

TEST NUMBER - 348-00

**1999 CFR TITLE 47 FCC PART 15 SUBPART B
CLASS B TESTING**

for

Clare Corporation
78 Cherry Hill Drive
Beverly, MA 01915

978-524-6777

of

Embedded Modem Module

CPC 2420E

on

11/6/2000

Tested by

Clifton P. Brick

Reviewed by

Larry K. Stillings

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TEST DESCRIPTION

1. TEST OBJECTIVE

To test the Embedded Modem Module to FCC Part 15, Subpart B, Class B limits and write a report.

2. E.U.T. DESCRIPTION

GENERAL

The CPC 2420 is a 2400 Baud Embedded Modem Module for use in remote monitoring applications. The CPC 2420E was tested in conjunction with a telephone line simulator, an evaluation board and a PC. The PC ran a continuous routine of having the modem on-hook, off-hook, dialing and answering a call in 15 second intervals to exercise the modem.

SERIAL NUMBERS:

Pre Production Prototype

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TEST RESULTS AND CONCLUSIONS

PRODUCT TESTED - Embedded Modem Module

MODEL NUMBER - CPC 2420E

RADIATED TEST RESULTS

The test results show that the emissions radiated from this equipment are in compliance with FCC Rules, Part 15, Subpart B, for Class B equipment.

CONDUCTED TEST RESULTS

The test results show that the emissions conducted through the power line from this equipment are in compliance with FCC Rules, Part 15, Subpart B, for Class B equipment.

ANALYSIS AND CONCLUSIONS

Based upon the radiated and conducted measurements we find that this equipment is within the limits of the FCC Rules, Part 15, Subpart B, for Class B equipment. All results are based on a test of one sample, and represent other production units, only in as much as a sample represents other production units. If any significant changes are made to the unit, the changes shall be evaluated and a retest may be required.

NOTES (Special conditions unique to this test)

None.

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EQUIPMENT LABEL:

This equipment complies with Part 15 of FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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COMPLIANCE BLOCK DIAGRAM

See Product Technical File.

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TEST PROCEDURES

1. TEST EQUIPMENT

- A. HP 8546A (9 kHz - 6.5 GHz) EMI Receiver w/ RF Filter Section, S/N 3704A00323 / 3650A00360. Calibration Date 7-18-2000, calibrated annually.
- B. Electro-Metrics BiConical Antenna, Model EM6912A, S/N 149. Calibration Date 2-22-2000, calibrated annually.
- C. Electro-Metrics Log Periodic Antenna, Model EM-6950, S/N 1017. Calibration Date: 2-22-2000, calibrated annually.
- D. EMCO LISN, Model EM 3825/2, S/N 9109-1860. Calibration Date: 2-22-2000, calibrated annually.
- E. LISN, Compliance Worldwide, Model 50 μ H / 50 ohm, S/N 100. Calibration Date: 2-22-2000, calibrated annually.

2. FREQUENCY RANGE TO BE SCANNED.

- A. Radiated Test from 30 MHz to 1.0 GHz.
- B. Conducted Test from 450 kHz to 30 MHz.

3. TEST PROCEDURES.

Radiated test procedure:

The EUT, associated cables and peripheral devices are placed on the supporting table and any support equipment is placed off the site. The EUT is turned on and any necessary operating or test software installed and allowed to warm up. The frequency band from 30 MHz to 1 GHz is scanned. When an emission is found the emission is maximized by varying the bundle position of the connecting cables, the antenna height, the antenna polarization (vertical and horizontal) and the table orientation (360 degrees). The maximum reading is recorded and the next signal is searched for.

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3. TEST PROCEDURES (cont.)

Conducted test procedure:

The power line of the EUT is connected to the LISN (Line Impedance Stabilization Network). A measurement of the emissions are made from the power line for both phase and neutral on the analyzer in the frequency range from 450 KHz to 30 MHz. The maximum readings are recorded for each phase.

