



A2LA # 0844-1



ELA #116

**APPLICATION FOR CERTIFICATION
OF A CLASS B DEVICE
(Scanning Receiver)**

Per
47 CFR, Part 15 Subpart B

EUT: 8600B

PREPARED FOR APPLICANT:
AOR U.S.A Inc
20655 South Western Ave. Suite 112
Torence, CA 90501

REPORT #06079-1FCC
Test Dates: **8/15-16,2000**

Prepared By:
DNB ENGINEERING, INC.
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Revision Letter	Number of Pages	Page No. of Rev.	Description	Date
1A	37		Document Release	9/13/2000

TRANSMITTAL SUMMARY

Unit tested: AR8600B

Specifications: ANSI C63.4 1992
47 CFR, Part 15 Subpart B

Purpose of Report: This report was prepared to document the status of the AR8600B with requirements of the regulations listed above.

Test Summary The EUT's compliance status according to the tests performed is as follows.

Refer to Section 1.3

CERTIFICATION OF TEST DATA - per 2.911(d)

This report, containing emissions test data and evaluations, has been prepared by an independent electromagnetic compatibility laboratory, DNB ENGINEERING, in accordance with the applicable specifications and instructions required per the Introduction. DNB Engineering has been evaluated and approved to do these tests as proof of compliance.

The data evaluation and equipment configuration presented herein are a true and accurate representation of the measurements of the test emissions characteristics as of the dates and at the times of the test under the conditions herein specified.

Equipment Tested: AR8600B
FCC ID: NVJAR8600B
Dates of Test: 8/15-16,2000

Test Performed: _____
Yancey Staples
Test Engineer
Date

Test Report Reviewed: _____
Jeff Williams
Documentation Supervisor
Date

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1. INTRODUCTION

1.1 Administrative Data Per 2.1033(a) and 2.911(c)

1.1.1 REQUEST FOR CERTIFICATION Per 2.1033(b)1:

Applicant: AOR U.S.A Inc
20655 South Western Ave. Suite 112
Torence, CA 90501

Contact: Taka Nakayama
Phone: 310-787-8615

Manufacturer: Same as above

Dates of Test: 8/15-16,2000

Equipment Under Test (EUT): AR8600B
FCC ID: NVJAR8600B

1.2 Related Submittals/Grants

All Peripherals possess grants.

1.3 Purpose of Tests

The purpose of this series of tests was to demonstrate the Electromagnetic Compatibility (EMC) characteristics of the EUT. The following tests were performed:

REQUIREMENTS	STATUS
CFR 47 Part 15	
Radiated Emissions (15.109(g))	COMPLIANT Class B
Conducted Emissions (15.109(e))	COMPLIANT Class B

The report shall not be reproduced, except in full, without the written approval of DNB ENGINEERING, INC. Results contained in this report relate only to the item tested.

2. TEST DESCRIPTION

2.1 System Configuration Table

Config-uration	Unit Name - Processor, Monitor, Printer, Cable, etc. (indent for features of a unit)	Style/Model/Part No.	Serial Number	Obj. of test	VAC 120	Comments/ FCC ID#
A	AR8600B			■	■	NVJAR8600B
	Power Supply	AA8600UL AOR		■	■	60Hz/17w
	PCB			■		
	CPU PCB			■		
	Option PCB			■		
	VR PCB			■		
	BC PCB			■		

■ - Specific device(s) for which this test is being conducted.

2.2 Equipment Description

The AR8600B is a transportable wide band all mode receiver.

2.3 Circuit Description - per 2.1033(b)4

Electronically submitted.

2.3.1 Mode of Operation

The AR8600B was powered up and put into the scan mode.

2.3.2 Modifications to EUT

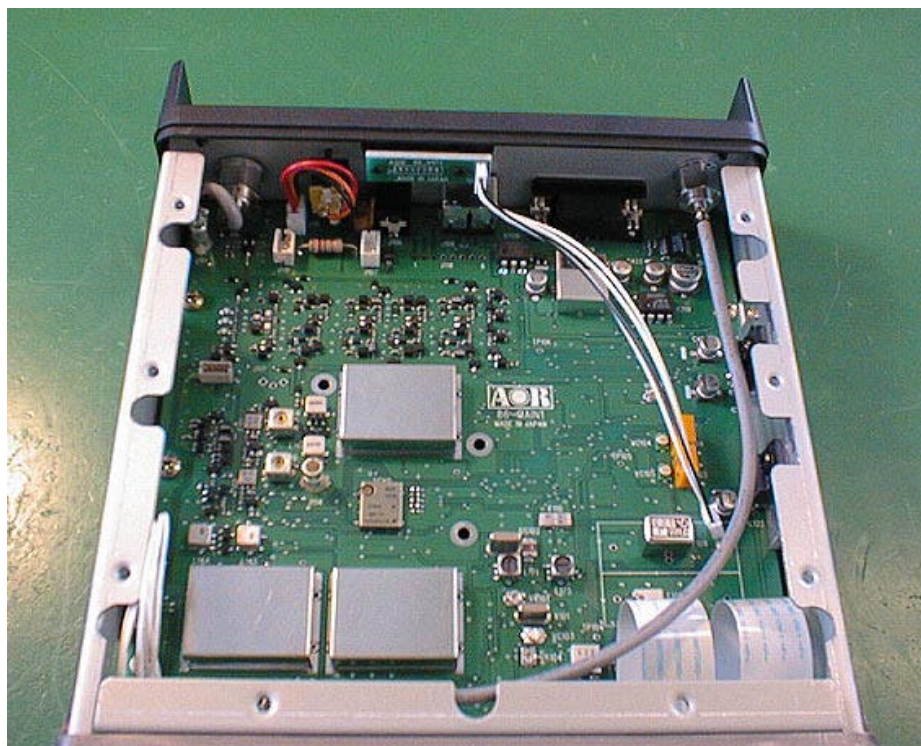
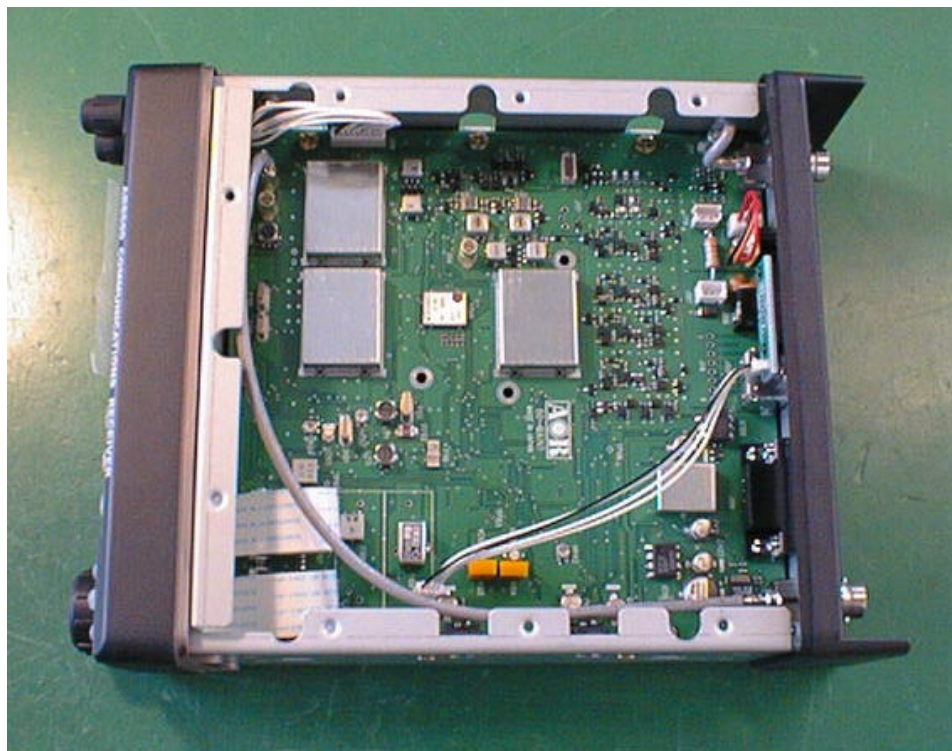
2.4 Photograph of EUT - per 2.1033(b)(7)

