REV A	APPROVALS	DATE
SH 1	**DRAWN** R. DeLong	01/20/00
	CHECKED **Steve Elliott**	**02/24/00**
	ENGINEER R. DeLong	01/20/00
DOC NO. 150-040565	**ISSUED** **Vern Wallace**	**02/24/00**

REV	DESCRIPTION	DATE	APPROVED
A	INITIAL RELEASE Per DCN W962	02/24/00	Vern Wallace

NEXT ASSEMBLY	FINAL ASSEMBLY

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:

FRACTIONS	DECIMALS	ANGLES
±	.XX ±	±
	.XXX ±	

DRAWING TITLE

TYPE ACCEPTANCE REPORT MODEL VC-401B, FCC ID: FRWVC-401B (8.33 kHz)

Wulfsberg Electronics Division
A Chelton Group Company
Prescott, AZ 86301 U.S.A.

SIZE	CAGE CODE	DWG . NO.	REV
A	1B7G3	150-040565	A
			SCALE

TABLE OF CONTENTS

1 INTRODUCTION

This Engineering Report contains the necessary information and details the test results for Certification of the VCS 40A communication system consisting of a VC-401B radio transceiver and a CD-402B control head.

The measurements detailed in this report were done in accordance with Parts 2, 15, and 87 of the FCC Rules and Regulations.

The VC-401B is intended for aircraft installation for the aviation communications services. This transceiver is designed to operate in systems with 25 kHz and/or 8.33 kHz channel spacing. No difference was noted between measurements for wide and narrow band operation. The intended frequency coverage is:

118-152 MHz

Associated equipment is the CD-402B control head, which provides frequency selection and indication.

Paragraph references throughout this report are referenced to CFR, Title 47 revised 1987.

2 TEST FACILITIES

Bench test measurements listed in chapter were completed at the Wulfsberg Electronics Division engineering facilities located in Prescott, Arizona. All test equipment used was in current calibration, traceable to NBS.

Radiated emissions measurements were conducted under contract by:

DNB Engineering, Inc.
3535W. Commonwealth Ave.
Fullerton, CA 92833
Phone 714-870-7781

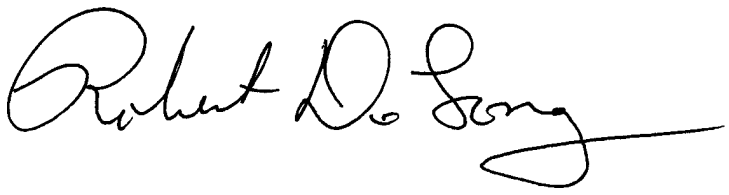
See Exhibit C for their statements of site and test facilities.

3 CERTIFICATION OF DATA

CERTIFICATION OF DATA CONCERNING CERTIFICATION APPLICATION FOR FCC ID:

FRWVC-401B

I certify that all bench tests in this Certification application and Test Report were performed under my supervision. To the best of my knowledge and belief, the facts set forth in the accompanying technical data are true and correct.



_____

Robert DeLong
Vice President Engineering Wulfsberg Electronics Division.

APPLICANT:	Wulfsberg Electronics Division of Chelton Avionics, Inc.
FCC ID	FRWVC-401B
DATE:	February 4, 2000

4 EXPOSITORY STATEMENTS; § 2.983 (a) - (d):

4.1 Name of Applicant; § 2.983 (a):

The applicant and manufacture is: Wulfsberg Electronics Division

4.2 Identification of Equipment; § 2.983 (b):

Models:
- Transceiver VC-401B
- Control Head CD-402B

Serial number: E1001
FCC ID: FRWVC-401B

4.3 Production Quantity; § 2.983 (c):

Quantity production of the Model VC-401B is planned.

4.4 Types of Emission; § 2.983 (d) (1):

6K00A3E
6K00A9W
5K00A3E

4.5 Frequency Range; § 2.983 (d) (2):

118-152 MHz

4.6 Power Rating; § 2.983 (d) (3):

20 Watts

4.7 Maximum Power Rating; § 2.983 (d) (4):

55 Watts

4.8 DC Voltage and Current into final Amplfier; § 2.983 (d) (5):

Collector voltage: 27.5 VDC
Supply voltage: 27.5 VDC
Drain Current: 3.8 Amps.

4.9 Function of Semiconductors and other active devices; § 2.983 (d) (6):

Please refer to Exhibit A for the Theory of Operation and schematics of the radio.

4.10 Complete Circuit Diagrams; § 2.983 (d) (7):

Complete Schematic diagrams are in the repair manual located in Exhibit A.

4.11 Instruction Book; § 2.983 (d) (8):

The instruction book is located in Exhibit B.