All measurements are made according to the procedures defined in: "ANSI C63.4-1992 Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz, American National Standard for (ISBN 1-55937-215-5).

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PART 15 CLASS B SUBPART B TEST LIMITS

1. Class B Radiation Limits:

Frequency MHz	Distance meters	Limit dB μ V/m	Limit μ V/m
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
960-1000	3	54.0	500

2. Class B Conduction Limits:

Frequency MHz	Limit dB μ V/m	Limit μ V/m
0.450 - 30.0	48.0	250

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TEST FACILITY DESCRIPTION

Compliance Worldwide is located on 357 Main Street in Sandown, New Hampshire.

The radiated site is a 10 meter indoor site with an enclosure for the product and measurement antenna. The basement below the enclosure is used for the test equipment, personnel and any support equipment.

The conducted site is part of a 16' x 20' x 12' ferrite tile chamber and uses on the walls for the vertical metal wall required by the measurement standard.

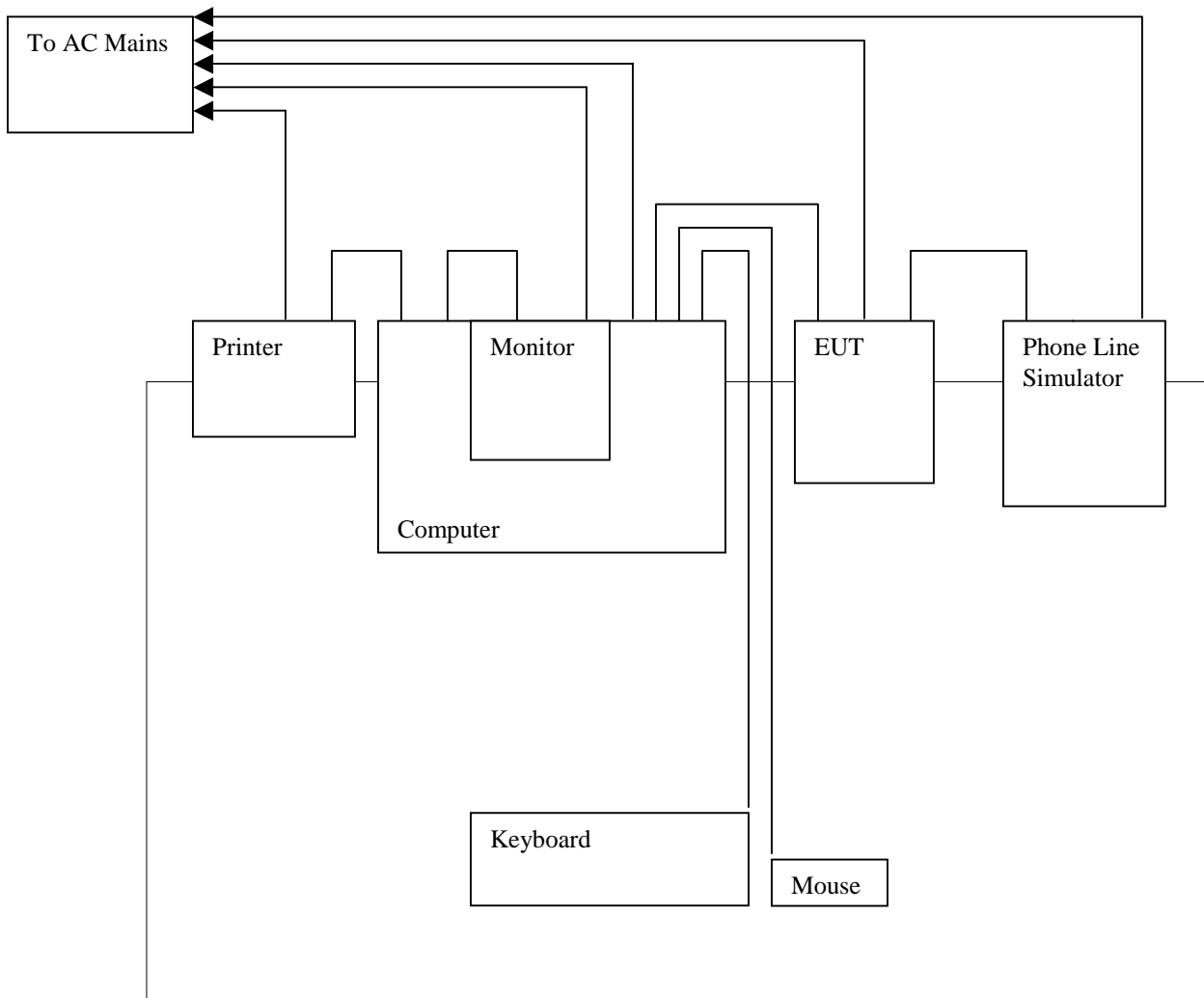
In keeping with the requirements of Section 2.948 of the Federal Communications Commission's Rules, Compliance Worldwide has filed a Test Facility Description with the F.C.C.