EUT: AR8600B

VIEW: Front

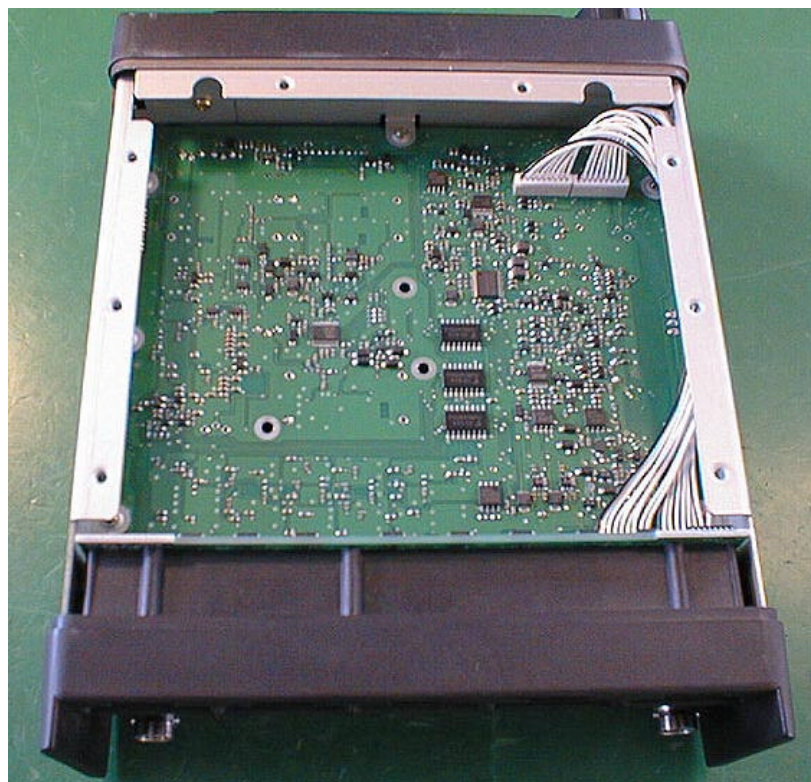
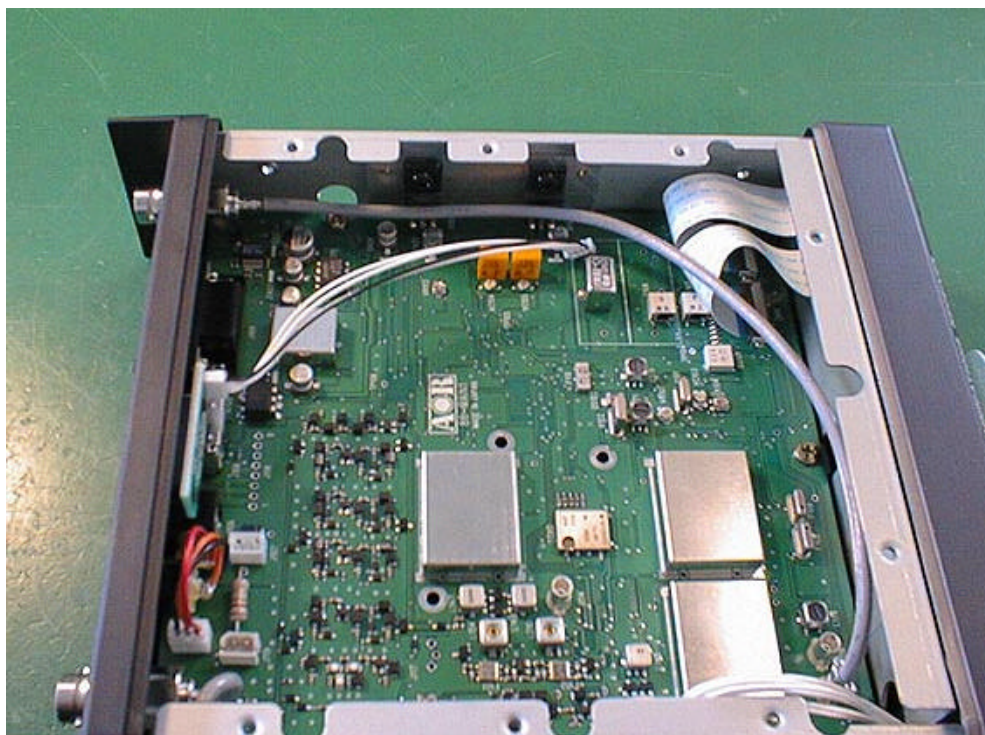


EUT: AR8600B
VIEW: Internals Top View

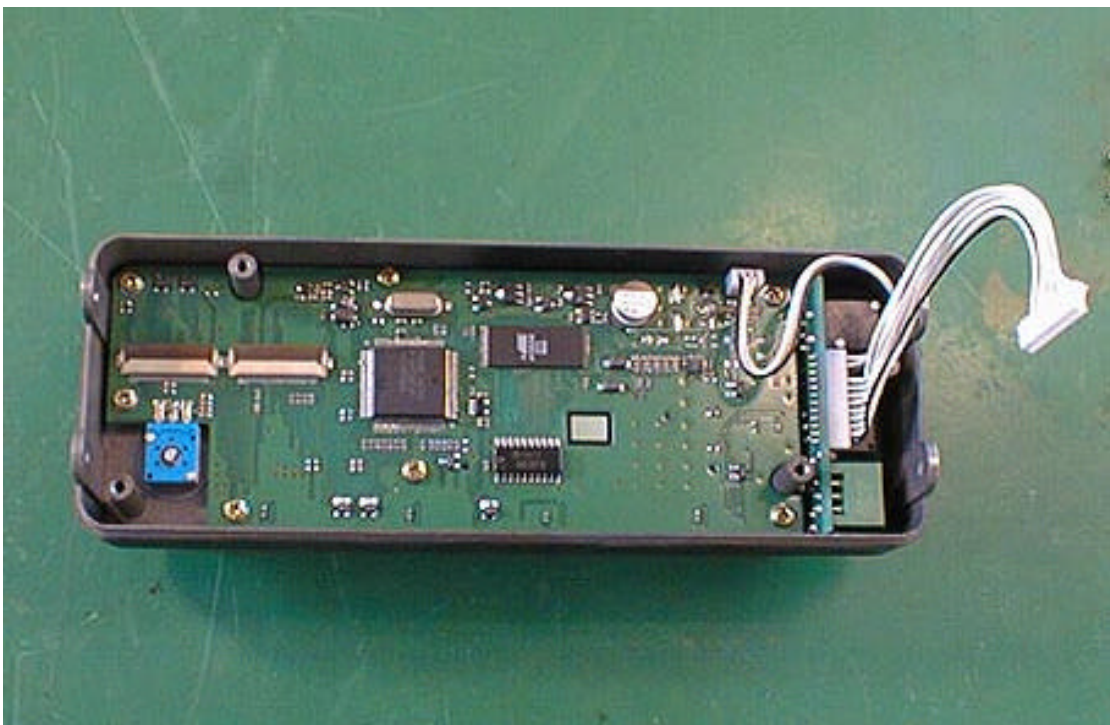
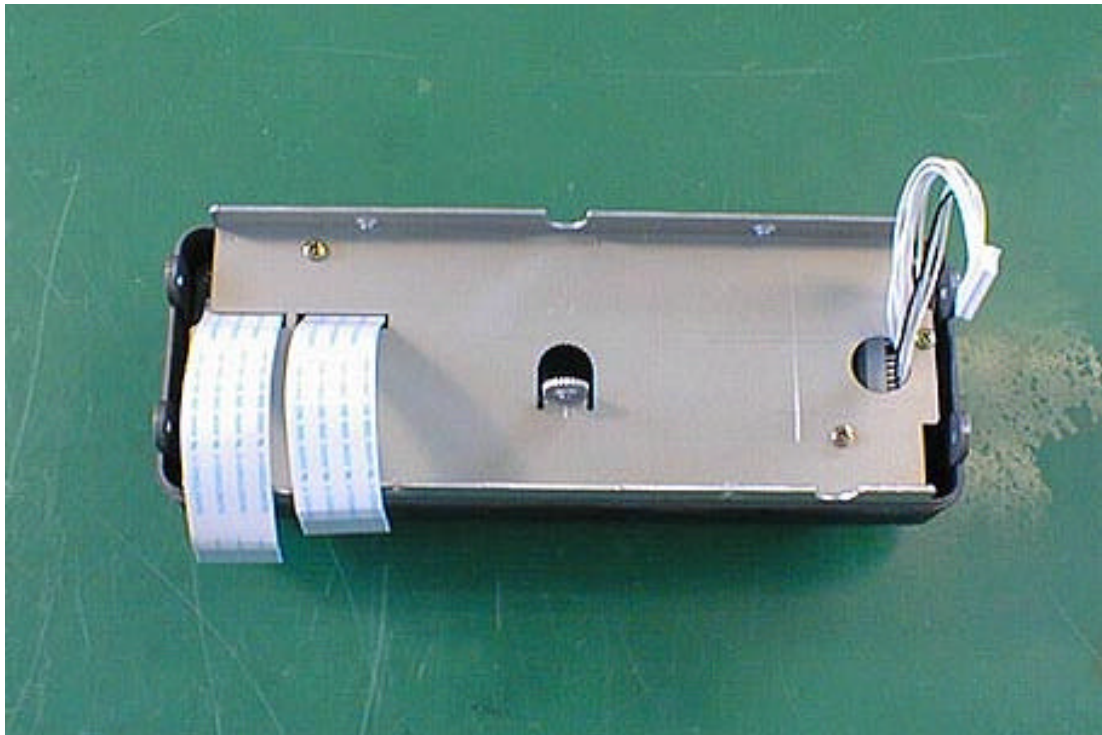