4.12 Tune-up Procedure at Nominal Power; 2.983 (d) (9):

The tune-up procedure is in the repair manual located in Exhibit A.

4.13 Circuitry and Devicies for Determining and Stabilizing Frequency; § 2.983 (d) (10):

The main VCO is phase locked to a temperature compensated crystal oscillator. The TCXO frequency is 12.8 MHz. Exact operation is detailed in Exhibit A.

4.14 Circuits for Suppression of Surious Radiation, Limiting of Modulation and Limiting of Power; § 2.983 (d) (11):

(i) Suppression of Spurious Radiation:
A low pass filter follows the Class C power amplifier to attenuate harmonic energy. The schematic of this circuit is located in the repair manual in Exhibit A.

(ii) Limiting of modulation:
The audio input is limited by the compressor, U301 and clipping diodes, CR300. This is followed by a low pass filter to remove induced harmonics. The schematic of this circuit is located in the repair manual in Exhibit A.

5 TEST PROCEDURES AND CONDITIONS

5.1 Measurement Procedures; § 2.947 (a), (b), (c):

The measurement procedures used to produce the data submitted in this report followed good engineering practice and were in accordance with accepted procedure, as specified in the applicable sections of the FCC rules. The measurement set-up for each set of data is detailed in Section 6 of this report in accordance with FCR 2.947 (b), (c).

5.2 Test Equipment; § 2.947 (d):

Following is a list of equipment used for the tests detailed herein. Item numbers will be used to refer to equipment in block diagrams. Each piece of equipment is in current calibration traceable to NIST.

Item Number	Equipment	Manufacturer / Model
1	Audio Analyzer	HP 8903B
2	Modulation Analyzer	HP 8901B
3	Spectrum Analyzer	HP 89441A
4	Multi-meter	Fluke 77
5	Wattmeter	HP 438A
6	Power Supply	Xantrex XHR 40-25
7	Temperature Chamber	Tenney Mite 5
8	30 dB Power Attenuator	Weinschell 49-30-33

5.3 Test Conditions for Transmitter Type Acceptance Test:

The following conditions applied during room temperature testing.

Temperature: 23 ± 5º C

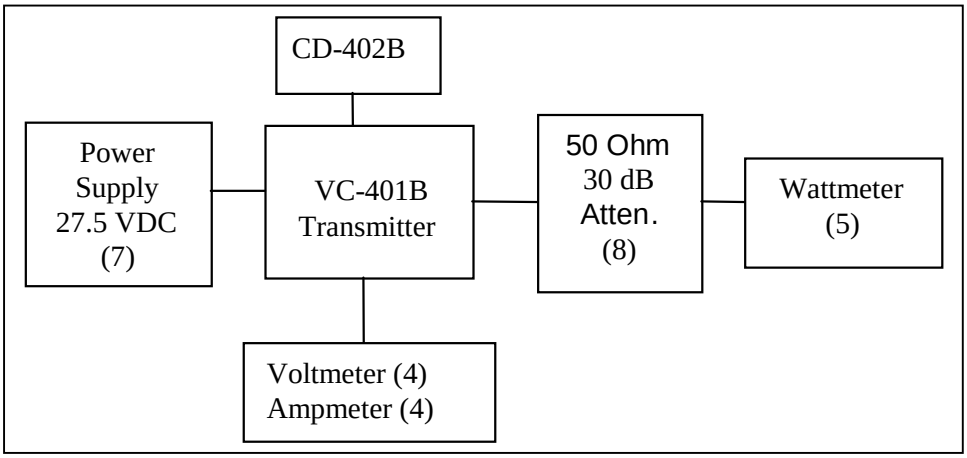
Supply Voltage: 27.5 VDC (nominal aircraft battery)

6 MEASUREMENT DATA FOR TYPE ACCEPTANCE

6.1 RF Power Output; § 2.985 (a):

RF power output was measured after alignment of the transmitter per the manufacture's instructions as detailed in the repair manual listed in Exhibit A.