Anyone wishing to review this Test Facility Description is referred to Registration Number: 96392. This is currently on file at the FCC's Authorization and Evaluation Lab in Columbia, Maryland, U.S.A.

DATE ON FILE: March 6, 2000.

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**TEST SET UP
AND
PERIPHERAL CONNECTION INFORMATION**



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The cables directly connected to this equipment are listed below. Please see below for a complete list of FCC ID's etc. on the supporting equipment.

Connection Descriptions

1. Phone Cord
(description)

EUT
(from device)

Phone Line Simulator
(to device)

CABLE LENGTH 2M (S) SHIELDED or (U) UNSHIELDED U

2. Parallel Cable
(description)

PC Parallel Port
(from device)

Printer
(to device)

CABLE LENGTH 2M (S) SHIELDED or (U) UNSHIELDED S

3. Serial Cable
(description)

PC Serial Port
(from device)

EUT
(to device)

CABLE LENGTH 2M (S) SHIELDED or (U) UNSHIELDED S

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CONNECTION DESCRIPTIONS (cont.)

4. Video Cable
(description)

PC Video Out
(from device)

Monitor
(to device)

CABLE LENGTH 2M (S) SHIELDED or (U) UNSHIELDED S

5. Keyboard Cable
(description)

Keyboard
(from device)

PC Keyboard Port
(to device)

CABLE LENGTH 2M (S) SHIELDED or (U) UNSHIELDED S

6. Mouse Cable
(description)

Mouse
(from device)

PC Mouse Port
(to device)

CABLE LENGTH 2M (S) SHIELDED or (U) UNSHIELDED S

7. Power Cord
(description)

EUT
(from device)

AC Mains Via 9V 600mA Class 2 DC Supply
(to device)

CABLE LENGTH 2M (S) SHIELDED or (U) UNSHIELDED U

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CONNECTION DESCRIPTIONS (cont.)

8. Power Cord
(description)PC
(from device)AC Mains
(to device)CABLE LENGTH 2M (S) SHIELDED or (U) UNSHIELDED U9. Power Cord
(description)Monitor
(from device)AC Mains
(to device)CABLE LENGTH 2M (S) SHIELDED or (U) UNSHIELDED U10. Power Cord
(description)Phone Line Simulator
(from device)AC Mains
(to device)CABLE LENGTH 2M (S) SHIELDED or (U) UNSHIELDED U11. Power Cord
(description)Printer
(from device)AC Mains
(to device)CABLE LENGTH 2M (S) SHIELDED or (U) UNSHIELDED U

