dB + 4.6 dB + 10.5 dB = 25.5 dBm for 2.428 GHz. (ii) -15.6 dBm + 28.8 dB + 4.6 dB + 10.5 dB = 28.3 dBm for 2.4394 GHz, and -19.0 dBm + 28.9 dB + 5.0 dB + 10.5 dB = 25.4 dBm for 2.428 GHz, rated ERP is 28.5 dBm.

6.1.3 Spectrum Analyzer Configuration (During Swept Frequency Scans)

Start Frequency .....2.419, 2.428, 2.458 GHz
Stop Frequency .....2.439, 2.448, 2.478 GHz
Sweep Speed.....Manual
RES Bandwidth .....100 kHz
Video Bandwidth.....100 kHz
Quasi Peak Adapter Mode.....Bypass
Quasi Peak Adapter Bandwidth.....Disabled

Prepared By: International Technology Company (ITC)
Tel: (925) 862-2944
Fax: (925) 862-9013
Email: itcemc@aol.com
Web: www.itcemc.com

6.2 Maximum Peak Output Power per FCC Part 15 Section 47 CFR §15.247(b)

Maximum Peak Output Power Plot
Low Frequency

Prepared By: International Technology Company (ITC)
Tel: (925) 862-2944
Fax: (925) 862-9013
Email: itcemc@aol.com
Web: www.itcemc.com

6.2 Maximum Peak Output Power per FCC Part 15 Section 47 CFR §15.247(b)

Maximum Peak Output Power Plot
Middle Frequency

Prepared By: International Technology Company (ITC)
Tel: (925) 862-2944
Fax: (925) 862-9013
Email: itcemc@aol.com
Web: www.itcemc.com

6.2 Maximum Peak Output Power per FCC Part 15 Section 47 CFR §15.247(b)

Maximum Peak Output Power Plot
High Frequency

Prepared By: International Technology Company (ITC)
Tel: (925) 862-2944
Fax: (925) 862-9013
Email: itcemc@aol.com
Web: www.itcemc.com

6.3 Transmitted Power Density Test per FCC Part 15 Section 47 CFR §15.247(d)

6.3.1 EUT Configuration

The EUT is set up in accordance with the suggested configuration given in FCC Measurement Procedure ANSI C63.4-1992. The measurement instrumentation used was an Hewlett Packard 8569A Spectrum Analyzer with detector and bandwidth parameters as stipulated in C63.4-1992. The measured signal was averaged over a 1 second interval. The EUT was powered by a +55 Vdc adapter.

6.3.2 Test Procedure

The Transmitter (FXO) was placed on the test table. The EUT was configured for maximum response and was set up as described above and configured to transmit continuously. Signal strength were monitored at an HP 8569A Spectrum Analyzer, below and above the center frequencies using an appropriate receiving antenna. Maximum emissions were obtained by varying the height of the antennas and then orienting the turntable in 360-degree turns with the analyzer in the manual mode.

6.3.3 Spectrum Analyzer Configuration (During Swept Frequency Scans)

Start Frequency .....2.4241, 2.4369, 2.4659 GHz
Stop Frequency.....2.4291, 2.4419, 2.4709 GHz
Sweep Speed.....Manual
RES Bandwidth .....3 kHz
Video Bandwidth.....3 kHz
Quasi Peak Adapter Mode.....Bypass
Quasi Peak Adapter Bandwidth.....Disabled

Prepared By: International Technology Company (ITC)
Tel: (925) 862-2944
Fax: (925) 862-9013
Email: itcemc@aol.com
Web: www.itcemc.com

6.3 Transmitted Power Density Test per FCC Part 15 Section 47 CFR §15.247(d)

6.3.4 Test Results

The table below shows a summary of the highest amplitudes of the Transmitted Power Density from the equipment under test at various antenna heights, antenna polarizations, and EUT orientations.