6.1.1 Test Set-up:

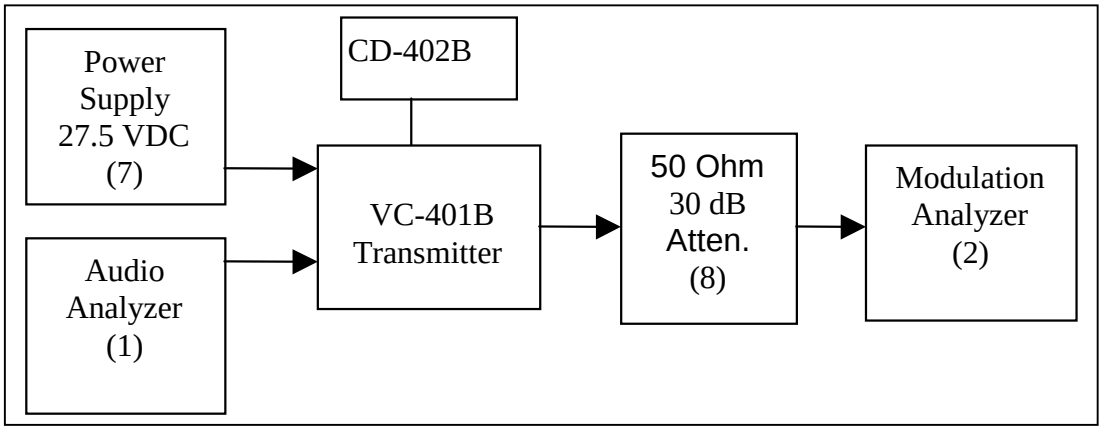


6.1.2 Power Measurements:

Frequency	Power	Drain Current
118.0 MHz	22.0 Watts	3.80 Amps
134.0 MHz	21.5 Watts	3.81 Amps
152 MHz	20.4 Watts	3.85 Amps

6.2 Modulation Characteristics; § 2.987:

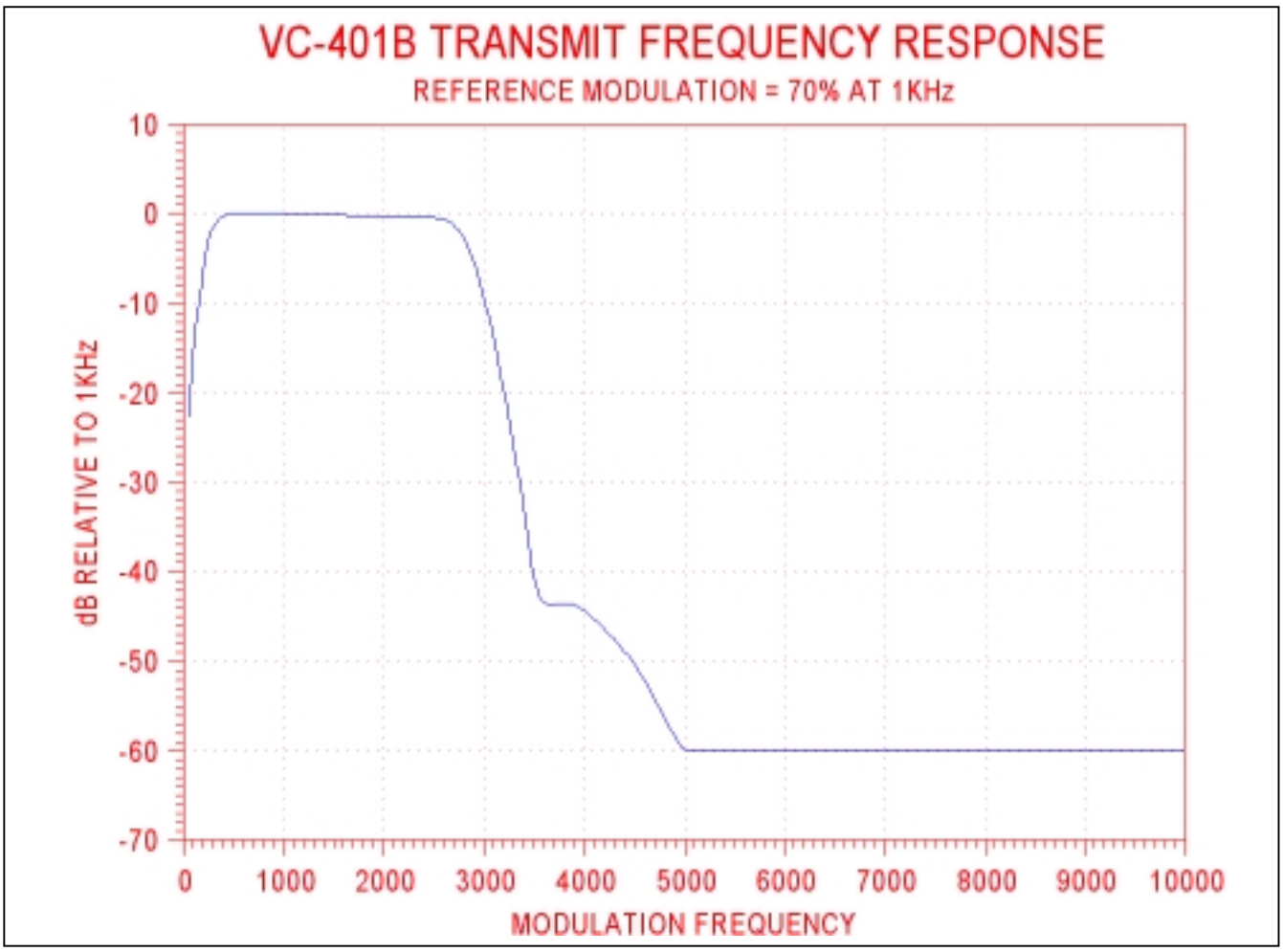
6.2.1 Test setup for Frequency Response and Limiting:



6.2.2 Frequency Response; § 2.987 (a)

Measurement of transmitter audio frequency response was made with the setup shown in section 6.2.1 of this report. A zero Decibel reference was established at a 1.0 kHz tone. The audio input frequency was varied over the range of 50 Hz to 10.0 kHz with the audio input level held constant. Demodulated audio was measured on the modulation analyzer.

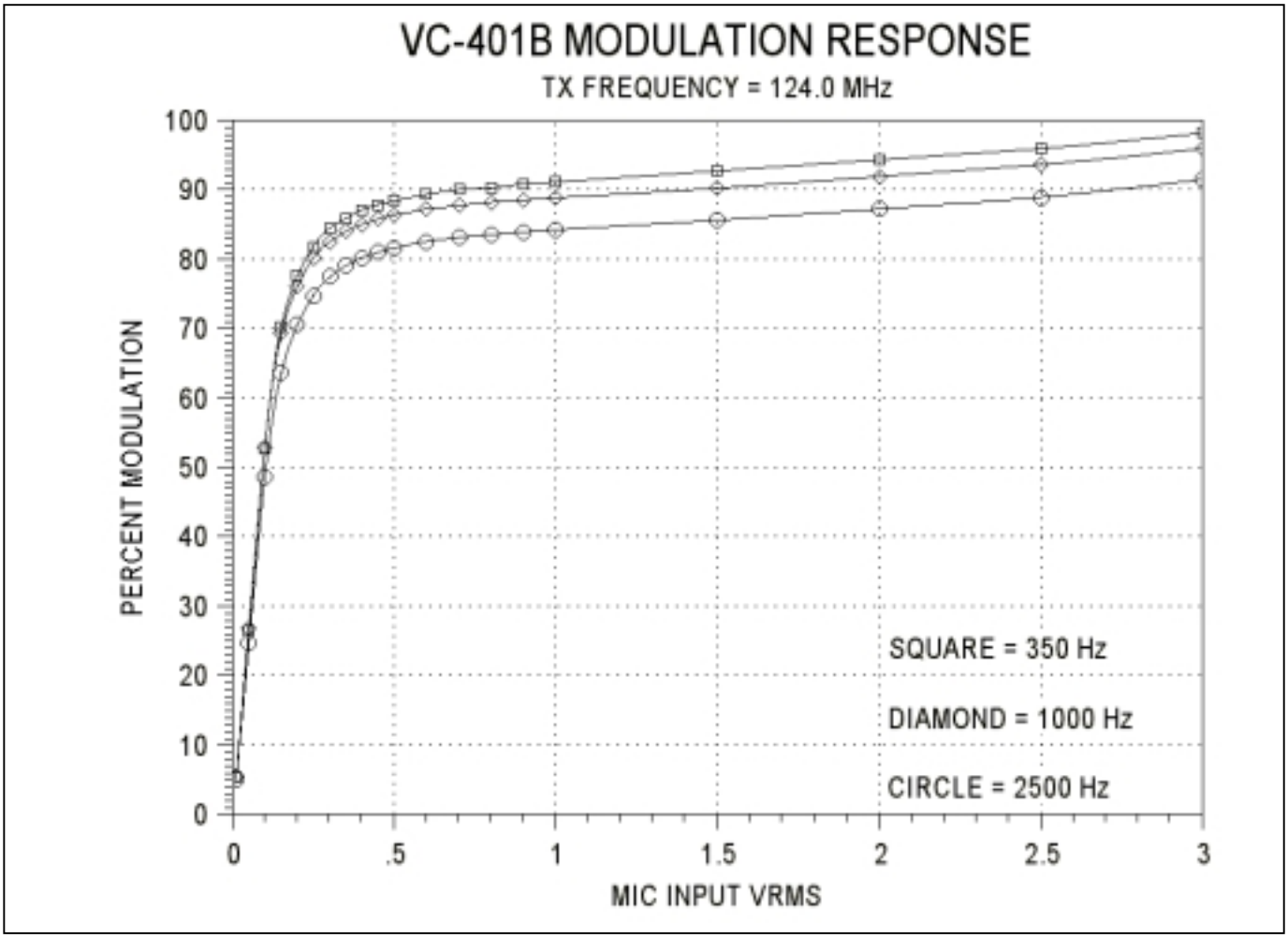
6.2.3 Measured Frequency Response:



6.2.4 Modulation Limiting Characteristics; § 2.987 (b)

To measure modulation limiting characteristics, the audio input was varied from 10 mV up to a level exceeding 20 dB above that giving 50% modulation at 1 kHz. Modulation deviation was measured for various input levels. The limiting audio responses at frequencies of 350, 1000, and 2500 Hz were measured for narrow and wide band operation.

