FCC CERTIFICATION TEST REPORT

for

Descartes Corporation
6 Colonial Lake Drive
Suite 6
Lawrenceville, NJ 08648

FCC ID: PP9P2000CDPD

August 7, 2001

WLL PROJECT #: 6315X

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FCC CERTIFICATION TEST REPORT

for

FCC ID: PP9P2000CDPD

1.0 Introduction

This report has been prepared on behalf of Descartes to support the attached Application for Equipment Authorization. The test and application are submitted for a portable Electronic Fund Transfer (EFT)/ P.O.S. Terminal containing an internal CDPD Modem Module Transmitter under Part 22 of the FCC Rules and Regulations. The Equipment Under Test was the P2000CDPD.

The transmitter module (CDPD Modem) has already been authorized by Novatel Wireless Technologies Ltd. under FCC ID: NBZNRM-6832. Descartes Corp. is integrating the module into the P2000 CDPD terminal to which they are obtaining FCC Certification under the FCC ID: PP9P2000CDPD. The approved CDPD module has not been changed or modified.

The complete FCC Certification Test Report for the approved CDPD module (FCC ID: NBZNRM-6832) has been included as Appendix B of this test report. The Desacartes Corp. P2000 CDPD has also been evaluated for RF Exposure in accordance with FCC Rule Part 2.1093, ET Docket 96-326 Rules for mobile and portable devices. The SAR report has been included in the submission for the certification.

The AC power line conducted emissions measurements reported herein were performed according to the 1992 version of ANSI C63.4. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation. Calibration checks are made periodically to verify proper performance of the measuring instrumentation.

The AC power line conducted emissions measurements were performed at Washington Laboratories, Ltd. test center in Gaithersburg, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent FCC test laboratory.

All results reported herein relate only to the equipment tested. The measurement uncertainty of the data contained herein is ±2.3 dB. Refer to Appendix A for Statement of Measurement Uncertainty. This report shall not be used to claim product endorsement by NVLAP or any agency of the US Government.

1.1 Summary

The Descartes Corporation P2000CDPD complies with the requirements for a CDPD radio under Part 22, Subpart H of the FCC Rules and Regulations.

2.0 Description of Equipment Under Test (EUT)

The Descartes Corporation P2000CDPD (EUT) is a battery powered handheld wireless credit card point of sale terminal that contains a CDPD Modem Card. The EUT contains a 17 key keypad, magnetic card reader, removable/re-chargeable battery pack, and a printer. A RangeStar, P/N: 100800 antenna has been incorporated in

the *ARTEMA US Mobile*. A specification sheet on the RangeStar antenna is included in Appendix C. The following are the specifications of the *ARTEMA US Mobile* transmitter:

Tx Frequency Range:	824 MHz to 849 MHz
Maximum RF Output:	0.827 Watts (ERP)

3.0 Test Configuration

To complete the test configuration required by the FCC, the EUT was configured by connecting a RJ11 to DB9 cable from the EUT cradle to the support PC. In Windows, HyperTerminal was executed to communicate to the EUT thru the cradle to the handheld wireless modem. This communication was established for set up/configuring purposes. All testing was performed at 115VAC using a CDK-N Model: 4530040A transformer to power the EUT.

Following is a list of the I/O ports available and cables attached to them during testing.

I/O Ports	I/O Cables
RJ11 Com1 (on cradle)	unshielded, 5m connected from RJ11/DB9 from EUT to PC
RJ11 Com2 (on cradle)	unshielded, 1 meter terminated
RJ11 Line (on cradle)	unshielded, 1 meter terminated
¼" DC input port (on cradle)	unshielded cable from AC Adapter

3.1 Conducted Emissions Testing

The EUT was placed on an 80 cm high 1 x 1.5 m non-conductive table above a ground plane. Power to the CPU was provided through a Solar Corporation 50 Ω/50 µH Line Impedance Stabilization Network bonded to a 3 x 2 meter ground plane. The LISN has its AC input supplied from a filtered AC power source. Power was supplied to the peripherals through a second LISN. The peripherals were placed on the table in accordance with ANSI C63.4-1992. Power and data cables were moved about to obtain maximum emissions.

The 50 Ω output of the LISN was connected to the input of the spectrum analyzer and the emissions in the frequency range of 450 kHz to 30 MHz were measured. The detector function was set to quasi-peak or peak, as appropriate, and the resolution bandwidth during testing was at least 9 kHz, with all post-detector filtering no less than 10 times the resolution bandwidth.

Table 1: FCC 15.231 Conducted Emissions Data

CLIENT: Descartes
MODEL NO: P2000CDPD
DATE: 1 Feb 01
BY: Chad M. Beattie
JOB #: 6315

LINE 1 - NEUTRAL

Frequency MHz	Voltage (Peak) dBuV	Voltage uV	FCC Limit uV	Margin dB
0.54	30.1	32.0	250	-17.9
6.09	33.5	47.3	250	-14.5
12.18	33.3	46.2	250	-14.7
20.31	40.3	103.5	250	-7.7
24.39	44.5	167.9	250	-3.5
28.46	44.2	162.2	250	-3.8

LINE 2 - PHASE

Frequency MHz	Voltage (Peak) dBuV	Voltage uV	FCC Limit uV	Margin dB
0.51	29.7	30.5	250	-18.3
6.09	34.9	55.6	250	-13.1
12.18	37.1	71.6	250	-10.9
20.37	36.0	63.1	250	-12.0
24.39	44.8	173.8	250	-3.2
28.46	44.0	158.5	250	-4.0

Table 2: System Under Test

FCC ID: PP9P2000CDPD

EUT: Descartes Corporation; M/N: P2000 CDPD; S/N: 981108107773 (base cradle)

Support Equipment:

PC: Gateway 2k Tower; M/N N/A: S/N: 0007784578; FCC ID: HWYG6V200T

Monitor: RIC; M/N: X-555, S/N: CVR9990323938; FCC ID: HSUTRLX-555

Keyboard: Hewlett Packard; M/N: KB-9970, S/N: 9H02203278B

Printer: Hewlett Packard; M/N 2225C+; S/N: 2717S40327; FCC ID: DSI6XU2225

Mouse: Microsoft, M/N: 2.0A, S/N: 07053616, FCC ID: C3K5MP1

Table 3: Interface Cables Used

Non-shielded I/O cables were used throughout the system under test.

The EUT was powered via a non-shielded AC power cord.

Table 4: Measurement Equipment Used

The following equipment is used to perform measurements:

Hewlett-Packard Spectrum Analyzer: HP8564E
Hewlett-Packard Spectrum Analyzer: HP8568B
Hewlett-Packard Spectrum Analyzer: HP8593A
Hewlett-Packard Quasi-Peak Adapter: HP85650A
Hewlett-Packard Preselector: HP85685A
Hewlett-Packard Preamplifier: HP8449B
Antenna Research Associates, Inc. Biconical Log Periodic Antenna: LPB-2520 (Site 1)
Antenna Research Associates, Inc. Horn Antenna: DRG-118/A
Solar 50 Ω/50 µH Line Impedance Stabilization Network: 8012-50-R-24-BNC
Solar 50 Ω/50 µH Line Impedance Stabilization Network: 8028-50-TS-24-BNC
Washington Laboratories Portable Antenna Mast (Site 1)
Washington Laboratories Motorized Turntable (Site 1)
RG-214 semi-rigid coaxial cable
RG-223 double-shielded coaxial cable

Appendix A

Statement of Measurement Uncertainty

For the purposes of the measurements performed by Washington Laboratories, the measurement uncertainty is ±2.3 dB. This has been calculated for a *worst-case situation* (radiated emissions measurements performed on an open area test site).