INDICATED FREQ MHz	AMPL dBuV/m	CORRECTION ANT dB	CAB dB	DIST dB	CORR AMPL dBuV/m	T/TAB ANG DEG	HT m	ANT POL -	FCC 15 LIMIT dBuV/m	MARG dB
2427.00	-38.6	28.8	4.6	10.5	5.3	0	1.0	VH	8.0	-2.7
2438.00	-37.3	28.8	4.6	10.5	6.6	0	1.0	VH	8.0	-1.4
2468.00	-39.2	28.9	5.0	10.5	5.2	0	1.0	VH	8.0	-2.8

Table 6.3.4 Transmitted Power Density

Conclusion: The Wireless Local Loop Extender (Digital Remote Phone Link) meets the requirements of the test reference for Transmitted Power Density.

Prepared By: International Technology Company (ITC)
Tel: (925) 862-2944
Fax: (925) 862-9013
Email: itcemc@aol.com
Web: www.itcemc.com

PART 7
FUNDAMENTAL HARMONIC & SPURIOUS EMISSIONS per FCC PART 2 SECTION 47 CFR §2.1053 & PART 15 SECTION 47 CFR §15.249(a)

7.1. Configuration and Procedure

7.1.1 EUT Configuration

The EUT is set up in accordance with the suggested configuration given in FCC Measurement Procedure ANSI C63.4-1992. The measurement instrumentation used was an Hewlett Packard 8566B and 8569A Spectrum Analyzers with detector and bandwidth parameters as stipulated in C63.4-1992. At frequencies above 1GHz, average measurements, if necessary, were made using the video filter method and quasi peak detector and preselector functions were disabled. The EUT was powered by a +55 Vdc adapter.

7.1.2 Test Procedure

The Transmitter was placed on the test table. The EUT was configured for maximum response and was set up as described above and configured to transmit continuously. Signal strength were monitored at an HP 8566B and 8569A Spectrum Analyzers, below and above the center frequencies using an appropriate receiving antenna. Maximum emissions was obtained by varying the height of the antennas and then orienting the turntable in 360-degree turns with the analyzer in the manual mode. Unless stated otherwise, the antenna to EUT distance was 3 meters. Any multiple entries cover the two orientations of the transmitters and cover all three axes due to rotation of the test table and EUT and are the maximum signals resulting from rotation and height search at each frequency. The measurements are quasi-peak measurements below 1 GHz and average measurements above 1 GHz

7.1.3 Spectrum Analyzer Configuration (During Swept Frequency Scans)

Start Frequency .....30 MHz
Stop Frequency.....1,000MHz
Sweep Speed.....Manual
RES Bandwidth 100KHz
Video Bandwidth.....100 KHz
Quasi Peak Adapter Mode.....Normal
Quasi peak Adapter Bandwidth.....120 KHz
Measurements above 1GHz (unless stated otherwise)
Start Frequency .....1 GHz
Stop Frequency.....24.835 GHz
Sweep Speed.....Manual
Analyzer Mode .....Video Filter
RES Bandwidth 1MHz

Video Bandwidth.....1MHz

Prepared By: International Technology Company (ITC)
Tel: (925) 862-2944
Fax: (925) 862-9013
Email: itcemc@aol.com
Web: www.itcemc.com

7.2 Fundamental Harmonic & Spurious Emissions per FCC Part 2 Section 47 CFR §2.1053 & Part 15 Section 47 CFR §15.249(a)

7.2.1 Administrative Details

Date(s) of Test: September 28-29, 1999
Emission Limits: Class C
Test Technician(s): Bruce Gordon

Technician's Signature: .....

7.2.2 Test Results

The table below shows a summary of the highest amplitudes of the radiated emissions from the equipment under test at various antenna heights, antenna polarizations, and EUT orientations.