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RADIATED TEST RESULTS

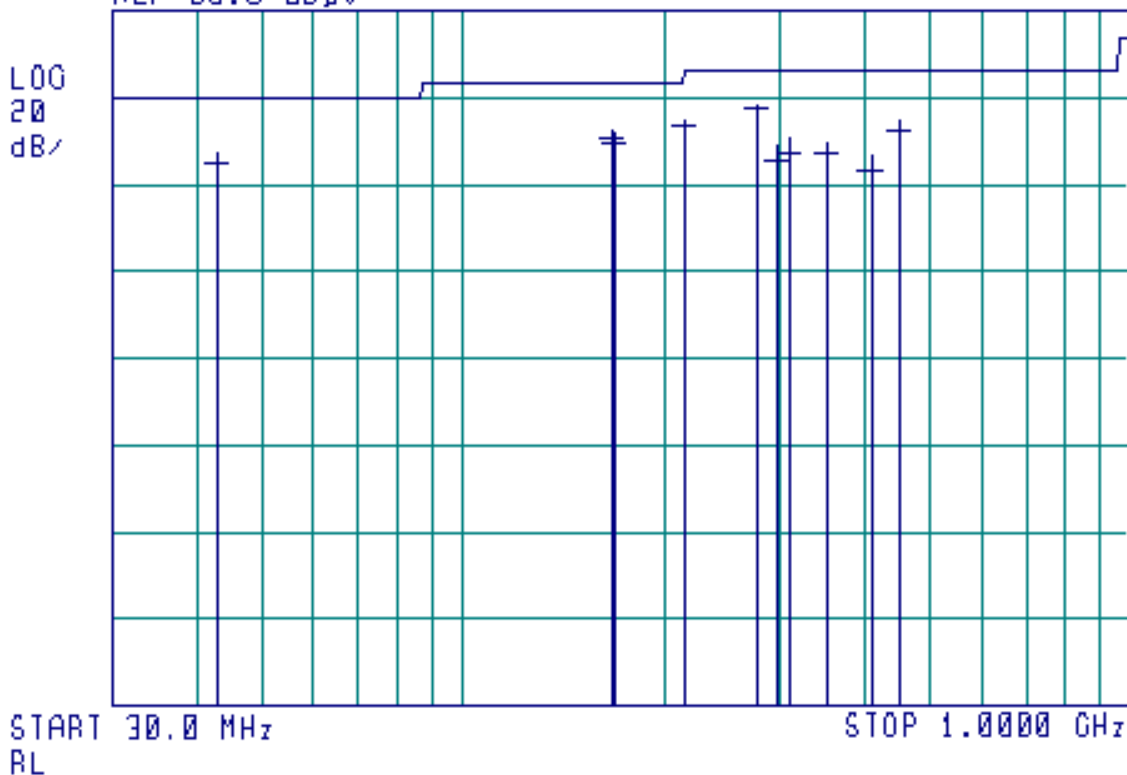
Frequency Range: 30 - 1000 MHz.
Measurement Distance: 3.0 Meters.
Bandwidth: 120 kHz, Per ANSI C63.4-1992.
Detector Functions: Peak, Quasi Peak.
Video Filter: 300 kHz
Table Height: 0.8 meters
Antenna Height Variation: 1 - 4 Meters.
Horizontal and Vertical Polarization Measurements Taken.

PLEASE SEE NEXT PAGE FOR RADIATED TEST DATA

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Radiated Horizontal Data Log Plot