The following measurement uncertainty calculation is provided:

$$\text{Total Uncertainty} = (A^2 + B^2 + C^2)^{1/2}/(n-1)$$

where:

A = Antenna calibration uncertainty, in dB = 2 dB

B = Spectrum Analyzer uncertainty, in dB = 1 dB

C = Site uncertainty, in dB = 4 dB

n = number of factors in uncertainty calculation = 3

Thus, Total Uncertainty = $0.5\ (2^2 + 1^2 + 4^2)^{1/2}$ = ±2.3 dB.

Appendix B

Novatel Certification Test Report for the CDPD Modem Module
FCC ID: NBZNRM-6832

PAGE NO. 1 of 30.

Required information per ISO/IEC Guide 25-1990, paragraph 13.2:

a) TEST REPORT

b) Laboratory: M. Flom Associates, Inc.
(FCC: 31040/SIT) 3356 N. San Marcos Place, Suite 107
(Canada: IC 2044) Chandler, AZ 85224

c) Report Number: d98c0011

d) Client: Novatel Wireless Technologies Ltd.
6715 - 8th St., N.E., Suite 200
Calgary, AB T2E 7H7 Canada

e) Identification: NRM-6832
FCC ID: NBZNRM-6832
Description: CDPD Modem Module

f) EUT Condition: Not required unless specified in individual tests.

g) Report Date: December 7, 1998
EUT Received: November 23, 1998

h, j, k): As indicated in individual tests.

i) Sampling method: No sampling procedure used.

l) Uncertainty: In accordance with MFA internal quality manual.

m) Supervised by:

Morton Flom, P. Eng.

n) Results: The results presented in this report relate only to the item tested.

o) Reproduction: This report must not be reproduced, except in full, without written permission from this laboratory.

LIST OF GENERAL INFORMATION REQUIRED FOR CERTIFICATION

IN ACCORDANCE WITH FCC RULES AND REGULATIONS,
VOLUME II, PART 2 AND TO

1.1310, 22(H), Confidentiality

Sub-part 2.1033

(c)(1): NAME AND ADDRESS OF APPLICANT:

Novatel Wireless Technologies Ltd.
6715 - 8th St., N.E., Suite 200
Calgary, AB T2E 7H7 Canada

MANUFACTURER:

Wong's Electronics Co. Ltd./Welco China Ltd.
Man Fung Wan Lak Electronics Factory
Man Fung Industrial Estate, Sha Jing, Po On, Shenzhen,
Guang Dong Province,
People's Republic of China

(c)(2): FCC ID: NBZNRM-6832

MODEL NO: NRM-6832

(c)(3): INSTRUCTION MANUAL(S):

PLEASE SEE ATTACHED EXHIBITS

(c)(4): TYPE OF EMISSION: 28K8FXW

(c)(5): FREQUENCY RANGE, MHz: 824 to 849

(c)(6): POWER RATING, Watts: 0.006 to 0.6
___ Switchable x Variable ___ N/A

(c)(7): MAXIMUM POWER RATING, Watts: 7

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Subpart 2.1033 (continued)

(c)(8): VOLTAGES & CURRENTS IN ALL ELEMENTS IN FINAL R. F. STAGE, INCLUDING FINAL TRANSISTOR OR SOLID STATE DEVICE:

COLLECTOR CURRENT, A = per manual
COLLECTOR VOLTAGE, Vdc = per manual
SUPPLY VOLTAGE, Vdc = 3.6

(c)(9): TUNE-UP PROCEDURE:

PLEASE SEE ATTACHED EXHIBITS

(c)(10): CIRCUIT DIAGRAM/CIRCUIT DESCRIPTION: Including description of circuitry & devices provided for determining and stabilizing frequency, for suppression of spurious radiation, for limiting modulation and limiting power.

PLEASE SEE ATTACHED EXHIBITS

(c)(11): LABEL INFORMATION:

PLEASE SEE ATTACHED EXHIBITS

(c)(12): PHOTOGRAPHS:

PLEASE SEE ATTACHED EXHIBITS

(c)(13): DIGITAL MODULATION DESCRIPTION:

___ ATTACHED EXHIBITS
_x_ N/A

(c)(14): TEST AND MEASUREMENT DATA:

FOLLOWS

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Sub-part 2.1033(c)(14): TEST AND MEASUREMENT DATA

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II; Part 2, Sub-part J, Sections 2.947, 2.1033(c), 2.1041, 2.1046, 2.1047, 2.1079, 2.1051, 2.1053, 2.1055, 2.1057 and the following individual Parts:

____ 21 - Domestic Public Fixed Radio Services
____ 22 - Public Mobile Services
_x_ 22 Subpart H - Cellular Radiotelephone Service
____ 22.901(d) - Alternative technologies and auxiliary services
____ 23 - International Fixed Public Radiocommunication services
____ 24 - Personal Communications Services
____ 74 Subpart H - Low Power Auxiliary Stations
____ 80 - Stations in the Maritime Services
____ 80 Subpart E - General Technical Standards
____ 80 Subpart F - Equipment Authorization for Compulsory Ships
____ 80 Subpart K - Private Coast Stations and Marine Utility Stations
____ 80 Subpart S - Compulsory Radiotelephone Installations for Small Passenger Boats
____ 80 Subpart T - Radiotelephone Installation Required for Vessels on the Great Lakes
____ 80 Subpart U - Radiotelephone Installations Required by the Bridge-to-Bridge Act
____ 80 Subpart V - Emergency Position Indicating Radiobeacons (EPIRB'S)
____ 80 Subpart W - Global Maritime Distress and Safety System (GMDSS)
____ 80 Subpart X - Voluntary Radio Installations
____ 87 - Aviation Services
____ 90 - Private Land Mobile Radio Services
____ 94 - Private Operational-Fixed Microwave Service
____ 95 Subpart A - General Mobile Radio Service (GMRS)
____ 95 Subpart C - Radio Control (R/C) Radio Service
____ 95 Subpart D - Citizens Band (CB) Radio Service
____ 95 Subpart E - Family Radio Service
____ 95 Subpart F - Interactive Video and Data Service (IVDS)
____ 101 - Fixed Microwave Services

GENERAL INFORMATION

1. Prior to testing, the deviation for audio modulation and each of the respective SAT + ST tones were set as close as possible to the required limit.

2. Except for audio modulation, which was applied externally, Wideband Data SAT, ST and all other tones and operational modes were provided by a test control unit incorporating appropriate software. Worst case repetition rate for Wideband Data was 10 kb/s.

3. Spurious radiation was measured at three (3) meters.

4. The two cellular frequency bands are available to the user automatically. Please refer to the manual contained in the documentation.

5. The normal modes of modulation are:

____ (a) VOICE
____ (b) WIDEBAND DATA
____ (c) SAT
____ (d) ST
____ (e) SAT + VOICE
____ (f) SAT + DTMF
____ (g) CDMA
____ (h) TDMA
____ (i) NAMPS VOICE
____ (j) NAMPS DSAT
____ (k) NAMPS ST
____ (l) NAMPS VOICE + DSAT
_x_ (m) GMSK

STANDARD TEST CONDITIONS and ENGINEERING PRACTICES

Except as noted herein, the following conditions and procedures were observed during the testing:

In accordance with ANSI C63.4-1992, section 6.1.9, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104 °F) unless the particular equipment requirements specify testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Prior to testing, the EUT was tuned up in accordance with the manufacturer's alignment procedures. All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing.