EUT: AR8600B

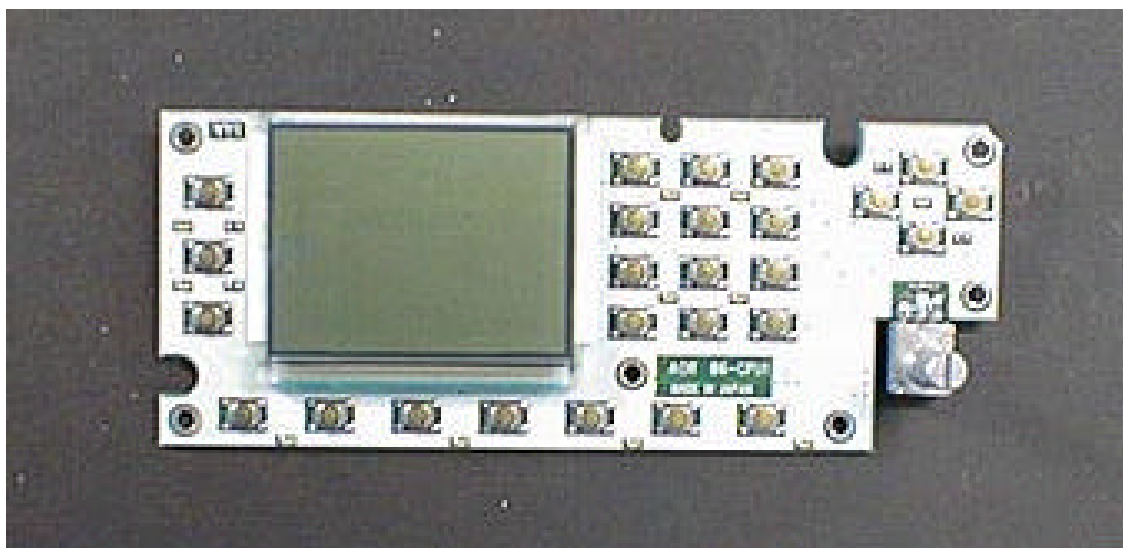
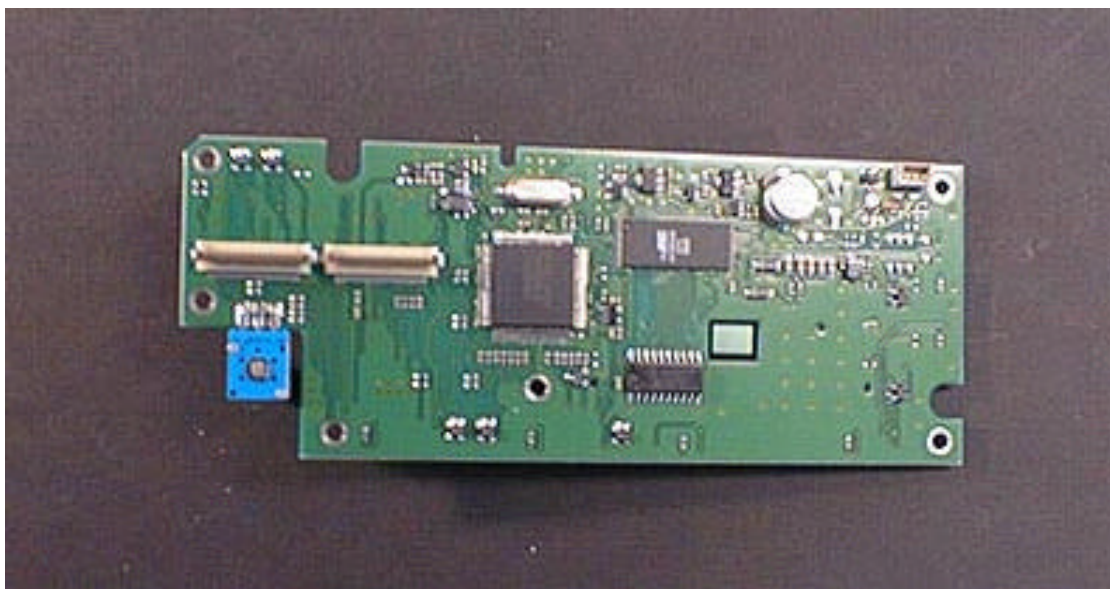
VIEW: Internals Main Board Top & Bottom View



EUT: AR8600B
VIEW: Internals Front Panel

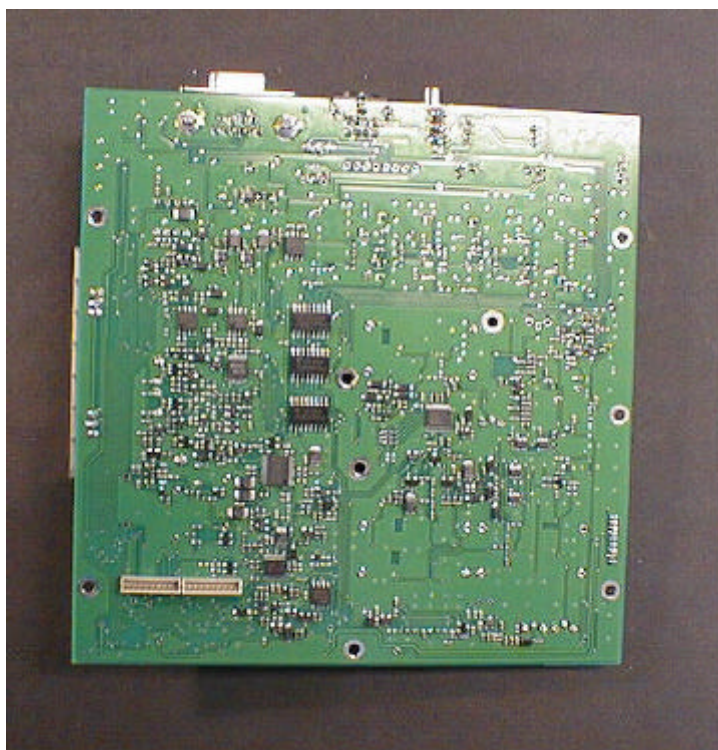
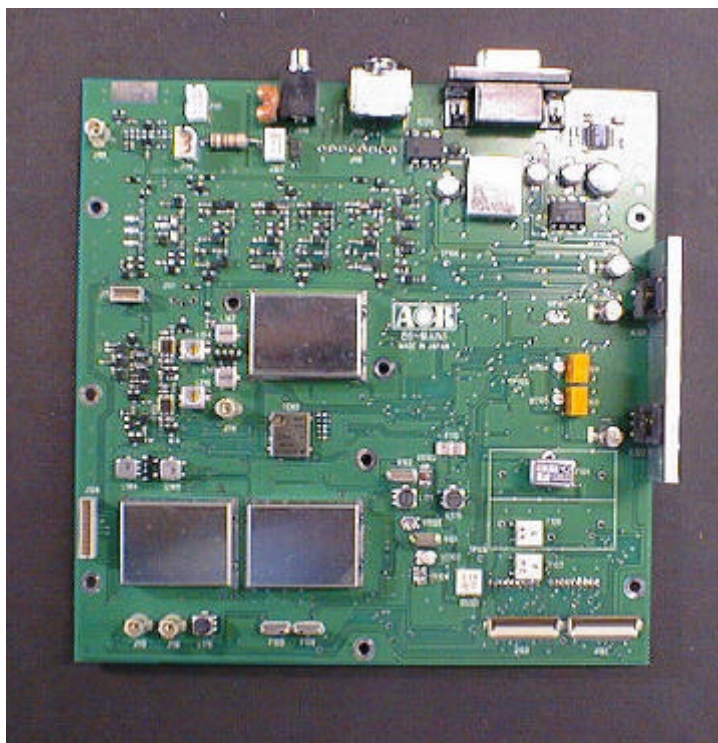