6.2.5 Measured Standard Band Limiting



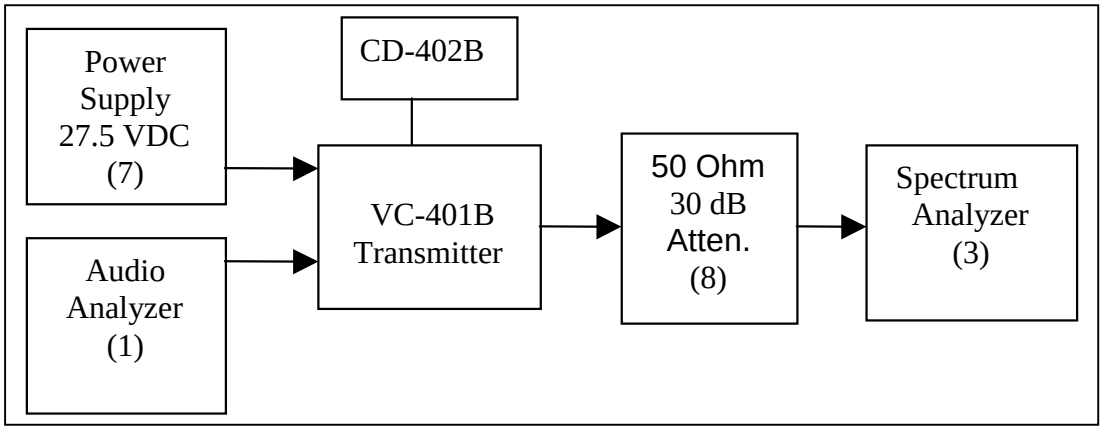
6.3 Occupied Bandwidth; § 2.989:

Occupied bandwidth was measured at 134 MHz, which is the center of the band of the frequency range.

6.3.1 Occupied Bandwidth Test Procedure; § 2.989

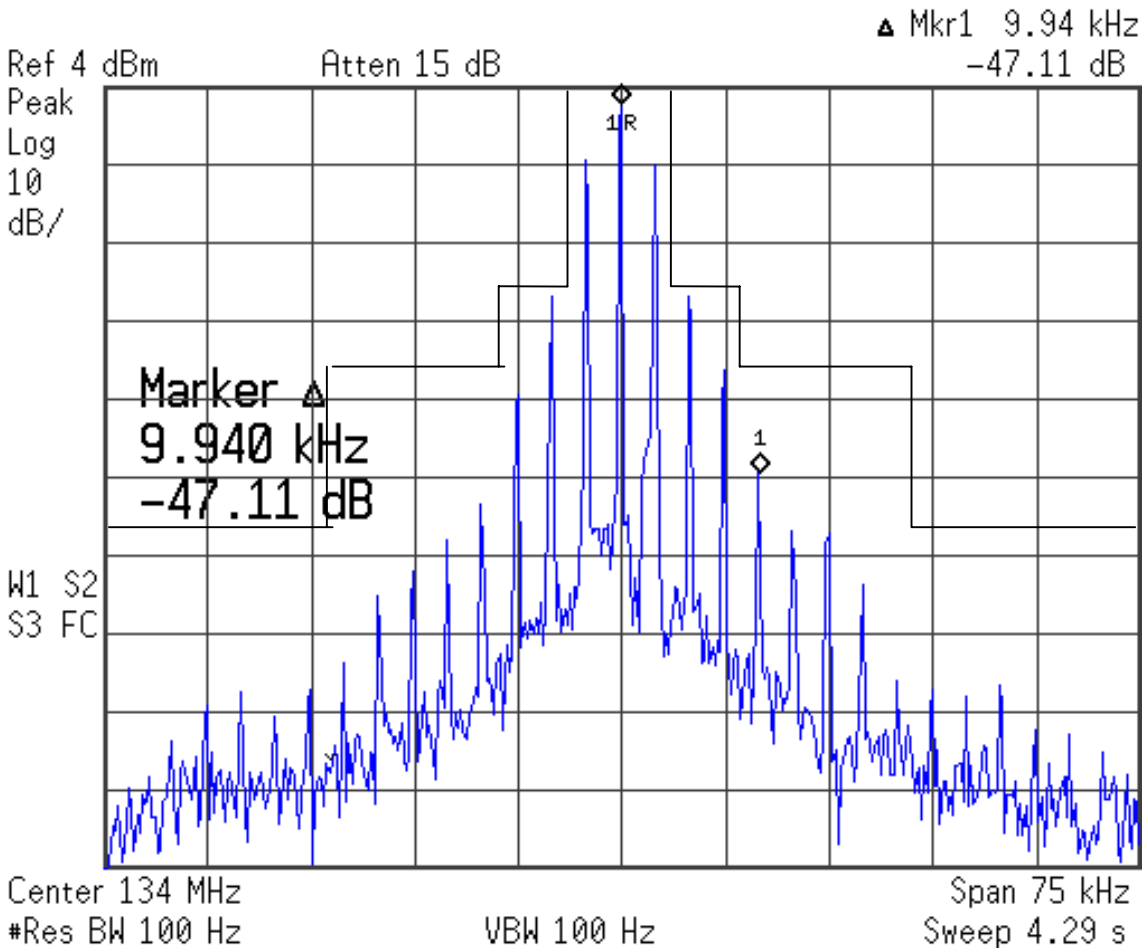
An audio input frequency of 2.5 kHz with a level 16 dB greater than that required to produce 50% modulation was applied to the radio under test. The transmitter spectrum was measured with a 20 Watt output on a spectrum analyzer with a 50 kHz span.