Measurement results, unless otherwise noted, are worst case measurements.

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NAME OF TEST: R. F. Power Output (Radiated)

SPECIFICATION: 47 CFR 2.1046(a)

GUIDE: EIA/IS-19-B-1988
TIA/EIA/IS-137-A-1996

TEST EQUIPMENT: As per attached page

MEASUREMENT PROCEDURE (RADIATED)

1. The EUT was placed on an open-field site and its radiated field strength at a known distance was measured by means of a spectrum analyzer. Equivalent loading was calculated from the equation $P_t=((E \times R)^2/49.2)$ watts, where R = 3m.

2. Measurement accuracy is ±1.5 dB.

MEASUREMENT RESULTS

g98b0377: 1998-Nov-23 Mon 15:39:00
STATE: 1:Low Power
AMPS MODE:

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	METER, dBuV/m	CF, dB	uV/m @ 3m	ERP, dBm	ERP, Watts
824.040000	824.040000	75.72	30.66	208449.09	9.05	0.008
836.400000	836.403000	76.43	30.69	226986.49	9.75	0.009
836.400000	848.970000	76.15	30.73	220800.47	9.55	0.009

g98b0376: 1998-Nov-23 Mon 12:00:00
STATE: 2:High Power
AMPS MODE:

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	METER, dBuV/m	CF, dB	uV/m @ 3m	ERP, dBm	ERP, Watts
824.040000	824.038000	95.29	30.66	1983809.66	28.55	0.716
836.400000	836.400000	95.86	30.69	2125690.35	29.15	0.822
848.970000	848.968000	95.08	30.73	1952090.73	28.45	0.700

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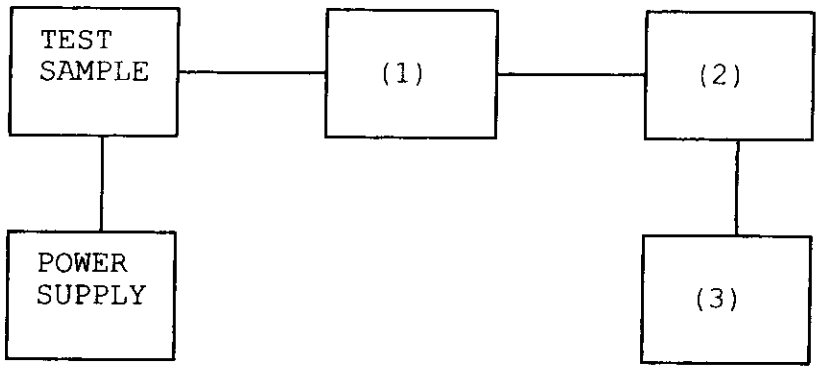
TRANSMITTER POWER CONDUCTED MEASUREMENTS

TEST 1: R. F. POWER OUTPUT
TEST 2: FREQUENCY STABILITY



	Asset	Description	s/n
(1)		COAXIAL ATTENUATOR	
___	i00122	Narda 766-10	7802
___	i00123	Narda 766-10	7802A
___	i00069	Bird 8329 (30 dB)	1006
x	i00113	Sierra 661A-3D	1059
(2)		POWER METERS	
___	i00014	HP 435A	1733A05836
x	i00039	HP 436A	2709A26776
x	i00020	HP 8901A POWER MODE	2105A01087
(3)		FREQUENCY COUNTER	
___	i00042	HP 5383A	1628A00959
x	i00019	HP 5334B	2704A00347
x	i00020	HP 8901A FREQUENCY MODE	2105A01087

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NAME OF TEST:	Emission Masks (Occupied Bandwidth)
SPECIFICATION:	47 CFR 2.1049(c)(1)
GUIDE:	EIA/IS-19-B-1988 TIA/EIA/IS-137-A-1996
TEST EQUIPMENT:	As per previous page

MEASUREMENT PROCEDURE

1. The EUT and test equipment were set up as shown on the following page, with the Spectrum Analyzer connected.

2. For EUTs supporting audio modulation, the audio signal generator was adjusted to the frequency of maximum response and with output level set for ±2.5 kHz deviation (or 50% modulation). With level constant, the signal level was increased 16 dB.

3. For EUTs supporting digital modulation, the digital modulation mode was operated to its maximum extent.

4. The Occupied Bandwidth was measured with the Spectrum Analyzer controls set as shown on the test results.

5. MEASUREMENT RESULTS: ATTACHED

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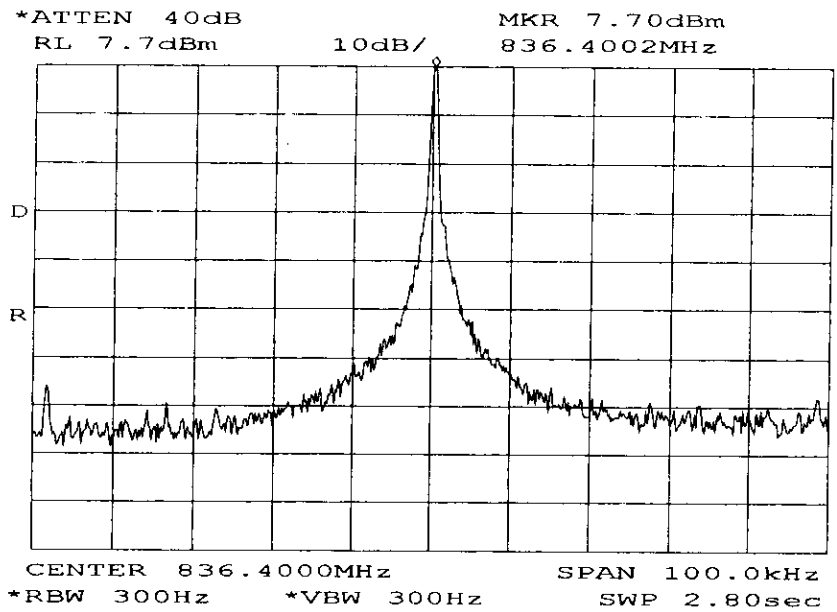
NAME OF TEST: Emission Masks (Occupied Bandwidth)
g98b0363: 1998-Nov-23 Mon 12:35:00
STATE: 1:Low Power



POWER: LOW
MODULATION: NONE

SUPERVISED BY: Morton Flom, P. Eng.