EUT: AR8600B
VIEW: Internals CPU PCB



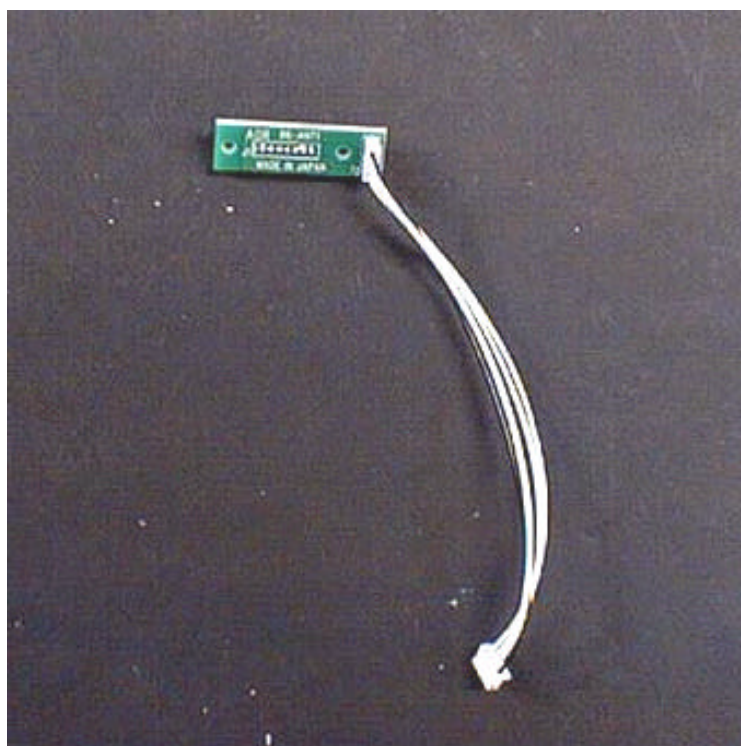
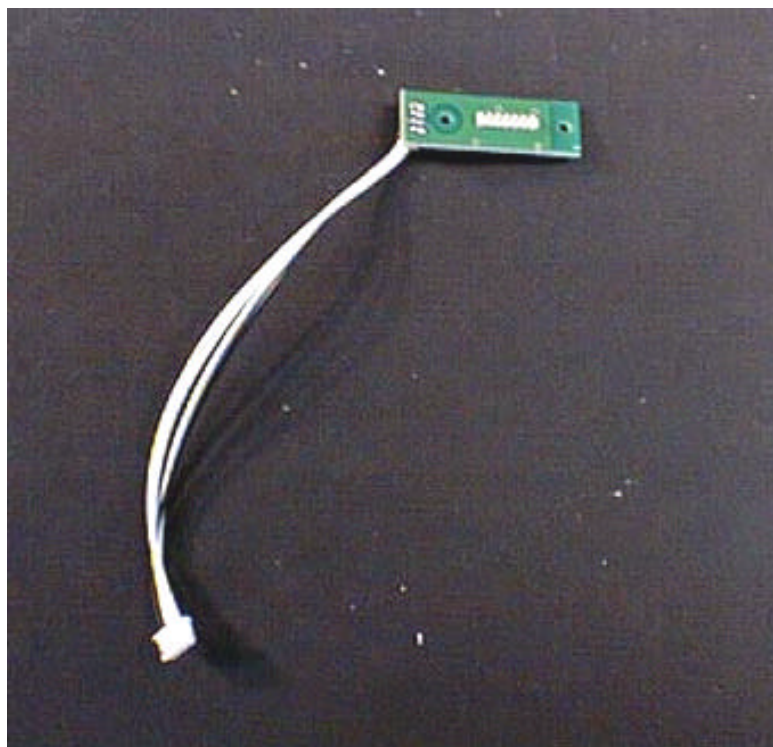
EUT: AR8600B

VIEW: Internals Main PCB Front & Back



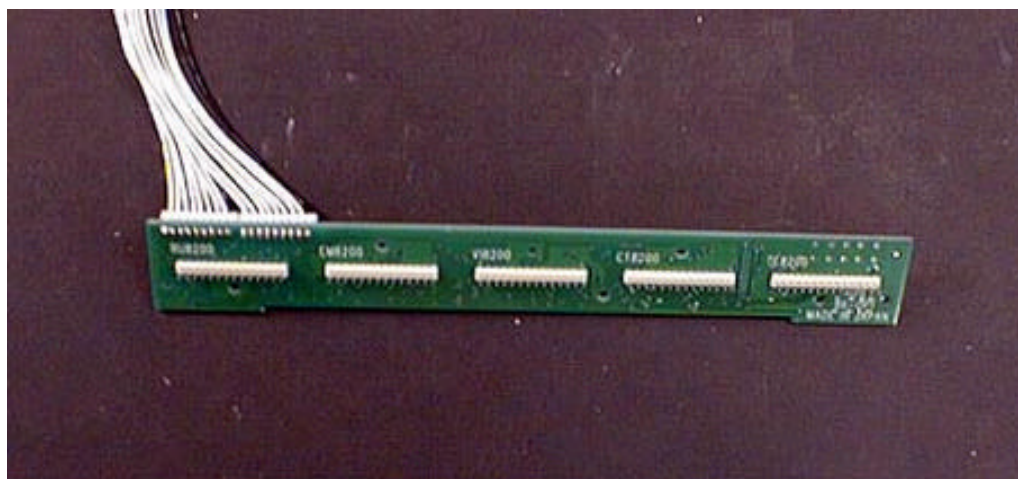
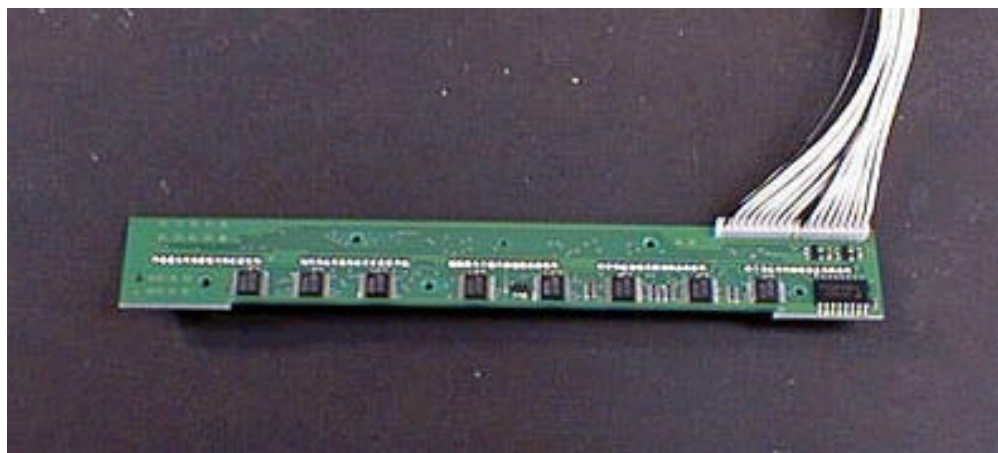
EUT: AR8600B