Table #1: Fundamental Harmonic and Spurious Emissions at Low Frequency - 2429MHz

INDICATED FREQ MHz	AMPL dBuV/m	CORRECTION ANT dB	CAB dB	CORR AMPL dBuV/m	T/TAB ANG DEG	HT m	ANT POL -	FCC 15 LIMIT dBuV/m	MARG dB
37.50	27.1	6.9	1.2	35.2	0	1.0	VB	40.0	-8.0
43.80	28.5	7.4	1.2	37.1	0	1.0	VB	40.0	-2.9
266.97	22.4	12.0	1.8	36.2	0	1.0	VL	46.0	-9.8
267.50	14.6	12.0	1.8	28.4	0	1.0	VL	46.0	-19.6
268.20	12.9	12.0	1.8	26.7	0	1.0	VL	46.0	-19.3
403.51	3.5	13.0	2.1	18.6	0	1.0	VL	46.0	-27.4
613.29	0.9	15.6	2.4	18.9	0	1.0	VL	46.0	-27.1
1554.00	13.0	25.6	3.5	42.1	0	1.0	VH	54.0	-11.9
2429.00	13.0	28.8	4.5	46.3	0	1.0	VH	94.0	-47.7
4839.00	-5.0	34.5	6.0	35.5	0	1.0	VH	54.0	-18.5
7249.00	-6.2	37.0	13.9	44.7	0	1.0	VH	54.0	-9.3
9659.00	-8.2	37.9	19.5	49.2	0	1.0	VH	54.0	-4.8
12069.00	-23.0	38.5	27.3	42.8	0	1.0	VH	54.0	-11.2
14479.00	-50.0	43.0	35.2	28.2	0	1.0	HH	54.0	-25.8

Prepared By: International Technology Company (ITC)
Tel: (925) 862-2944
Fax: (925) 862-9013
Email: itcemc@aol.com
Web: www.itcemc.com

7.2 Fundamental Harmonic & Spurious Emissions per FCC Part 2 Section 47 CFR §2.1053 & Part 15 Section 47 CFR §15.249(a) …..

Table #2: Fundamental Harmonic and Spurious Emissions at Low Frequency - 2438MHz

INDICATED FREQ MHz	AMPL dBuV/m	CORRECTION ANT dB	CAB dB	CORR AMPL dBuV/m	T/TAB ANG DEG	HT m	ANT POL -	FCC 15 LIMIT dBuV/m	MARG DB
37.90	27.0	6.9	1.2	35.1	0	1.0	VB	40.0	-4.9
44.50	28.1	7.4	1.2	36.7	0	1.0	VB	40.0	-3.3
267.90	20.4	12.0	1.8	34.2	0	1.0	VL	46.0	-11.8
268.21	13.8	12.0	1.8	27.6	0	1.0	VL	46.0	-18.4
403.11	2.0	13.0	2.1	17.1	0	1.0	VL	46.0	-28.9
613.43	1.0	15.6	2.4	19.0	0	1.0	VL	46.0	-27.0
1553.62	13.2	25.6	3.5	42.3	0	1.0	VH	54.0	-11.7
2438.00	12.5	28.8	4.5	45.8	0	1.0	VH	94.0	-48.2
4876.00	-5.4	34.5	6.0	35.1	0	1.0	VH	54.0	-18.9
7314.00	-5.4	37.0	13.9	45.5	0	1.0	VH	54.0	-8.5
9752.00	-8.3	37.9	19.5	49.1	0	1.0	VH	54.0	-4.9
12190.00	-22.7	38.5	27.3	43.1	0	1.0	VH	54.0	-10.9
14628.00	-50.0	43.0	35.2	28.2	0	1.0	HH	54.0	-25.8