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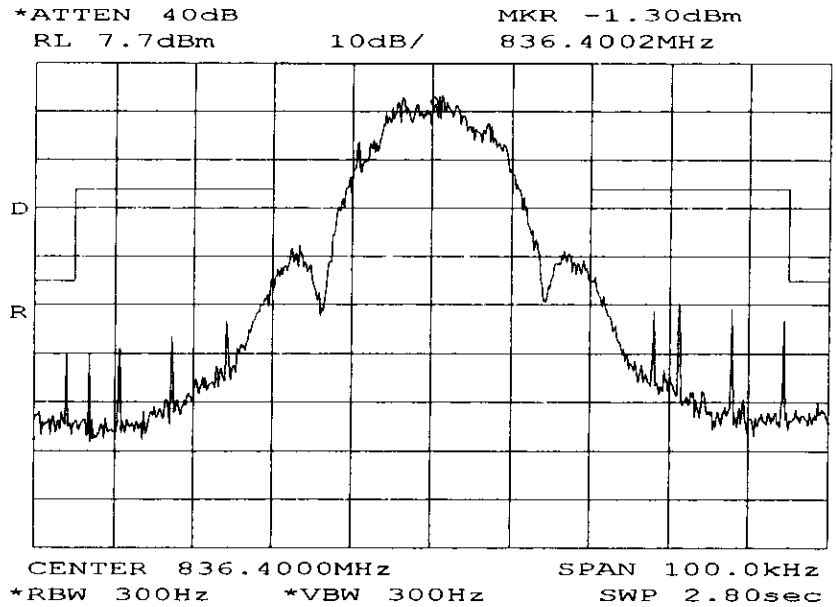
NAME OF TEST: Emission Masks (Occupied Bandwidth)
g98b0368: 1998-Nov-23 Mon 12:41:00
STATE: 1:Low Power



POWER: LOW
MODULATION: DATA GMSK
MASK: AMPS CELLULAR, F1D, DATA

SUPERVISED BY: Morton Flom, P. Eng.

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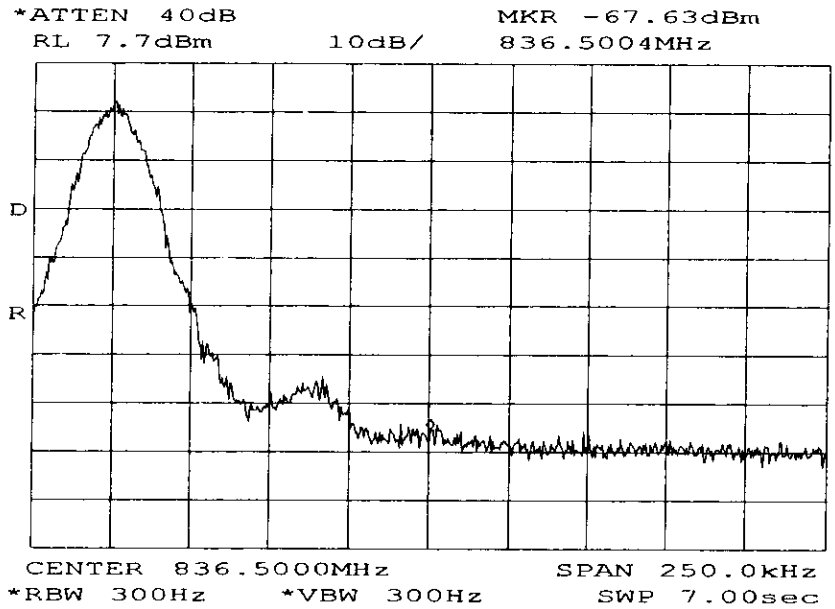
NAME OF TEST: Emission Masks (Occupied Bandwidth)
g98b0371: 1998-Nov-23 Mon 12:49:00
STATE: 1:Low Power



POWER: LOW
MODULATION: DATA GMSK
OFFSET OCCUPIED BANDWIDH

SUPERVISED BY: Morton Flom, P. Eng.

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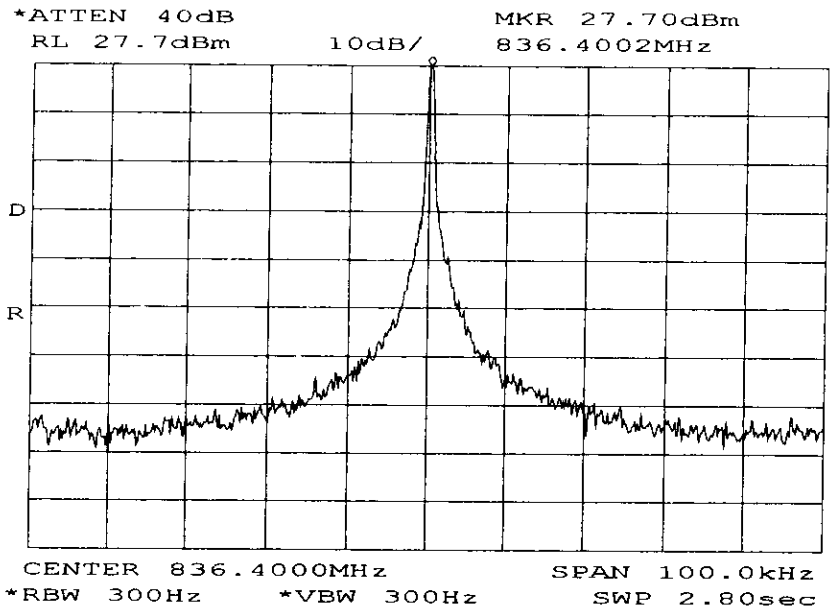
NAME OF TEST: Emission Masks (Occupied Bandwidth)
g98b0362: 1998-Nov-23 Mon 12:31:00
STATE: 2:High Power



POWER: HIGH
MODULATION: NONE

SUPERVISED BY: Morton Flom, P. Eng.

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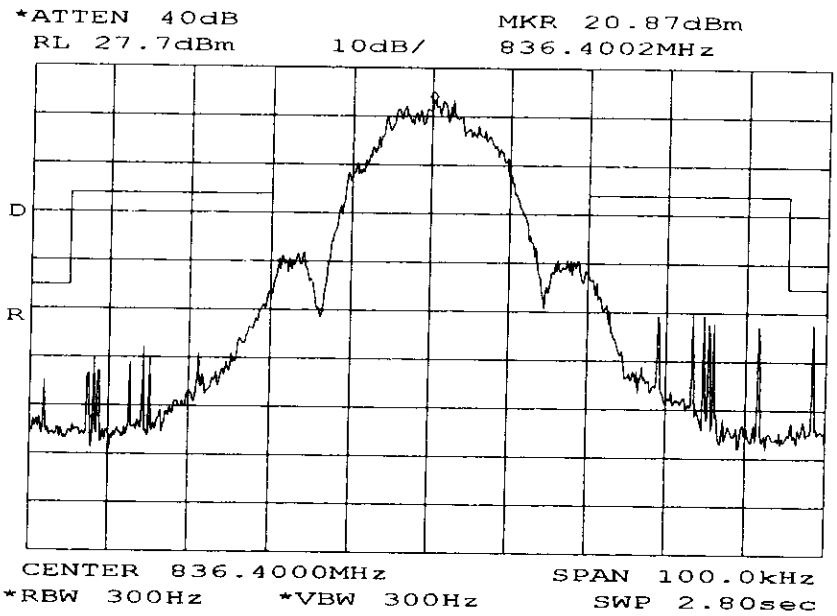
NAME OF TEST: Emission Masks (Occupied Bandwidth)
g98b0369: 1998-Nov-23 Mon 12:42:00
STATE: 2:High Power



POWER: HIGH
MODULATION: DATA GMSK
MASK: AMPS CELLULAR, F1D, DATA

SUPERVISED BY: Morton Flom, P. Eng.