VIEW: Internals BC PCB Front & Back



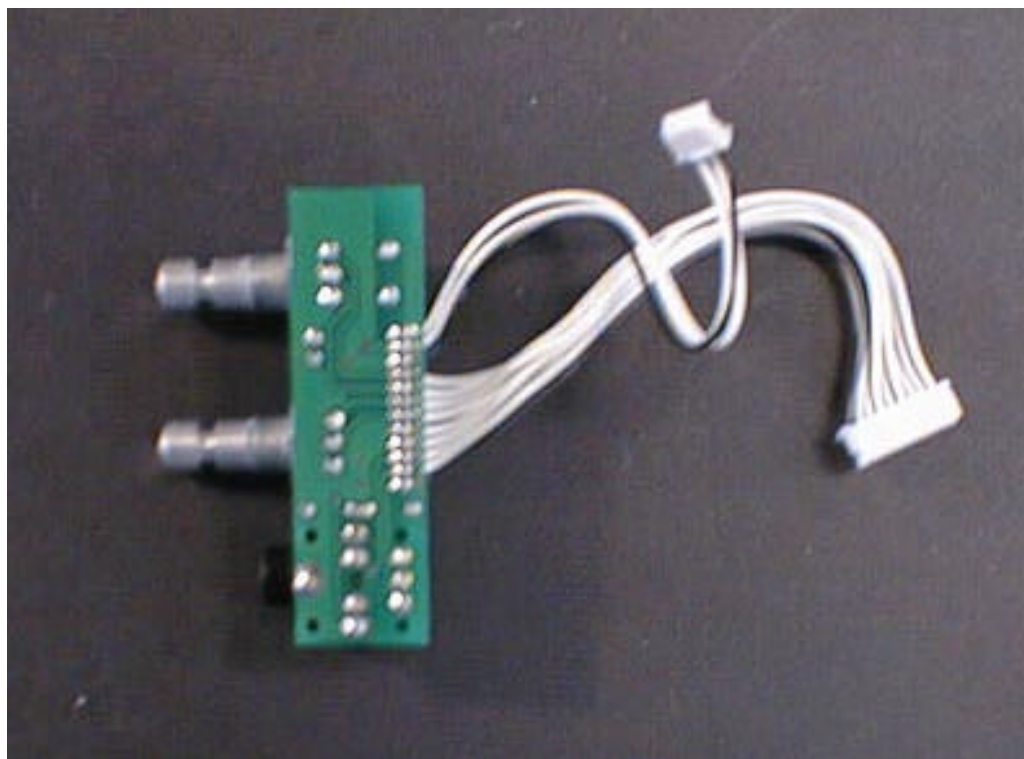
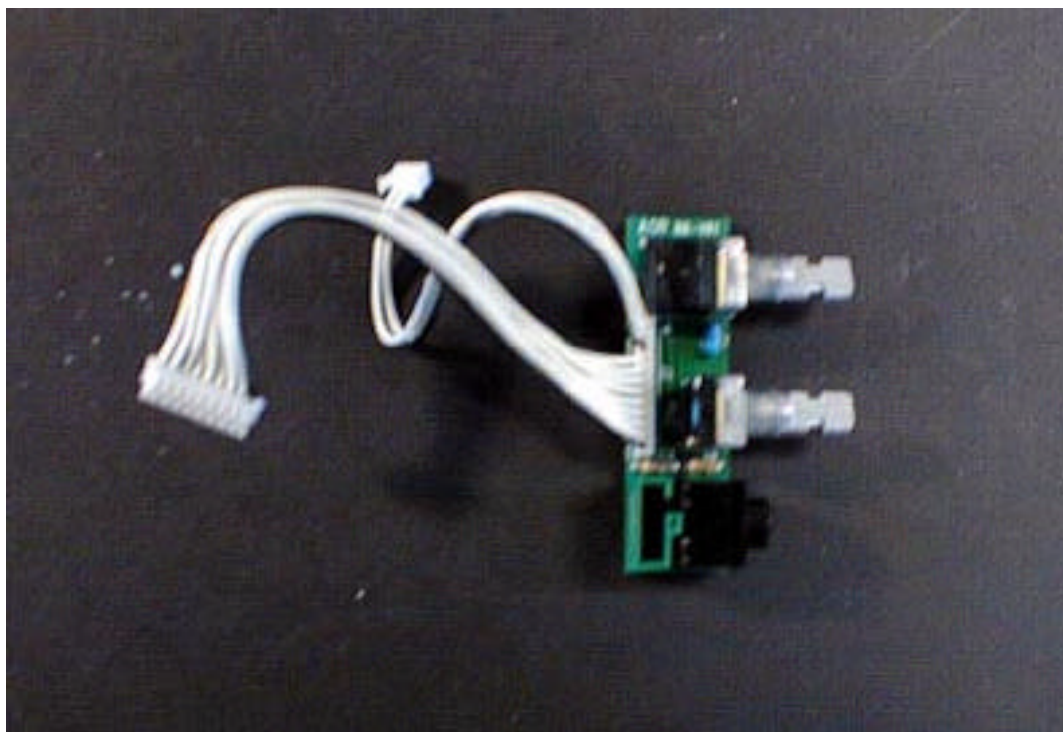
EUT: AR8600B

VIEW: Internals Option PCB Front & Back



EUT: AR8600B

VIEW: Internals VR PCB Front & Back



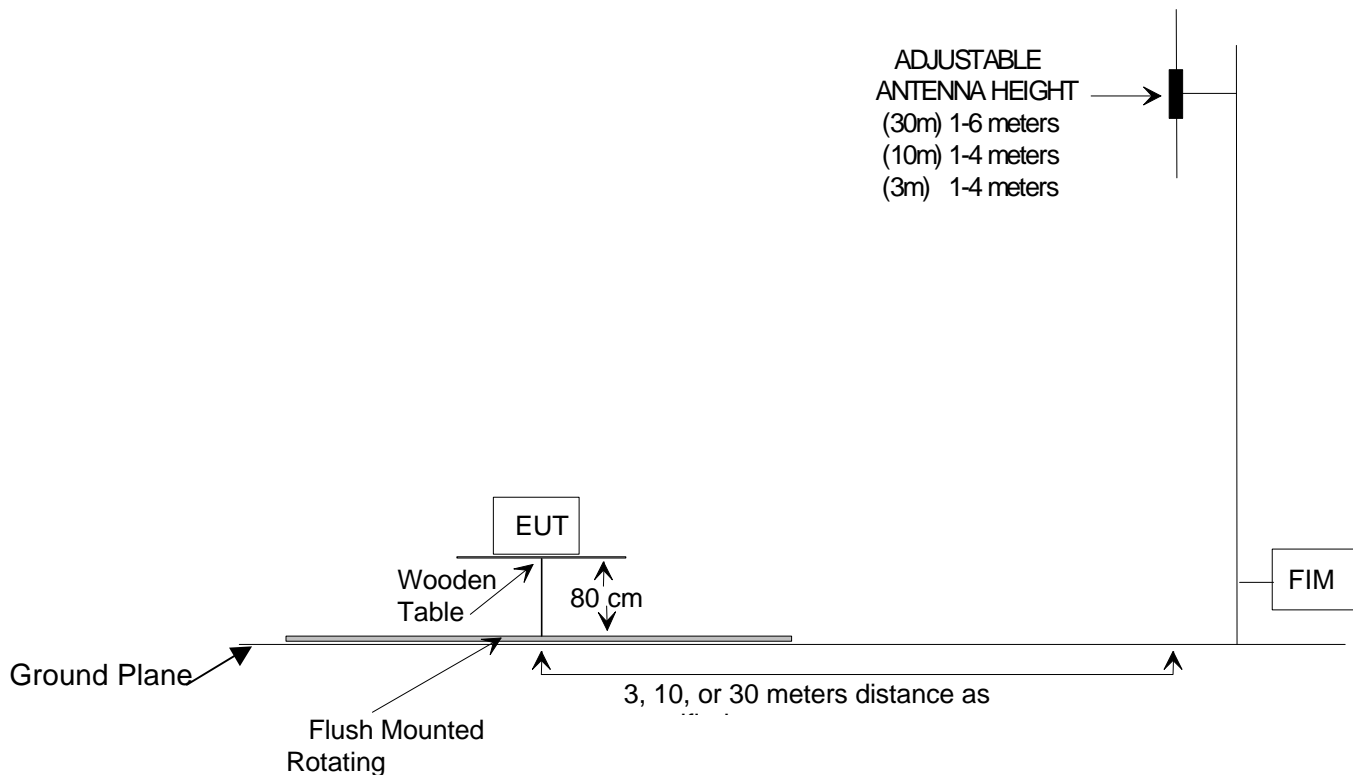
3. EMISSIONS FCC PART 15

per 47 CFR, Part 15 Subpart B

3.1 Radiated Emissions Test Setup and Procedure - Per 2.1033(b)(6) Per 2.947(a)

The EUT was placed on a wooden table 1 meter wide and 1.5 meters long which rests on a flush mounted, steel-top turntable on the open area test site as shown in Section 3.1.1. The top of the table is 80 cm above the ground plane. The turn-table can be rotated 360 degrees. Measuring antenna is set at the prescribed distance. Measurements are made with broad band antennas that have been correlated with tuned dipole antennas. The mast is 4.5 meters high and is self-supporting. The height of the antenna can be varied from 1 to 4 meters. Positioning of the antenna is controlled remotely.

3.1.1 Spurious Radiation Test Site Per 2.1033(b)6



Radiated Test Setup and Procedure - cont'd

The EUT is put into the operational test mode as stated in Section 2.3.1 is then started.