14:16:20 NOV 06, 2000 RADIATED HORIZONTAL
CPCLARE CPC2420 FCCB TEST# 348-00
REF 60.0 dB μ V



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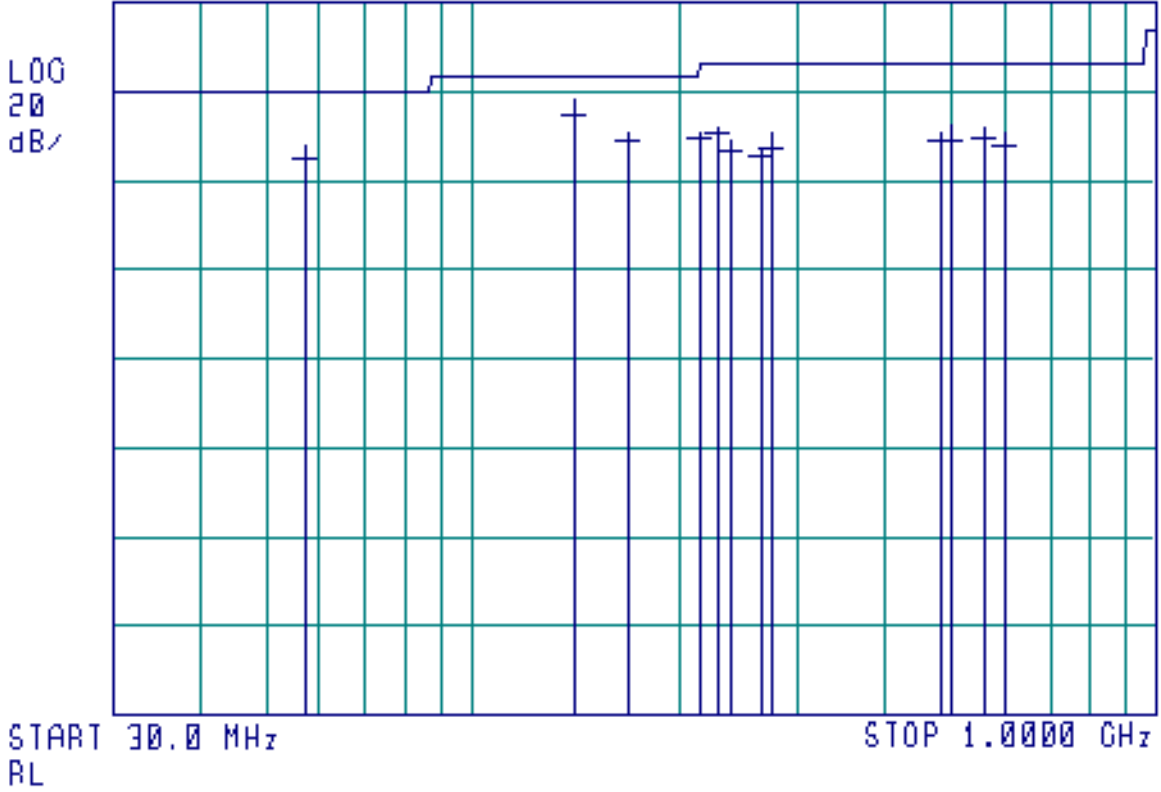
Radiated Horizontal Tabular Data

Freq (MHz)	Azimuth (Degrees)	Antenna Height (Meters)	Peak Amp (dBuV)	QP Amp (dBuV)	QP Limit (dBuV)	QP Margin (dB)
42.953542	135	2.5	27.42	25.14	40.00	-14.86
167.196488	0	2.6	33.00	30.49	43.50	-13.01
169.190394	0	2.6	32.21	30.12	43.50	-13.38
216.022122	270	1.5	35.20	33.78	46.00	-12.22
275.637509	135	1.2	38.41	37.44	46.00	-8.56
294.902554	45	1.0	28.96	25.80	46.00	-20.20
307.188272	90	1.0	30.69	27.71	46.00	-18.29
350.820550	45	1.0	29.98	27.31	46.00	-18.69
408.041429	135	3.0	26.92	23.71	46.00	-22.29
451.027919	135	2.9	35.09	33.30	46.00	-12.70

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Radiated Vertical Data Log Plot

14:44:03 NOV 06, 2000 RADIATED VERTICAL
CPCLARE CPC2420 FCCB TEST# 348-00
REF 60.0 dB μ V



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Radiated Vertical Tabular Data