6.3.2 Occupied Bandwidth Test Setup:

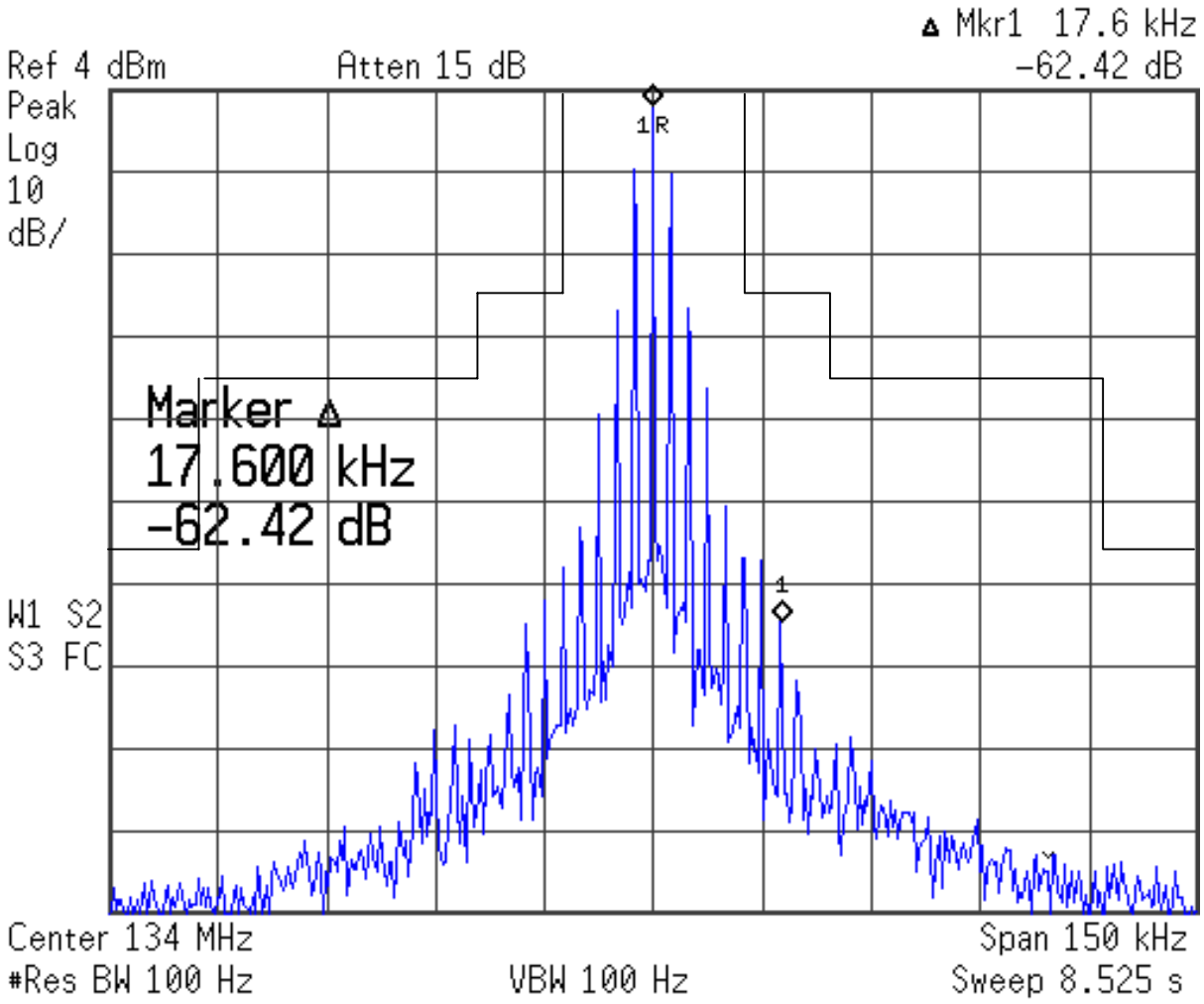


6.3.3 Measured Occupied Bandwidth:

Emissions measured with spectral mask for 8.33 kHz channel spacing § 87.139 (b).



Measured emissions with spectral mask for 25 kHz channel spacing § 87.139 (b).



Note: The same modulation circuitry is used for 8.33 kHz or 25 kHz channel spacing.

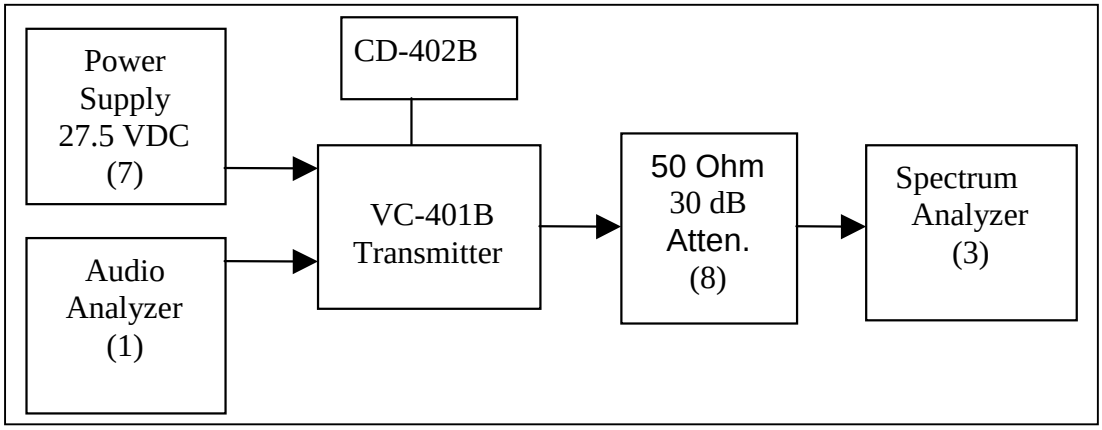
6.4 Spurious Emissions; § 2.991, 2.993:

The permitted maximum level of spurious emissions, as per § 87.139 (3) of the FCR is:
= 43 + 10 Log (Mean Power Output) dBc