The spectrum analyzer is setup to store the peak emission over the frequency range of the antenna. Peak EUT and ambient emissions are stored while the turntable is rotated 360°. The Peak spectrum analyzer trace is then plotted with the addition of antenna and cable correction factors. The limit is plotted on the same graph. A receiver with CISPR Quasi Peak detector is then used on the frequencies identified as the highest with respect to the plotted limit. Ambients are noted on the graph along with EUT emissions. The highest emissions are maximized.

To maximize emissions levels, the turntable is rotated and the antenna is raised and lowered to determine the point of maximum emanations. The cables are then manipulated at that point to maximize emissions. Measurements are made with the antennas in each horizontal and vertical polarization. The data obtained from these tests is corrected with the proper cable, preamplifier and antenna factors. The results are then transcribed onto tables that show the maximum emission levels. The highest emissions are listed in a Radiated Emissions Summary table.

If no emissions can be found, the lowest harmonics of the EUT clocks within the bands of the standard are tuned to with the receiver. If no emissions are found, the noise floor will be entered into the table and noted. A minimum of six frequencies will be logged. Summary results will reflect only actual emissions from the EUT.

Radiated Test Setup and Procedure - cont'd

The field intensity measurements are made using standard techniques with a spectrum analyzer or EMI receiver as the calibrated Field Intensity Meter (FIM). Preamplifiers and filters are used when required.

When using the Hewlett Packard Model 8568B Spectrum Analyzer as the FIM, the Analyzer is calibrated to read signal level in dBm. Where:

$$0 \text{ dBm (50 ohms)} = 107 \text{ dBuV (50 ohms)}$$

The signal level (dBuV) = indicated signal level (dBm) + 107 dB. To obtain the signal level in dBuV/m it is necessary to add the antenna factor in dB.

3.1.2 Example Of Typical Calculation Per 2.1033(b)6

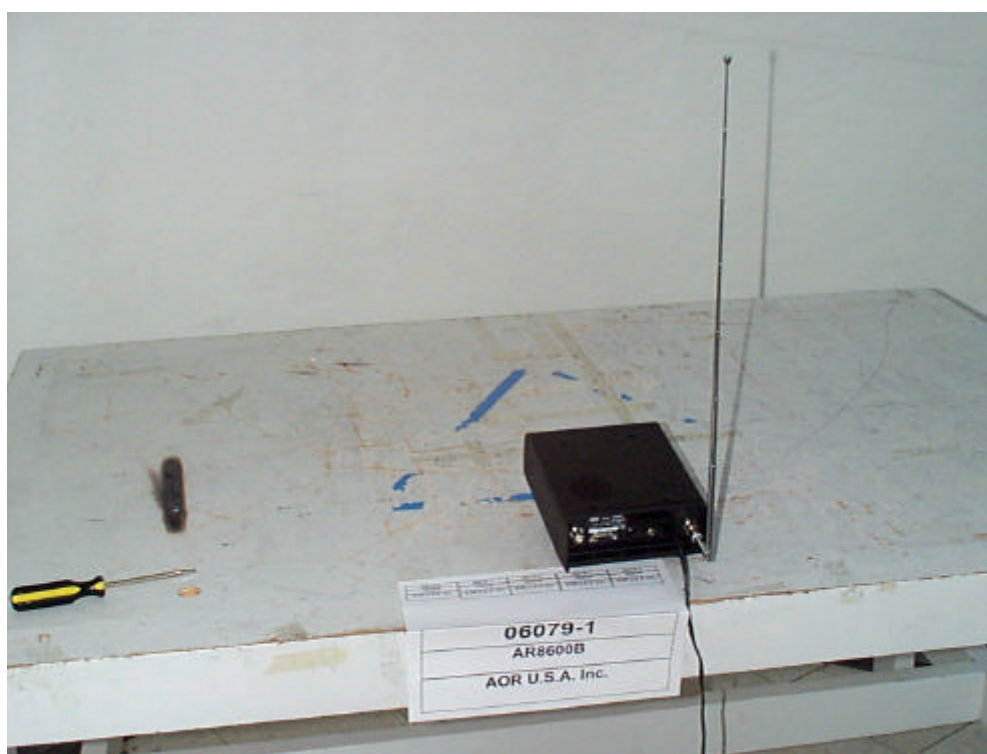
Measurement Distance = 3 Meter		
Rohde and Schwarz reading @ 60 MHz	→	49.0 dBuV
Antenna Factor	+7.5 dBuV	
Cable Loss	+2.0 dBuV	
Preamplifier	-25.5 dBuV	
	→	-16.0 dBuV
Field Strength dBuV/m at 3 Meter =	→	33.0 dBuV

Radiated testing in the range of 1000 MHz to 2000 MHz was investigated with the spectrum (peak detector function) under the FCC regulation section 15.35 (b). The test performed at an antenna to EUT distance of three meters.

3.1.3 Photograph of Test Setup - per 2.1033(b)5

EUT: AR8600B

VIEW: Front & Back



3.1.4 Radiated Emissions Compliance Data - table #1

The EUT was compliant with FCC part 15 class B radiated emissions requirements.

Radiated Emissions Summary Test Data (30 to 1000 MHz)

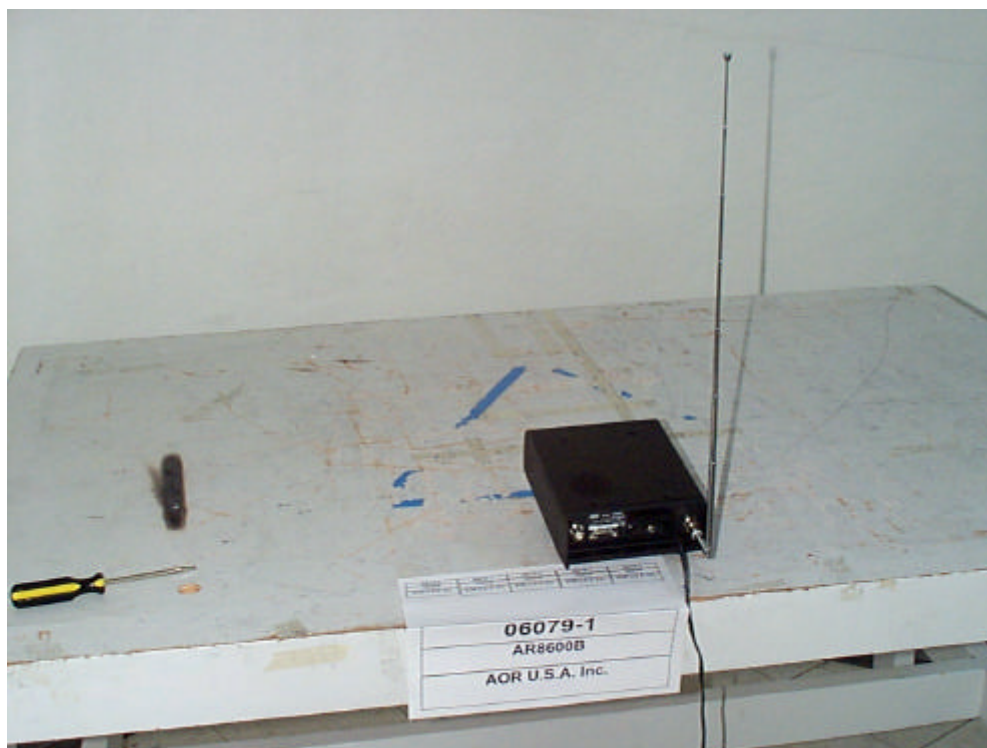
AOR USA, INC EUT: AR8600B								
Freq. (MHz)	Meas'd (dBuV)	Amp Factors (dB)	Cable Factors (dB)	Antenna Factors (dB)	Total Factors (dB)	Corrected signal (dBuV/m)	Limit (dBuV/m)	Delta (dB)
843.45	34.4	25.4	10.7	24.2	9.5	43.9	46.0	-2.1
843.45	34.0	25.4	10.7	24.2	9.5	43.5	46.0	-2.5
710.00	36.4	25.6	9.6	22.9	6.9	43.3	46.0	-2.7
710.00	33.6	25.6	9.6	22.9	6.9	40.5	46.0	-5.5
48.00	28.4	24.8	1.9	12.5	-10.4	18.0	40.0	-22.0
44.60	23.7	25.1	1.8	13.7	-9.6	14.1	40.0	-25.9

- Compliant to FCC Limits per CFR 47 15.109(g).
- Six highest frequencies relative to the Limit.
- Reference Appendix A for all data taken.