Freq (MHz)	Azimuth (Degrees)	Antenna Height (Meters)	Peak Amp (dBuV)	QP Amp (dBuV)	QP Limit (dBuV)	QP Margin (dB)
57.733088	0	1.0	28.58	25.38	40.00	-14.62
141.353600	180	1.0	38.60	35.37	43.50	-8.13
168.015625	225	1.0	30.99	29.25	43.50	-14.25
216.009744	0	1.0	31.72	29.58	46.00	-16.42
229.092797	135	1.0	32.45	30.57	46.00	-15.43
240.008219	90	1.0	29.01	26.69	46.00	-19.31
264.062338	225	1.0	27.90	25.72	46.00	-20.28
272.010201	180	1.0	30.84	27.93	46.00	-18.07
480.027450	135	1.0	31.90	29.02	46.00	-16.98
501.143619	135	1.2	32.75	29.45	46.00	-16.55
559.991422	150	1.0	32.33	30.05	46.00	-15.95
601.370266	0	1.0	31.47	28.57	46.00	-17.43

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CONDUCTED TEST RESULTS

Frequency Range: 450 kHz to 30.0 MHz.
Bandwidth: 9 kHz per ANSI C63.4-1992.
Detector Functions: Peak, Quasi-Peak, Average
Table Height: 0.8 meters
Video Bandwidth: 30 kHz.

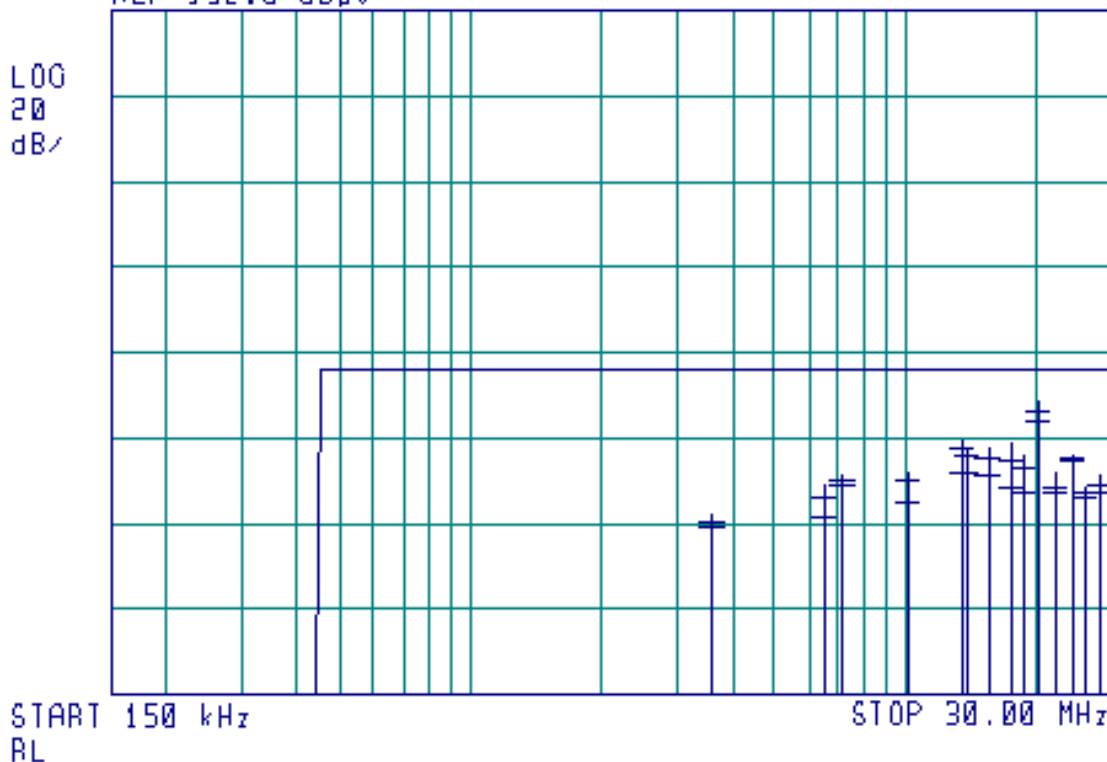
Phase and Neutral Measurements Taken.