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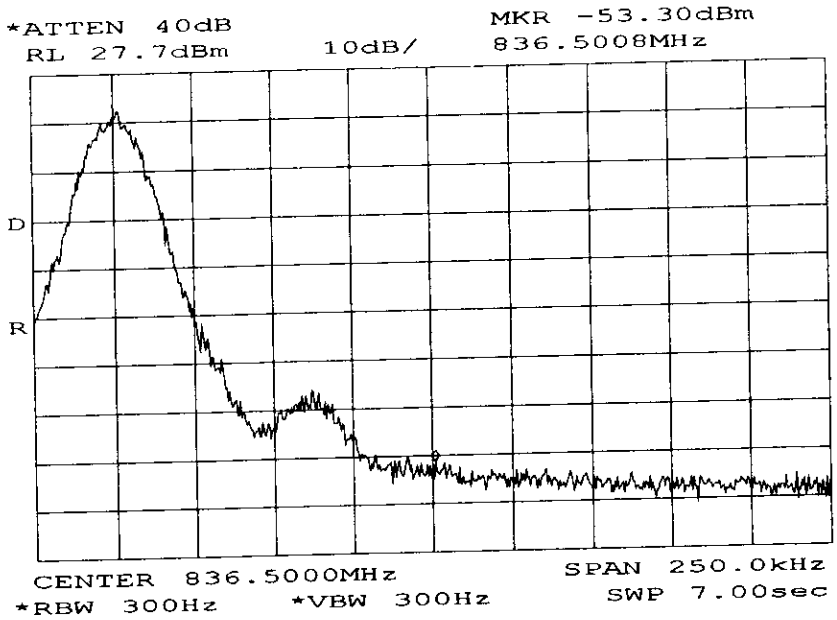
NAME OF TEST: Emission Masks (Occupied Bandwidth)
g98b0370: 1998-Nov-23 Mon 12:48:00
STATE: 2:High Power



POWER: HIGH
MODULATION: DATA GMSK
OFFSET OCCUPIED BANDWIDH

SUPERVISED BY: Morton Flom, P. Eng.

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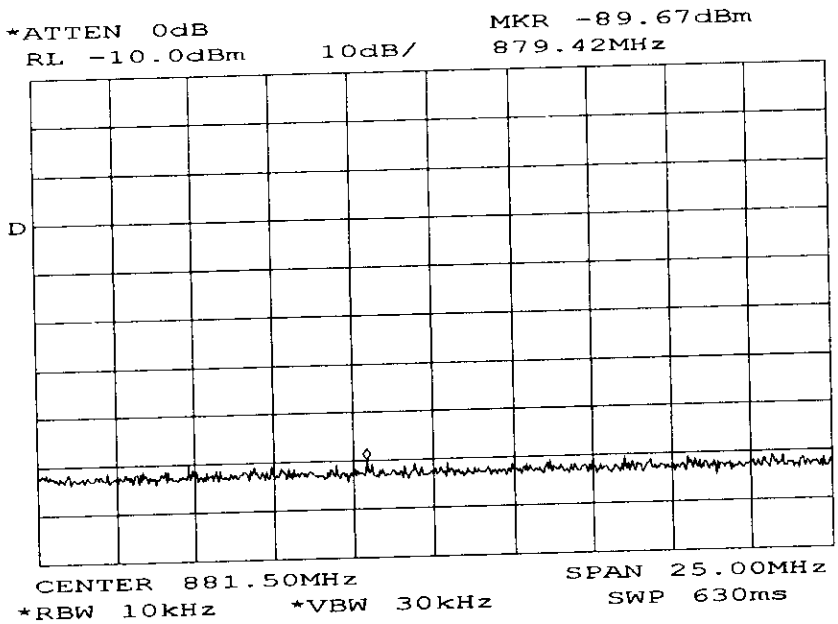
NAME OF TEST: Emission Masks (Occupied Bandwidth)
g98b0372: 1998-Nov-23 Mon 13:22:00
STATE: 1:Low Power



POWER: LOW
MODULATION: DATA GMSK
TX SPURS IN RX CRITICAL BAND

SUPERVISED BY: Morton Flom, P. Eng.

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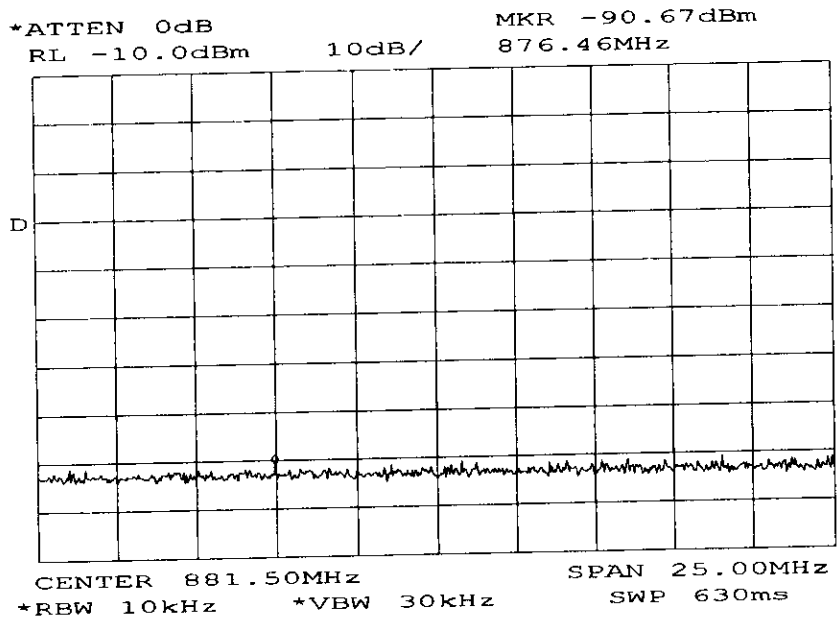
NAME OF TEST: Emission Masks (Occupied Bandwidth)
g98b0373: 1998-Nov-23 Mon 13:30:00
STATE: 2:High Power



POWER: HIGH
MODULATION: DATA GMSK
TX SPURS IN RX CRITICAL BAND

SUPERVISED BY: Morton Flom, P. Eng.

PAGE NO.	18 of 30.
NAME OF TEST:	Spurious Emissions at Antenna Terminals
SPECIFICATION:	47 CFR 2.1051, 22.917
GUIDE:	EIA/IS-19-B-1988 TIA/EIA/IS-137-A-1996
TEST EQUIPMENT:	As per attached page

MEASUREMENT PROCEDURE

1. The EUT was connected to a coaxial attenuator and then to a Spectrum Analyzer.

2. A notch filter was introduced to reduce or eliminate spurious emission which could be generated internally in the spectrum analyzer.

3. Measurements were made over the range from 45 kHz to 10 GHz for the worst case modulation so both the highest and lowest R.F. power settings.

4. All other emissions were 20 dB or more below the limit.

5. Spectrum analyzer bandwidth was set to section 22.917(h) as applicable.

6. MEASUREMENT RESULTS: ATTACHED

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NAME OF TEST: Unwanted Emissions (Transmitter Conducted)
g98b0375: 1998-Nov-23 Mon 14:06:00
STATE: 1:Low Power

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	LEVEL, dBm	LEVEL, dBc	MARGIN, dB
836.400000	1672.708333	-36.6	-44.3	-23.6
836.400000	2509.590000	-47.8	-55.5	-34.8
836.400000	3345.670000	-49.5	-57.2	-36.5
836.400000	4181.966667	-50.5	-58.2	-37.5
836.400000	5018.471667	-50.3	-58	-37.3
836.400000	5854.573333	-50.5	-58.2	-37.5
836.400000	6690.735000	-48.5	-56.2	-35.5
836.400000	7527.783333	-48.5	-56.2	-35.5
836.400000	8364.113333	-48.6	-56.3	-35.6
836.400000	9200.481667	-48.5	-56.2	-35.5
836.400000	10036.348333	-49.5	-57.2	-36.5
836.400000	10873.493333	-46.1	-53.8	-33.1
836.400000	11709.381667	-48.8	-56.5	-35.8
836.400000	12545.863333	-49.1	-56.8	-36.1