3.1.5 Photograph of Radiated Test Setup - per 2.1033(b)(7)

EUT: AR8600B

VIEW: Front & Back



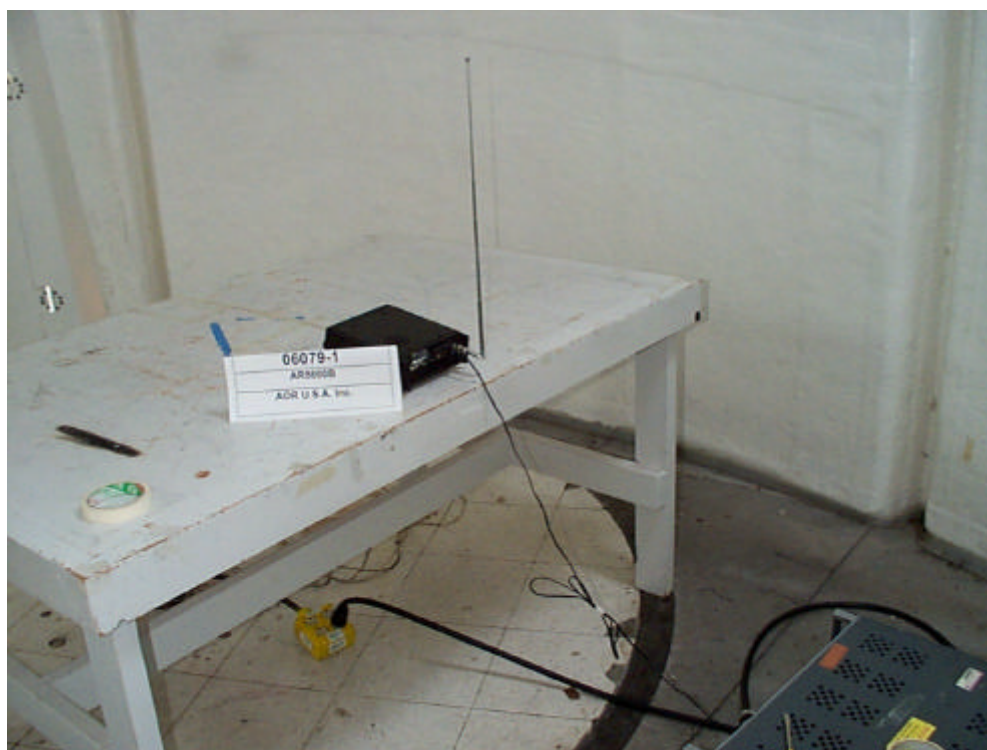
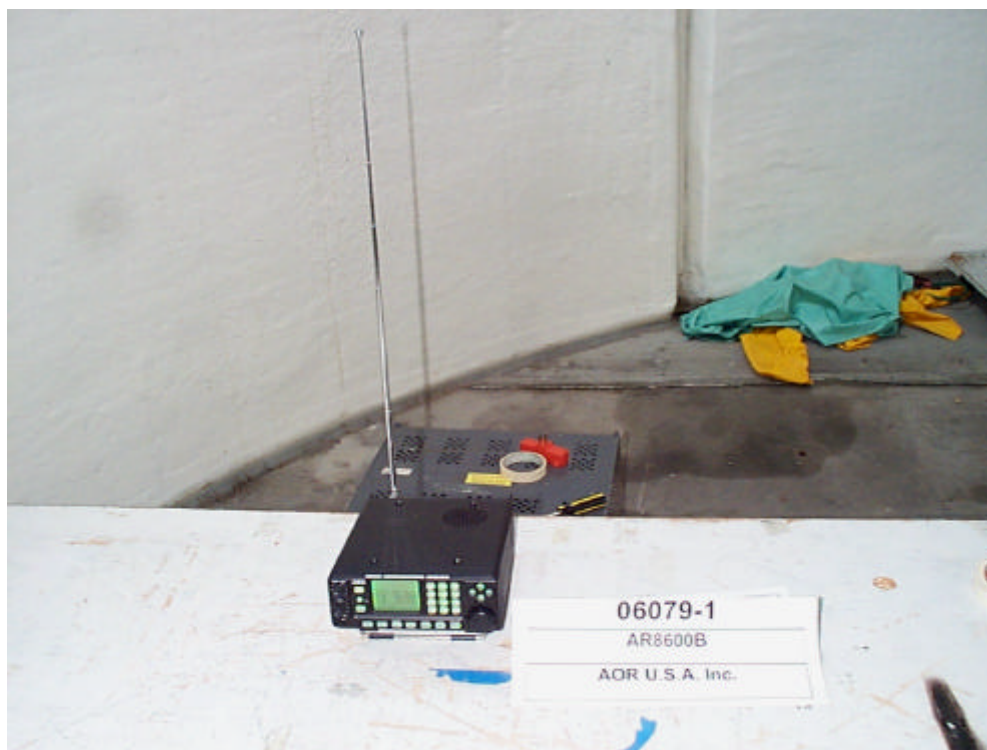
3.2 Conducted Emissions Test Setup and Procedure - Per 2.1033(b)(6) Per 2.947(a)

The EUT was in the Mode of Operation as stated in Section 2.3.1 and set up in the open area test site as shown in Section 3.2.1. The conducted tests are performed by inserting a 50 ohm, 50 uH LISN in series with the power line of the EUT. The tests are either performed on each unit individually or on several units at a time for each test configuration.

The spectrum analyzer is setup to store the peak emissions over the range stated in the applicable standard. Cables are then adjusted to maximize emissions. The peak spectrum analyzer trace and limits are plotted onto graph paper. A receiver (with CISPR quasi peak and average capability) is used to identify the highest frequencies with respect to the limit. Ambients are noted on the graph along with emissions from the EUT. EUT emissions with more than 10 dB margin may only have peak spectrum analyzer measurements taken. The highest levels are listed in the Conducted Emissions Summary Test Data.

3.2.1 Photograph of Test Setup - per 2.1033(b)5

VIEW: Front & Back



3.2.2 Conducted Compliance Data - table #2

The EUT was compliant with FCC part 15 class B conducted emissions requirements.

Conducted Emission Summary Test Data per CFR 47 Subpart 15 Part B class B

Configuration A		AOR USA, INC				AR8600B				
Equipment on LISN	Freq. MHz	Meas'd (dBuV)	LISN Factors	Cable Factors	Total Factors	Total (dBuV)	Limit (dBuV)	Delta	Detec. Mode	Line
AR8600B	0.455	11.70	0.10	0.20	0.30	12.00	48.0	-36.0	QP	P1
AR8600B	0.454	11.30	0.10	0.20	0.30	11.60	48.0	-36.4	QP	N
AR8600B	0.664	9.30	0.10	0.10	0.20	9.50	48.0	-38.5	QP	P1
AR8600B	0.450	8.10	0.10	0.20	0.30	8.40	48.0	-39.6	QP	N
AR8600B	0.450	7.70	0.10	0.20	0.30	8.00	48.0	-40.0	QP	P1
AR8600B	0.874	6.60	0.10	0.10	0.20	6.80	48.0	-41.2	QP	N

- Reference Appendix A for all test data.
- Six highest frequencies relative to the Limit.
- Compliant to FCC Limits per CFR 47 15.107(e).
- P1 = Phase 1, P2 = Phase 2, P3 = Phase 3, N = Neutral

4. LABELING REQUIREMENTS - PER 2.1033(B)(7)

Label will be constructed of 0.02 inch plastic attached as shown on the equipment with permanent adhesive.

All information on the label will be etched or screened. All methods will exceed the expected lifetime of the equipment.

The label will be large enough to allow all information to be readily legible.

4.1 Additional Label Required

This device complies with Part 15 of the 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.

Shown above is a copy of the label with the Part 15.19 Compliance Statement, Location of required information is checked "below".

- ☐ The label will be placed in a conspicuous location on the device.
- ☐ The device is too small for a compliance label. Therefore the label will be placed in a prominent location in the Instruction Manual or other information supplied to the user.
- ☐ The device is too small for a compliance label. The label will be placed on the container in which the device will be marketed.

4.2 Photograph of Label Placement and Contents

PDF File. See the attachment that was electronically submitted.



5. BLOCK DIAGRAM & SCHEMATIC DIAGRAMS

PDF File. See the attachment that was electronically submitted.

6. OWNERS MANUAL

PDF File. See the attachment that was electronically submitted.

7. APPENDIX SECTION

7.1 APPENDIX A: TEST DATA

PDF File. See the attachment that was electronically submitted.