PLEASE SEE NEXT PAGE FOR CONDUCTED TEST DATA

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Conducted 120V 60Hz Neutral Data Log Plot

15:56:30 NOV 06, 2000 CONDUCTED NEUTRAL FCCB
CPCLARE CPC2420 MODEM TEST# 348-00
REF 132.0 dB μ V



TEST NUMBER - 348-00

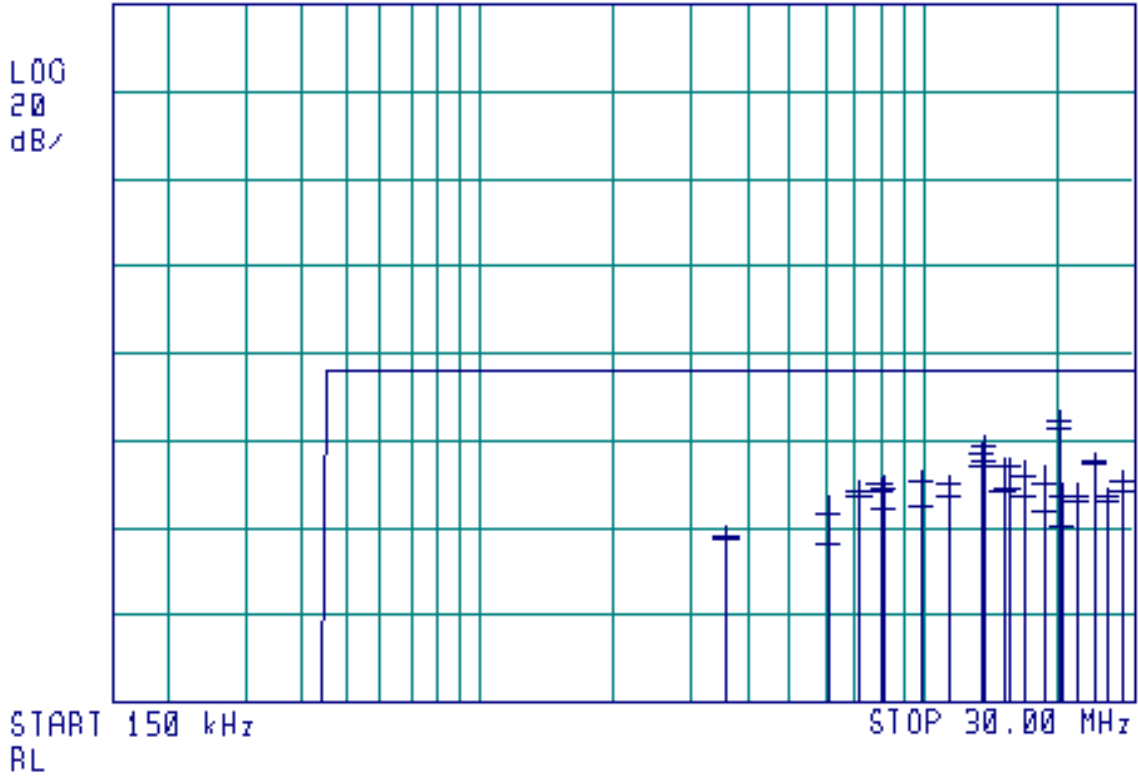
Conducted 120V 60Hz Neutral Tabular Data

Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	Avg Amp (dBuV)	QP Limit (dBuV)	Avg Limit (dBuV)	QP Margin (dB)	Avg Margin (dB)
3.578424	14.66	12.67	11.74	48.00	46.00	-35.33	-34.26
6.509360	21.50	18.72	13.56	48.00	50.00	-29.28	-36.44
7.159051	23.77	22.47	21.45	48.00	50.00	-25.53	-28.55
10.092180	24.96	22.70	17.46	48.00	50.00	-25.30	-32.54
13.457139	32.02	29.93	25.01	48.00	50.00	-18.07	-24.99
13.780208	30.34	28.29	24.75	48.00	50.00	-19.71	-25.25
15.460856	29.77	27.62	24.22	48.00	50.00	-20.38	-25.78
17.249745	30.56	27.11	20.97	48.00	50.00	-20.89	-29.03
18.541413	28.69	25.48	19.35	48.00	50.00	-22.52	-30.65
20.027993	40.94	38.95	36.57	48.00	50.00	-9.05	-13.43
22.029776	24.83	20.92	19.29	48.00	50.00	-27.08	-30.71
24.032804	28.85	27.51	26.94	48.00	50.00	-20.49	-23.06
25.881679	20.79	19.45	18.57	48.00	50.00	-28.55	-31.43
28.039153	24.15	21.73	19.42	48.00	50.00	-26.27	-30.58