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NAME OF TEST: Unwanted Emissions (Transmitter Conducted)
g98c0003: 1998-Dec-01 Tue 15:04:00
STATE: 1:Low Power

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	LEVEL, dBm	LEVEL, dBc	MARGIN, dB
824.04000	1648.076667	-37.8	-45.5	-24.8
824.04000	2471.975000	-65.7	-73.4	-52.7
824.04000	3296.073333	-68.3	-76	-55.3
824.04000	4119.735000	-67.7	-75.4	-54.7
824.04000	4944.456667	-68.7	-76.4	-55.7
824.04000	5768.043333	-68	-75.7	-55
824.04000	6591.938333	-67.5	-75.2	-54.5
824.04000	7416.110000	-67.5	-75.2	-54.5
824.04000	8240.623333	-67.8	-75.5	-54.8
824.04000	9064.698333	-66.8	-74.5	-53.8
824.04000	9888.918333	-67.7	-75.4	-54.7
824.04000	10712.440000	-67.5	-75.2	-54.5
824.04000	11536.906667	-67.2	-74.9	-54.2
824.04000	12360.736667	-66.8	-74.5	-53.8

PAGE NO. 21 of 30.

NAME OF TEST: Unwanted Emissions (Transmitter Conducted)
g98c0001: 1998-Dec-01 Tue 14:44:00
STATE: 2:High Power

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	LEVEL, dBm	LEVEL, dBc	MARGIN, dB
848.97000	1697.940000	-28.1	-55.8	-15.1
848.97000	2546.915000	-46	-73.7	-33
848.97000	3395.531667	-47.8	-75.5	-34.8
848.97000	4244.490000	-47.6	-75.3	-34.6
848.97000	5093.578333	-48.5	-76.2	-35.5
848.97000	5943.148333	-48	-75.7	-35
848.97000	6791.931667	-47.5	-75.2	-34.5
848.97000	7640.768333	-46.3	-74	-33.3
848.97000	8489.295000	-48	-75.7	-35
848.97000	9338.280000	-47.1	-74.8	-34.1
848.97000	10188.075000	-47.3	-75	-34.3
848.97000	11036.350000	-47.5	-75.2	-34.5
848.97000	11885.923333	-47	-74.7	-34
848.97000	12734.668333	-46.5	-74.2	-33.5

PAGE NO. 22 of 30.

NAME OF TEST: Unwanted Emissions (Transmitter Conducted)
g98c0004: 1998-Dec-01 Tue 15:09:00
STATE: 2:High Power

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	LEVEL, dBm	LEVEL, dBc	MARGIN, dB
824.04000	1648.076667	-28.8	-56.5	-15.8
824.04000	2471.806667	-47	-74.7	-34
824.04000	3295.861667	-47.5	-75.2	-34.5
824.04000	4120.546667	-48.8	-76.5	-35.8
824.04000	4944.265000	-48.3	-76	-35.3
824.04000	5767.901667	-48.6	-76.3	-35.6
824.04000	6591.838333	-47.5	-75.2	-34.5
824.04000	7415.863333	-47.1	-74.8	-34.1
824.04000	8240.328333	-46.6	-74.3	-33.6
824.04000	9064.245000	-47.3	-75	-34.3
824.04000	9888.886667	-47.6	-75.3	-34.6
824.04000	10712.021667	-46.6	-74.3	-33.6
824.04000	11536.118333	-47.8	-75.5	-34.8
824.04000	12360.445000	-47.5	-75.2	-34.5

PAGE NO. 23 of 30.

NAME OF TEST: Field Strength of Spurious Radiation

SPECIFICATION: 47 CFR 2.1053(a)

GUIDE: EIA/IS-19-B-1988
TIA/EIA/IS-137-A-1996

TEST EQUIPMENT: As per attached page

MEASUREMENT PROCEDURE

1. A description of the measurement facilities was filed with the FCC and was found to be in compliance with the requirements of Section 15.38, by letter from the FCC dated March 3, 1997, FILE 31040/SIT. All pertinent changes will be reported to the Commission by up-date prior to March 2000.

2. At first, in order to locate all spurious frequencies and approximate amplitudes, and to determine proper equipment functioning, the test sample was set up at a distance of three meters from the test instrument. Valid spurious signals were determined by switching the power on and off.

3. In the field, the test sample was placed on a wooden turntable above ground at three (or thirty) meters away from the search antenna. Excess power leads were coiled near the power supply.

   The cables were oriented in order to obtain the maximum response. At each emission frequency, the turntable was rotated and the search antennas were raised and lowered vertically.

4. The emission was observed with both a vertically polarized and a horizontally polarized search antenna and the worst case was used.

6. The field strength of each emission within 20 dB of the limit was recorded and corrected with the appropriate cable and transducer factors.

7. The worst case for all channels is shown.

8. Measurement results: ATTACHED FOR WORST CASE

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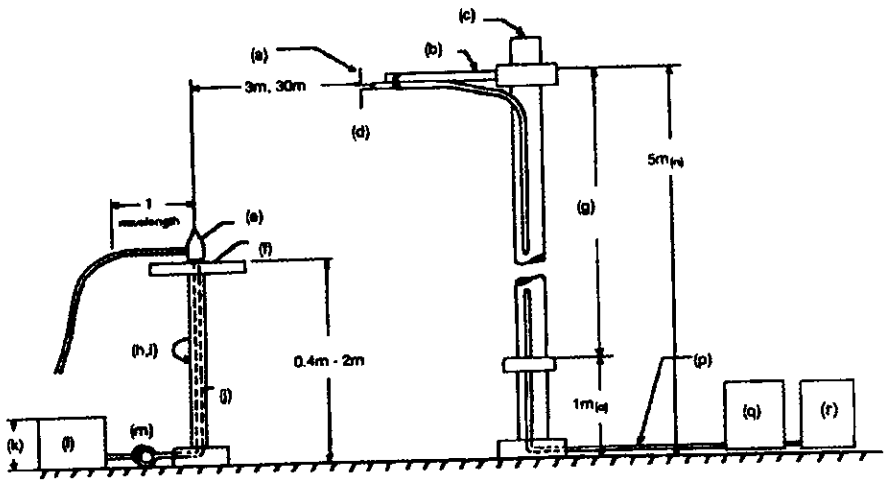
RADIATED TEST SETUP



NOTES:
(a) Search Antenna - Rotatable on boom
(b) Non-metallic boom
(c) Non-metallic mast
(d) Adjustable horizontally
(e) Equipment Under Test
(f) Turntable
(g) Boom adjustable in height.
(h) External control cables routed horizontally at least one wavelength.
(i) Rotatable
(j) Cables routed through hollow turntable center
(k) 30 cm or less
(l) External power source
(m) 10 cm diameter coil of excess cable
(n) 25 cm (V), 1 m-7 m (V, H)
(o) 25 cm from bottom end of 'V', 1m normally
(p) Calibrated Cable at least 10m in length
(q) Amplifier (optional)
(r) Spectrum Analyzer