Table #3: Fundamental Harmonic and Spurious Emissions at Low Frequency - 2468MHz

INDICATED FREQ MHz	AMPL dBuV/m	CORRECTION ANT dB	CAB dB	CORR AMPL dBuV/m	T/TAB ANG DEG	HT m	ANT POL -	FCC 15 LIMIT dBuV/m	MARG DB
37.80	25.0	6.9	1.2	33.1	0	1.0	VB	40.0	-6.9
43.80	28.2	7.4	1.2	36.8	0	1.0	VB	40.0	-3.2
266.97	21.7	12.0	1.8	35.5	0	1.0	VL	46.0	-10.5
267.32	14.0	12.0	1.8	27.8	0	1.0	VL	46.0	-18.2
268.10	13.3	12.0	1.8	27.1	0	1.0	VL	46.0	-18.9
403.22	3.0	13.0	2.1	18.1	0	1.0	VL	46.0	-26.9
612.99	1.7	15.6	2.4	19.7	0	1.0	VL	46.0	-26.3
1553.20	13.3	25.6	3.5	42.4	0	1.0	VH	54.0	-11.6
2468.00	12.7	28.9	4.5	46.1	0	1.0	VH	94.0	-47.9
4936.00	-5.2	34.5	6.0	35.3	0	1.0	VH	54.0	-18.7
7404.00	-6.0	37.0	13.9	44.9	0	1.0	VH	54.0	-9.1
9872.00	-8.9	37.9	19.7	48.7	0	1.0	VH	54.0	-5.3
12340.00	-26.0	38.5	27.4	39.9	0	1.0	VH	54.0	-14.1
14808.00	-50.0	43.0	35.4	28.4	0	1.0	HH	54.0	-25.6

Table 7.2.2 Fundamental Harmonics and Spurious Emissions

No emissions of significant levels were observed between 9KHz and the lowest frequencies shown in the above data. No emissions of significant levels were observed between the highest frequency shown in the above data and 24.835 GHz

Conclusion: The Wireless Local Loop Extender (Digital Remote Phone Link) meets the requirements of the test reference for Fundamental Harmonic and Spurious Emissions.

Prepared By: International Technology Company (ITC)
Tel: (925) 862-2944
Fax: (925) 862-9013
Email: itcemc@aol.com
Web: www.itcemc.com

PART 8
MODULATION FREQUENCY CHARACTERISTICS per FCC PART 2 SECTION 47 CFR §2.1047

The equipment meets the general requirements for modulation frequency characteristics.

Prepared By: International Technology Company (ITC)
Tel: (925) 862-2944
Fax: (925) 862-9013
Email: itcemc@aol.com
Web: www.itcemc.com

APPENDIX A
MEASUREMENT PROCEDURES

Conducted Emissions

The measurements are performed in a 21' x 14' x 9' shielded room. A wooden bench 80 cm in height is located at the center of the shielded room; desktop EUT are placed on top of this bench. The rear of the EUT and bench are placed 40 cm from the shielded room wall. All items on the table (or test-table) are placed at least 10 cm apart. Excess EUT power cord is folded back and forth to form a 30 cm by 40 cm long bundle, hanging approximately in the middle between the ground plane and table. The EUT power cord is plugged into a LISN 80 cm away, while all other devices are plugged into a second LISN, also 80 cm away from the closest part of the EUT.

The highest emissions are also analyzed in detail by operating the spectrum analyzer in fixed tuned mode to determine the precise amplitude of the emissions. While doing so, the interconnecting cables are moved around to maximize the emissions, and the position of the peripheral devices are interchanged to check for any changes in emissions.

Radiated Emissions

The EUT is set up in accordance with the suggested configuration given in FCC Measurement Procedure ANSI C63.4-1992.

The EUT and support equipment are set up on the turntable of an open field site. Desktop EUT are set up on a wooden stand (test table), 80 cm above the ground plane. All items on the table are placed at least 10 cm apart. Interconnecting cables which hang closer than 40 cm to the ground plane are folded back and forth to form a 30 cm by 40 cm long bundle, hanging approximately between the ground plane and table.

The highest emissions are also analyzed, in detail, by operating the spectrum analyzer in fixed tuned quasi-peak mode to determine the precise amplitude of the emissions. While doing so, the interconnecting cables are moved around and at the highest amplitudes observed, the EUT is rotated in the horizontal plane while changing the antenna polarization in the vertical plane to maximize the reading. Once the maximum reading is obtained, the antenna elevation and polarization will be varied between specified limits to maximize the readings. The position of the peripheral devices are interchanged to check for any changes in emissions.