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Conducted 120V 60Hz Phase Data Log Plot

16:22:56 NOV 06, 2000 CONDUCTED PHASE FCCB
CPCLARE CPC2420 MODEM TEST# 348-00
REF 25.0 dBm



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Conducted 120V 60Hz Phase Tabular Data

Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	Avg Amp (dBuV)	QP Limit (dBuV)	Avg Limit (dBuV)	QP Margin (dB)	Avg Margin (dB)
3.578513	-93.93	-96.21	-97.37	-59.00	-61.00	-37.21	-36.37
6.083849	-87.46	-91.48	-97.64	-59.00	-57.00	-32.48	-40.64
7.159854	-84.26	-86.05	-87.30	-59.00	-57.00	-27.05	-30.30
7.961674	-82.81	-84.78	-85.97	-59.00	-57.00	-25.78	-28.97
8.013174	-82.03	-85.30	-89.88	-59.00	-57.00	-26.30	-32.88
9.808465	-81.78	-84.17	-89.31	-59.00	-57.00	-25.17	-32.31
11.383353	-82.28	-84.31	-87.13	-59.00	-57.00	-25.31	-30.13
13.421065	-75.48	-77.46	-81.00	-59.00	-57.00	-18.46	-24.00
13.670565	-74.13	-76.31	-79.27	-59.00	-57.00	-17.31	-22.27
14.963304	-78.42	-80.77	-86.53	-59.00	-57.00	-21.77	-29.53
15.461663	-78.55	-80.67	-85.47	-59.00	-57.00	-21.67	-28.47
16.751440	-79.33	-81.99	-88.16	-59.00	-57.00	-22.99	-31.16
18.538373	-81.14	-84.38	-90.85	-59.00	-57.00	-25.38	-33.85
20.026449	-67.65	-69.94	-72.37	-59.00	-57.00	-10.94	-15.37
20.330214	-84.42	-87.69	-93.88	-59.00	-57.00	-28.69	-36.88
22.029084	-84.65	-86.76	-88.49	-59.00	-57.00	-27.76	-31.49
24.032199	-77.67	-79.09	-79.72	-59.00	-57.00	-20.09	-22.72
25.874805	-85.58	-87.58	-88.72	-59.00	-57.00	-28.58	-31.72
28.036439	-81.38	-84.05	-86.40	-59.00	-57.00	-25.05	-29.40

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NOTES AND COMMENTS

(Special conditions unique to this test)

None.

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PHOTOGRAPHS

Radiated Test Setup (Front)



PHOTOGRAPHS

Radiated Test Setup (Rear)



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PHOTOGRAPHS

Conducted Test Setup (Front)



PHOTOGRAPHS

Conducted Test Setup (Rear)



The following statement should be conspicuously located in bold letters in the instruction manual:

RADIO AND TELEVISION INTERFERENCE

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

You may also find helpful the following booklet, prepared by the FCC: "How to Identify and Resolve Radio-TV Interference Problems." This booklet is available from the U.S. Government Printing Office, Washington D.C. 20402.

Changes and Modifications not expressly approved by the manufacturer or registrant of this equipment can void your authority to operate this equipment under Federal Communications Commissions rules.

* In order to maintain compliance with FCC regulations shielded cables must be used with this equipment. Operation with non-approved equipment or unshielded cables is likely to result in interference to radio & television reception.

* NOTE: If shielded cables were used when testing your product you must also add this paragraph to the manual statement.