	Asset	Description	s/n	Cycle (Per ANSI C63.4-1992, 10.1.4)	Last Cal
TRANSDUCER					
___	i00065	EMCO 3109B 100Hz-50MHz	2336	12 mo.	
___	i00033	Singer 94593-1 10kHz-32MHz	0219	12 mo.	
x	i00088	EMCO 3109-B 25MHz-300MHz	2336	12 mo.	Oct-98
x	i00089	Aprel 2001 200MHz-1GHz	001500	12 mo.	Oct-98
x	i00103	EMCO 3115 1GHz-18GHz	9208-3925	12 mo.	Oct-98
___	i00085	EMCO 3116 10GHz-40GHz	2076	12 mo.	
AMPLIFIER					
___	i00028	HP 8449A	2749A00121	12 mo.	Mar-98
SPECTRUM ANALYZER					
___	i00029	HP 8563E	3213A00104	12 mo.	
x	i00033	HP 85462A	3625A00357	12 mo.	Dec-97
___	i00048	HP 8566B	2511AD1467	6 mo.	Mar-98

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NAME OF TEST: Field Strength of Spurious Radiation
g98b0382: 1998-Nov-24 Tue 13:29:00
STATE: 1:Low Power

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	METER, dBuV	CF, dB	uV/m @ 3m	ERP, dBm	MARGIN , dB
824.040000	1648.080000	35.67	31.65	2322.74	-30.05	-17.1
836.400000	1672.700250	30.33	31.81	1279.38	-35.25	-22.3
848.970000	1697.942500	29.83	31.97	1230.27	-35.55	-22.6
824.040000	2472.120000	46.5	5.83	413.52	-45.05	-32.1
836.400000	2509.217084	45.83	5.99	389.94	-45.55	-32.6
848.970000	2547.029167	45.83	6.18	398.57	-45.35	-32.4
824.040000	3296.160000	43.17	9.32	421.21	-44.85	-31.9
836.400000	3345.683751	41.17	9.48	340.8	-46.75	-33.8
848.970000	3396.049167	40.83	9.65	334.2	-46.85	-33.9
824.040000	4120.200000	43	11.34	521.19	-43.05	-30.1
836.400000	4182.150418	41.5	11.32	437.52	-44.55	-31.6
848.970000	4245.069167	38.83	11.3	321	-47.25	-34.3
824.040000	4944.240000	41.17	13.17	521.19	-43.05	-30.1
836.400000	5018.617085	38.67	13.46	404.11	-45.25	-32.3
848.970000	5094.089167	39.33	13.72	449.26	-44.35	-31.4
824.040000	5768.280000	39.5	15.55	565.59	-42.35	-29.4
836.400000	5855.083752	38.83	15.73	534.56	-42.85	-29.8
848.970000	5943.109167	37.83	15.9	485.85	-43.65	-30.7
824.040000	6592.320000	39	16.76	613.76	-41.65	-28.6
836.400000	6691.550419	38.33	17.07	588.84	-41.95	-29
848.970000	6792.129167	37.17	17.38	533.95	-42.85	-29.9
824.040000	7416.360000	40.83	19.21	1004.62	-37.35	-24.4
836.400000	7528.017086	38	19.49	749.03	-39.85	-26.9
848.970000	7641.149167	38	19.66	763.84	-39.75	-26.7
824.040000	8240.400000	40	20.6	1071.52	-36.75	-23.8
836.400000	8364.483753	39.33	20.81	1016.25	-37.25	-24.3
848.970000	8490.169167	38.5	21.03	947.33	-37.85	-24.9

Fundamental Emissions (As previously shown on page 7)
g98b0377: 1998-Nov-23 Mon 15:39:00
STATE: 1:Low Power
AMPS MODE:

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	METER, dBuV/m	CF, dB	uV/m @ 3m	ERP, dBm	ERP, Watts
824.040000	824.040000	75.72	30.66	208449.09	9.05	0.008
836.400000	836.403000	76.43	30.69	226986.49	9.75	0.009
836.400000	848.970000	76.15	30.73	220800.47	9.55	0.009

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NAME OF TEST: Field Strength of Spurious Radiation
g98b0381: 1998-Nov-24 Tue 09:18:00
STATE: 2:High Power

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	METER, dBuV	CF, dB	uV/m @ 3m	ERP, dBm	MARGIN , dB
824.040000	1648.235000	47.33	31.65	8892.01	-18.35	-5.4
836.400000	1672.850000	43.33	31.81	5714.79	-22.25	-9.3
848.970000	1697.990000	41.5	31.97	4715.2	-23.95	-10.9
824.040000	2472.325000	38.83	35.83	5407.54	-22.75	-9.7
836.400000	2509.450000	51.67	5.99	763.84	-39.75	-26.7
848.970000	2547.110000	51.83	6.18	795.24	-39.35	-26.4
824.040000	3296.215000	46.83	9.32	641.95	-41.25	-28.3
836.400000	3345.600000	47.17	9.48	679.99	-40.75	-27.8
848.970000	3395.796667	46.67	9.65	654.64	-41.05	-28.1
824.040000	4120.255001	47.5	11.34	874.98	-38.55	-25.6
836.400000	4182.000000	46.17	11.32	749.03	-39.85	-26.9
848.970000	4244.766667	41.17	11.3	420.24	-44.95	-31.9
824.040000	4944.261668	42	13.17	573.46	-42.25	-29.2
836.400000	5018.400000	39.5	13.46	444.63	-44.45	-31.4
848.970000	5093.736667	39	13.71	432.02	-44.65	-31.7
824.040000	5768.268335	39	15.55	533.95	-42.85	-29.9
836.400000	5854.800000	37.83	15.73	476.43	-43.85	-30.8
848.970000	5942.706667	38.67	15.9	535.18	-42.85	-29.8
824.040000	6592.275002	38.17	16.76	557.83	-42.45	-29.5
836.400000	6691.200000	37.83	17.07	555.9	-42.45	-29.5
848.970000	6791.676667	37.83	17.37	575.44	-42.15	-29.2
824.040000	7416.281669	39	19.21	813.77	-39.15	-26.2
836.400000	7527.750000	38.17	19.49	763.84	-39.75	-26.7
848.970000	7640.646667	37.67	19.66	735.36	-40.05	-27.1
824.040000	8240.288336	38.83	20.6	936.48	-37.95	-25
836.400000	8364.150000	38.83	20.81	959.4	-37.75	-24.8
848.970000	8489.616667	38.33	21.03	928.97	-38.05	-25

Fundamental Emissions (As previously shown on page 7)
g98b0376: 1998-Nov-23 Mon 12:00:00
STATE: 2:High Power
AMPS MODE:

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	METER, dBuV/m	CF, dB	uV/m @ 3m	ERP, dBm	ERP, Watts
824.040000	824.038000	95.29	30.66	1983809.66	28.55	0.716
836.400000	836.400000	95.86	30.69	2125690.35	29.15	0.822
848.970000	848.968000	95.08	30.73	1952090.73	28.45	0.700

PAGE NO.	27 of 30.
NAME OF TEST:	Frequency Stability (Temperature Variation)
SPECIFICATION:	47 CFR 2.1055(a)(1)
GUIDE:	EIA/IS-19-B-1988 TIA/EIA/IS-137-A-1996
TEST CONDITIONS:	As Indicated
TEST EQUIPMENT:	As per previous page

MEASUREMENT PROCEDURE

1. The EUT and test equipment were set up as shown on the following page.

2. With all power removed, the temperature was decreased to -30°C and permitted to stabilize for three hours. Power was applied and the maximum change in frequency was noted within one minute.

3. With power OFF, the temperature was raised in 10°C steps. The sample was permitted to stabilize at each step for at least one-half hour. Power was applied and the maximum frequency change was noted within one minute.