APPENDIX B
DESCRIPTION OF OPEN FIELD TEST SITE

The open field test site is located on a 5.5 acre parcel, in the agriculturally zoned section of the city of Sunol, California. It is situated adjacent to Highway 680 on the West side, and adjacent to Calaveras Road in the South East. Distance of the site to each of these roads is a minimum of 200 feet. The north end of the site is surrounded by hills measuring up to 150 ft. high. The distance of the site to the hills is approximately 200 ft.

Supporting structures used to support device being measured and test instrumentation include the following:

a. Test Platform measuring 50 ft by 100 ft. The platform is located on top of a very large ground screen, to enhance a homogeneous reflective surface.

b. Test Site building measures approx. 5000 Sq. ft. This building houses the test laboratory, the shielded room, for performing Line Conducted test, test personnel and other support staff. The test building is an all wooden building, constructed using 2 by 4 inch studs. It also contains all necessary electrical wiring and utilities.

The International Technology Company (ITC) RFI test site described above has been approved for conducting contract RFI measurement work for client companies following the procedures stated in FCC/OET ANSI C63.4-1992,
EN 55011, EN 55022 Vfg. 243/1991 and VDE-0877. The site attenuation characteristics are routinely measured and recorded every three months.

Test site approved by VDE, File # F-R HF-MK.
Test site approved by FCC, Registration # 31010/SIT/ xxxx.
Test site approved by VCCI, Membership # 242.
Test site approved by the Industry Canada, Registration # DEB 5072-7, DEB 90-3008.

APPENDIX C
TEST EQUIPMENT

Some or all of the following test equipment is currently used to measure the conducted and/or radiated emissions from the equipment under test:

Test Equipment	*Model*	*Serial Number*
Spectrum Analyzer	Hewlett Packard 8590A	2752 A02715
Spectrum Monitor	Rhode & Schwarz EZM	881 334/025
Test Receiver (9 KHz - 30 MHz)	Rhode & Schwarz ESH3	RES 0753
Test Receiver (20-1300 MHz)	Rhode & Schwarz ESVP	RES 0749
Spectrum Analyzer	Hewlett-Packard 8566B	2618A02909
Spectrum Analyzer	Hewlett-Packard 8567A	2602A00239
Spectrum Analyzer Display (Site 1)	Hewlett-Packard 8590A	2542A11954
Spectrum Analyzer Display (Site 2)	Hewlett-Packard 85662A	2542A12593
Quasi Peak Adapter (Site 1)	Hewlett-Packard 85650	2521A00871
Quasi Peak Adapter (Site 2)	Hewlett-Packard 85650A	2521A00737
Preselector (Site 1)	Hewlett-Packard 85685A	2620A00265
Preselector (Site 2)	Hewlett-Packard 85685A	2648A00462
Preamp	Hewlett-Packard 8447D	2648A04855
Preamp	Hewlett-Packard 8449B	3008A00101
Computer	Hewlett-Packard 9000/300	RES 449
Absorbing Clamp	MDS21	891 092/025
Antenna Cable (OPTK45)	RG8/u	-
Antenna System	EMCO 3230	-
Biconical Antenna (Site 1)	EMCO 3104	3549
Biconical Antenna (Site 2)	EMCO 3104C	9111-4463
Log Periodic Antenna (Site 1) (200-1000 MHz)	EMCO 3146	2075
Log Periodic Antenna (Site 2) (200-1000 MHz)	EMCO 3146	9510-4202
Adj. Element Dipole Antenna (28 MHz-1 GHz)	EMCO 3120	2632
Horn Antenna	Eaton 96001	2632
LISN (25 Amp)	EMCO 38825/2	9210-2008
LISN (100 Amp)	Solar 8610-50-TS-100N	
LISN	EMCO 3825/2R	1188/1001

Test Equipment.....