7.2 APPENDIX B: UNCERTAINTY TOLERANCE

DNB Engineering's Utah Facility is within acceptable uncertainty tolerances per ANSI C63.4 (1992) sections 5.4.6.1 and 5.4.6.2 as well as CISPR 16-1(1993) Annex M, section M.2.

ANSI C63.4 (1992)

5.4.6.1 Site Attenuation. A measurement site shall be considered acceptable for radiated electromagnetic field measurements if the horizontal and vertical NSA derived from measurements, i.e., the "measured NSA," are within ± 4 dB of the theoretical NSA (5.4.6.3) for an ideal site.

5.4.6.1 NSA Tolerance. The ± 4 dB tolerance in 5.4.6.1 includes instrumentation calibration errors, measurement technique errors, and errors due to site anomalies. These errors are analyzed in ANSI C63.6-1988 [3], wherein it is shown that the performance of a well-built site contributes only 1 dB of the total allowable tolerance.

CISPR 16-1 (1993)

M.2 Error analysis

. . . The total estimated errors are the basis for the ± 4 dB site acceptability criterion consisting of approximately 3 dB measurement uncertainty and an additional allowable 1 dB for site imperfections.

7.3 APPENDIX C: TEST SITE CERTIFICATION, CHALK CREEK EMI SITE - per 2.948(a)

The DNB Engineering test facility is located in Chalk Creek Canyon near Coalville, Utah. Site characteristics were measured according to the procedures outlined in ANSI C63.4 (1992) "Characteristics of Open Field Test Site". The results of these characterizations indicate that the Chalk Creek site is an outstanding facility to perform accurate and repeatable EMI tests.

This facility has been FCC approved to perform class B certification testing since January, 1986. According to the FCC requirement to re-apply every three years, the facility was rectified. Certification was granted for the 3, 10, and 30 meter positions for both ranges. Facility approval was granted by the FCC Feb 2, 2003 under file number Registration number 90532.

In August of 1999, **The American Association for Laboratory Accreditation, A2LA**, granted accreditation to this facility. Standards for which accreditation was granted: RF Emissions: ANSI C63.4 - 1992, FCC Part 15 subpart B and C, FCC Part 18 CISPR 11, CISPR 13, CISPR 14, CISPR 22, EN 55011, EN 55013, EN 55014, EN 55022, EN 60601-1-2, EN 50081-1, EN 50081-2, IEC 601-1-2; RF Immunity: EN 50082-1, EN 50082-2, Radiated Susceptibility: EN 61000-4-3, ENV 50140, ENV 50204, IEC 1000-4-3, IEC 801-3, ESD: EN 61000-4-2, IEC 1000-4-2, IEC 801-2, EFT: EN 61000-4-4, IEC 1000-4-4, IEC 801-4, Surge: EN 61000-4-5, ENV 50142, IEC 1000-4-5, IEC 801-5, Injected RF Immunity: EN 61000-4-6, ENV 50141, IEC 1000-4-6, IEC 801-6 Magnetic EN 61000-4-8, Power Quality EN 61000-4-11, Harmonic EN 61000-3-2, Flicker EN 61000-3-3, Electric Strength Testing EN 60065(A1,A2,A3,), EN 61010-1, EN 60601-1-1, EN 60065, IEC 950, (Hi Pot) IEC 1010, IEC 601-1, IEC 65, IEC 335XX, Leakage EN 60950, EN 60601-1-1, Temperature Rise, Electric Strength Testing EN 60065(A1,A2,A3,), EN 61010-1, EN 60601-1-1, EN 60065, IEC 950, IEC 1010, IEC 601-1, IEC 65, IEC 335XX, Ground Bonding EN 61010-1, EN 60950, (A1,A2,A3,), EN 60601-1-1, EN 60065, IEC 1010, IEC 950, IEC 601-1, IEC 65, IEC 335XX, Humidity Conditioning EN 61010-1, EN 60950, (A1,A2,A3,), EN 60601-1-1, EN 60065, IEC 1010, IEC 950, IEC 601-1, IEC 65, IEC 335XX, Surges to Antenna or Mains EN 60065, IEC 65

In September, 1994 the National Certified Testing/Competent/ Notified Body for Norway and Scandinavian Countries (NEMKO) approved this test facility. DNB now offers the testing required for the CE Mark. **NEMKO EMC Laboratory Authorization No.: ELA 131**

Standards for which accreditation was granted: RF Emission: EN 55011, EN 55022, EN 50081-1, EN 50081-2; RF Immunity: EN 50082-1, EN 50082-2

In September, 1994, the New Zealand Ministry of Commerce certified that DNB ENGINEERING, INC. EMC facilities meet their laboratory approval criteria for EMC testing and placed DNB ENGINEERING on their list of Ministry-Approved laboratories.

In June of 1999, VCCI certified that the Chalk Creek facility was acceptable to perform EMI test according to VCCI requirements. The certificate number is 715.

Ambient Emissions

Ambient emission measurements were made to determine the level of the ambient emanations at the DNB test facility. The results indicate that all ambient signals are below the FCC, and VCCI radiated emission limits or that each can easily be identified as an ambient signal.

7.4 Equipment used for Test Data

Radiated Emissions Equipment

Description	Manufacturer/ Model	Asset #	Serial	Calibration Due
Amplifier	HP/8447D	067	2727A06182	22FEB01
Amplifier	HP/8447D	065	2727A06180	22FEB01
Amplifier	HP/8447D	066	2727A06181	22FEB01
Amplifier	HP/8447D	068	2727A06184	22FEB01
Bicon Antenna	SCH/BBA9106	187	6	15AUG01
Bicon Antenna	SCH/BBA9106	186	7	25JUL01
Log P Antenna	SCH/UJALP9107	011	11	25JUL01
Log P Antenna	SCH/UHAL0910 7	010	10	15AUG01
Loop Antenna	R&S/HFH 2-Z2	173	880665/-40	10JUL01
QP Adapter	HP/85650 A	002	2043A00277	28SEP00
QP Adapter	HP/85650 A	001	2043A00124	19OCT00
Receiver	R&S/ESVP	078	879807/048	4SEP00
Receiver	R&S/ESVP	083	882402/005	2NOV00
Spectrum Analyzer	HP/8568B	003A	17221A00113	14OCT00
Spectrum Analyzer	HP/8566B	138A	2421A00516	29SEP00

Conducted Emissions Equipment

Description	Manufacturer/ Model	Asset #	Serial	Calibration Due
LISN(AMN)	SCH/MNLK 8121	U-043	812156	23NOV00
LISN(AMN)	SCH/MNLK 8121	U-044	301	23NOV00
QP Adapter	HP/85650 A	U-002	2043A00277	28SEP00
QP Adapter	HP/85650 A	U-001	2043A00124	19OCT00
Receiver	R&S/ESH3	U-081	872742/045	26JUL01
Receiver	R&S/ESH3	U-082	882399/025	19Mar00
RF Preselector	85685A	U-070	2724A00659	18OCT00
Spectrum Analyzer	HP/8568B	U-003	17221A00113	18OCT00
Spectrum Analyzer	HP/8566B	U-138	2421A00516	29SEP00
75 Ohm CND	FCC/FCC-801- C1-8	U-339	9909	24MAR00
50 Ohm CDN	FCC/FCC-801- C1-B	U-338	9908	24MAR00
Current Probe	FCC/F130	U-267	1764	8OCT00

7.5 APPENDIX D: EMC INSTRUMENTATION AND MEASUREMENT EQUIPMENT

All test equipment are calibrated by a certified metrology facility using standards traceable to NIST.

Each instrument is calibrated annually or more frequently if required.

7.6 APPENDIX E: INFORMATION SUPPLIED TO APPLICANT

INFORMATION PERTAINING TO EQUIPMENT MANUFACTURED AFTER COMPLIANCE TESTING

It is prudent that manufacturers have an established Quality Assurance program to spot check their products on a periodic basis, either based upon time or quantities produced. Obviously, a change in the engineering design should be sufficient justification for a re-test.

The Quality assurance test need not be formal Verification or Certification such as required during the initial production of the product. However, it should be sufficient in scope to assure that the EMI characteristics of the product have not changed to the degree that the product exceeds the FCC limits. If a new model of a product is produced, it must undergo full Verification or Certification testing and, in case of Certification, be filed with the FCC.

It is expected that the FCC will place greater emphasis and resources in spot checking commercially available products. If a product is found not to be compliant with the Limits specified in Part 15, Subpart B. the manufacturer will be subject to the appropriate penalties imposed by the Commission. The initial Certification or Verification is sufficient to justify initial production. The additional quality assurance testing performed is the manufacturer's responsibility to assure continued compliance.