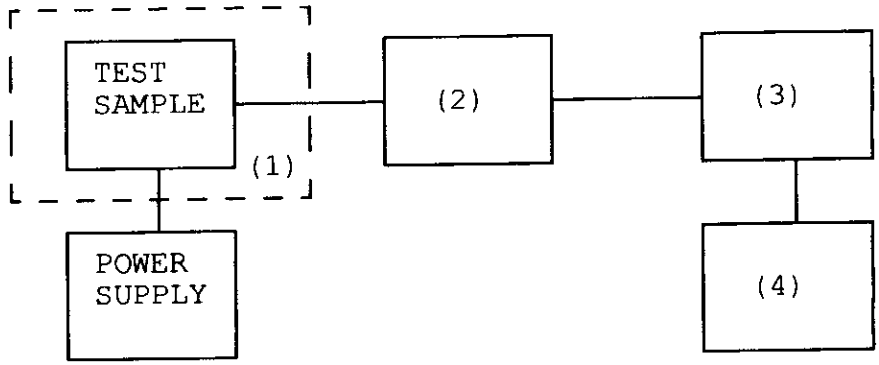
4. The temperature tests were performed for the worst case.

5. MEASUREMENT RESULTS: ATTACHED

PAGE NO. 28 of 30.

TRANSMITTER TEST SET-UP

TEST A. OPERATIONAL STABILITY
TEST B. CARRIER FREQUENCY STABILITY
TEST C. OPERATIONAL PERFORMANCE STABILITY
TEST D. HUMIDITY
TEST E. VIBRATION
TEST F. ENVIRONMENTAL TEMPERATURE
TEST G. FREQUENCY STABILITY: TEMPERATURE VARIATION
TEST H. FREQUENCY STABILITY: VOLTAGE VARIATION



	Asset	Description	s/n
(1)		TEMPERATURE, HUMIDITY, VIBRATION	
x	i00027	Tenny Temp. Chamber	9083-765-234
___	i00	Weber Humidity Chamber	
___	i00	L.A.B. RVH 18-100	
(2)		COAXIAL ATTENUATOR	
x	i00122	NARDA 766-10	7802
___	i00123	NARDA 766-10	7802A
___	i00113	SIERRA 661A-3D	1059
___	i00069	BIRD 8329 (30 dB)	10066
(3)		R.F. POWER	
___	i00014	HP 435A POWER METER	1733A05839
x	i00039	HP 436A POWER METER	2709A26776
x	i00020	HP 8901A POWER MODE	2105A01087
(4)		FREQUENCY COUNTER	
___	i00042	HP 5383A	1628A00959
___	i00019	HP 5334B	2704A00347
x	i00020	HP 8901A	2105A01087

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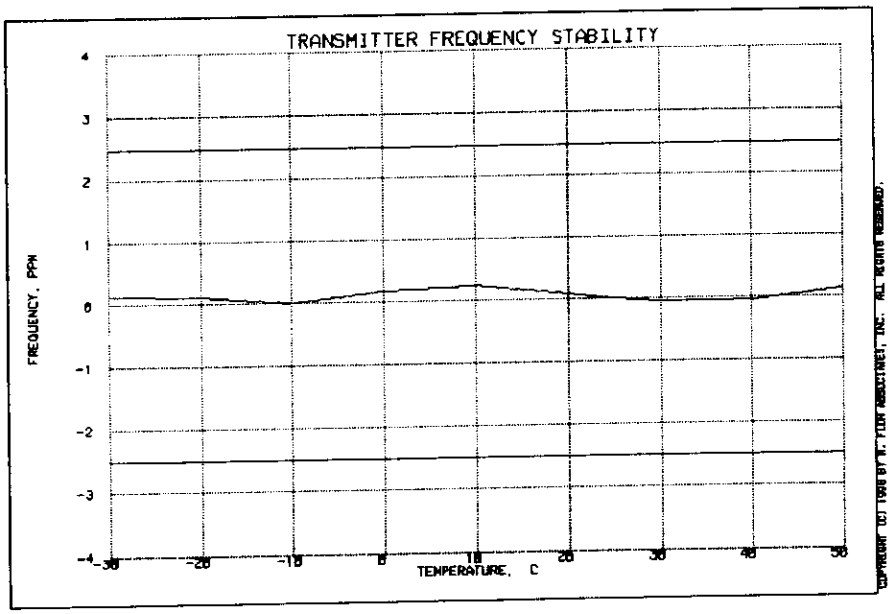
NAME OF TEST: Frequency Stability (Temperature Variation)
g98b0333: 1998-Nov-24 Tue 12:44:00
STATE: 0:General



SUPERVISED BY:

Morton Flom, P. Eng.

PAGE NO. 30 of 30.

NAME OF TEST: Frequency Stability (Voltage Variation)

SPECIFICATION: 47 CFR 2.1055 (b) (1)

GUIDE: EIA/IS-19-B-1988
TIA/EIA/IS-137-A-1996

TEST EQUIPMENT: As per previous page

MEASUREMENT PROCEDURE

1. The EUT was placed in a temperature chamber at 25±5°C and connected as for "Frequency Stability - Temperature Variation" test.
2. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.
3. The variation in frequency was measured for the worst case.

RESULTS: Frequency Stability (Voltage Variation)
g98b0380: 1998-Nov-24 Tue 12:43:42
STATE: 0:General

LIMIT, ppm = 2.5
LIMIT, Hz = 2091
BATTERY ENDPOINT (Voltage) = 3.3

% of STV	Voltage	Frequency, MHz	Change, Hz	Change, ppm
85	3.06	836.400000	0	0.00
100	3.6	836.400000	0	0.00
115	4.14	836.400010	10	0.01
85	3.2	836.399930	-70	-0.08

SUPERVISED BY: Morton Flom, P. Eng.

TESTIMONIAL AND STATEMENT OF CERTIFICATION

THIS IS TO CERTIFY THAT:

1. THAT the application was prepared either by, or under the direct supervision of, the undersigned.

2. THAT the technical data supplied with the application was taken under my direction and supervision.

3. THAT the data was obtained on representative units, randomly selected.

4. THAT, to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct.

CERTIFYING ENGINEER: Morton Flom, P. Eng.

STATEMENT OF QUALIFICATIONS

EDUCATION:

1. B. ENG. in ENGINEERING PHYSICS, 1949, McGill University, Montreal Canada.

2. Post Graduate Studies, McGill University & Sir Goerge Williams University, Montreal.

PROFESSIONAL AFFILIATIONS:

1. ARIZONA SOCIETY OF PROFESSIONAL ENGINEERS (NSPE), #026 031 821.

2. ORDER OF ENGINEERS (QUEBEC) 1949. #45 34.

3. ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOPHYSICISTS & GEOLOGISTS OF ALBERIA #5916.

4. REGISTERED ENGINEERING CONSULTANT - GOVERNMENT OF CANADA, DEPARTMENT OF COMMUNICATIONS. Radio Equipment approvals.

5. IEEE, Lifetime member no. 041/204 (Member since 1947).

EXPERIENCE:

1. Research/Development/Senior Project Engineer. R.C.A. LIMITED (4 years).

2. Owner/Chief Engineer of Electronics. Design/Manufacturing & Cable TV Companies (10 years)

3. CONSULTING ENGINEER (over 25 years).

M. Flom P. Eng

MORTON FLOM, P. Eng.