Test Equipment	*Model*	*Serial Number*
Remote Controlled 8 ft Rotating Table	RES RT1	
Remote Controlled 25 ft Rotating Table	RES RT2	
Remote Controlled 4 ft Rotating Table	RES RT3, RT4, RT5	
Remote Controlled 4 m Antenna Mast	RES AM1	
Remote Controlled 6 m Antenna Mast	RES AM2, RES AM3	
3 Phase 220 VAC/50 Hz Generator	-	DB7130B40
Oscilloscope (300 MHz)	Tektronix 2465	
Digital Scope	Hitachi VC-6075	
Power Analyzer	Valhalla Scientific/2101	RES 574
Digital Thermometer	Omega 440	
DC Power Supply	Kepco JQE 150-1.5m	H177085

The spectrum analyzers are self-calibrated before every test and are calibrated to NIST standards annually. All of the other EMI equipment is calibrated on a monthly basis using the spectrum analyzers as standards. Calibration dates of equipment are June 25, 1999. Next calibration is due on June 25, 2000.

APPENDIX D
EUT TECHNICAL DESCRIPTION

Applicant / Manufacturer	Carlson Wireless Telephone, Incorporated
General Description	Wireless Telephone Line Extender
Functional Description	Wireless Local Loop Extender (Digital Remote Phone Link)
Model Name	i-WLL-15
Trade Name	i-WLL
Serial Number	1200+
External Ports	i RS 232
Dimension	4.5 Dia x 30”
PCB Card Dimension	7.5” x 3.5”
Main Board Specification	FR4 1oz cu SMOBC
No. of Layers	2
Processor Type	AUR 90S8515
Oscillators	Toyocom 22MHz
Crystals	ECS 11.059MHz
Chip Set Used	Harris Prism
Equipment Type	Wireless PSTN Transmission System
Power Supply Type	DC Wall Transformer
Power Supply Rating	12W
Protocol Compatibility	ISDN
Transmittal Levels	+36.5dBm ERP
Receive Sensitivity	-95dBm
Maximum Data Speed	160Kbps
Maximum Fax Speed	14,4000
Supplemental Protection	Tecor, Buss

APPENDIX E
MODIFICATION LETTER

To Whom it May Concern:

This is to certify that no modifications were necessary for:

Wireless Local Loop Extender (Digital Remote Phone Link), model I-WLL-15

to comply with:

1. Power Line Conducted Emissions in a shielded room utilizing two LISN's in accordance with the FCC test procedure 47 CFR §15.207.

2. Radiated Emissions in a 3-meter open area site in accordance with the FCC test procedure 47 CFR §15.209 and §15.31(m).

3. Occupied Bandwidth Test in accordance with the FCC test procedure 47 CFR §15.247(2).

4. Frequency Stability Test requirements in accordance with 47CFR §2.1055.

5. Maximum Peak Output Power and Transmitted Power Density Test Requirement in accordance with 47 CFR §15.247(b) and 47 CFR §15.247(d).

6. Fundamental Harmonics and Spurious Emissions Test in accordance with the FCC test procedure 47 CFR §2.1053 and §15.249(a).

7. Modulation Frequency Characteristics in accordance with the FCC test procedure 47 CFR §2.1047.

The results show that the sample equipment tested as described in this report is in compliance with the FCC Rules Part 15, SubPart B Powerline Conducted and Open Field Radiated Emissions. Occupied Bandwidth, Frequency Stability, Maximum Peak Output Power and Transmitted Power Density, Fundamental Harmonics and Spurious Emissions and Modulation Characteristics test requirement limits of, SubPart C.

For further information, please contact the manufacturer at

Carlson Wireless Telephone, Incorporated
1150 Evergreen Road, Suite #1, PO Box 2400
Redway, California 95560-2400 USA
http://www.wireless-telephone.com
Tel: (707) 923-9593
Fax: (707) 923-1913
Attention: Mr. Jim Carlson

Email: jcarlson@carlson-eng.com