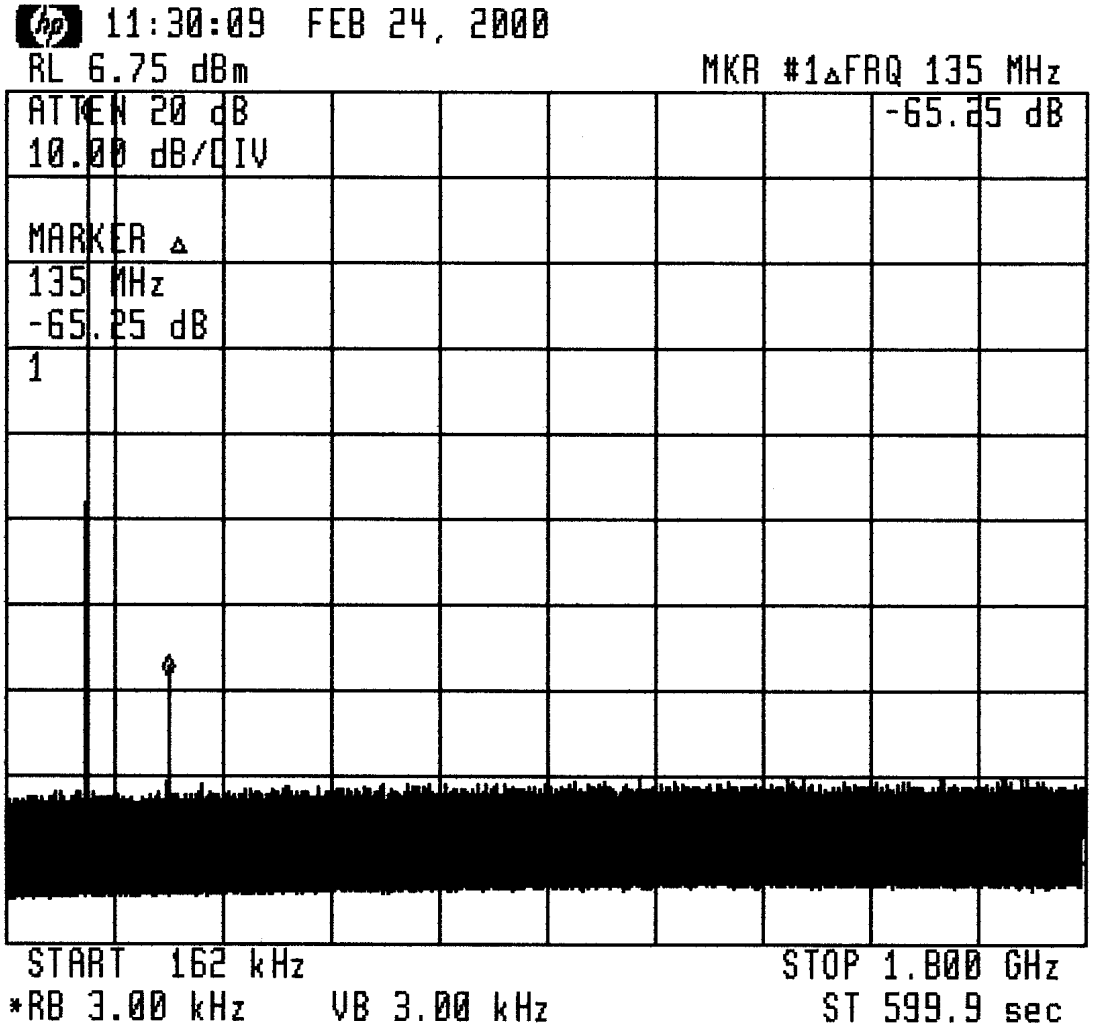
6.4.1 Spurious Emissions at the Antenna Terminals; § 2.991:

Spurious emissions were measured at the band center of 135 MHz while terminated into a 50 Ohm load. The transmitter was modulated with a 2500 Hz audio signal 16 dB above the level required for 50 % modulation. Spurious emissions were measured from 0.162 to 1.8 GHz. All signals noted were below –80 dBc. Harmonic emissions were below –60 dBc.

6.4.2 Spurious Emission Test Setup:



6.4.3 Plot of Measured Spurious



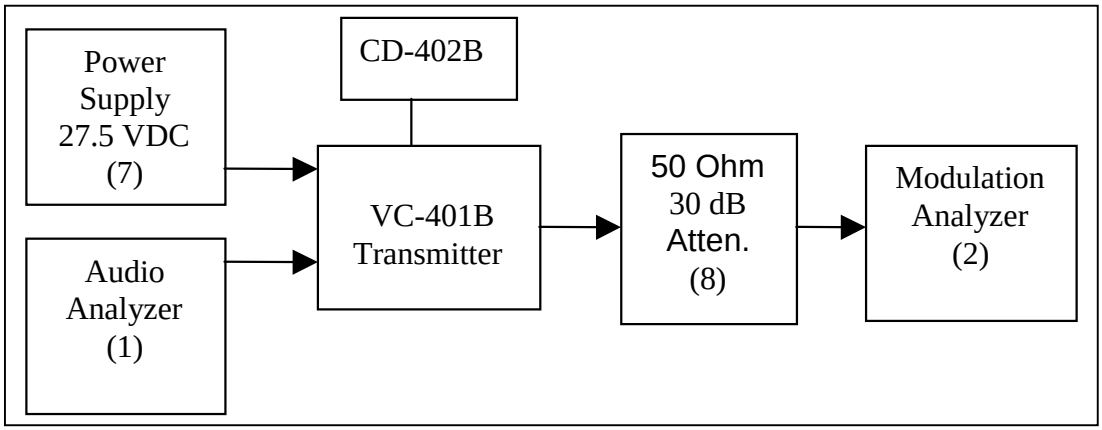
6.4.4 Field Strength Measurement of Spurious Radiation; § 2.993

Radiated Field strength measurements were by DNB Engineering in Fullerton, CA. The original report is attached in Exhibit C.

6.5 Frequency Stability; § 2.995:

The transceiver reference TCXO was adjusted at 25º C per the tune up instructions. A one-minute warm up period was allowed before data was taken upon reaching the test temperature.

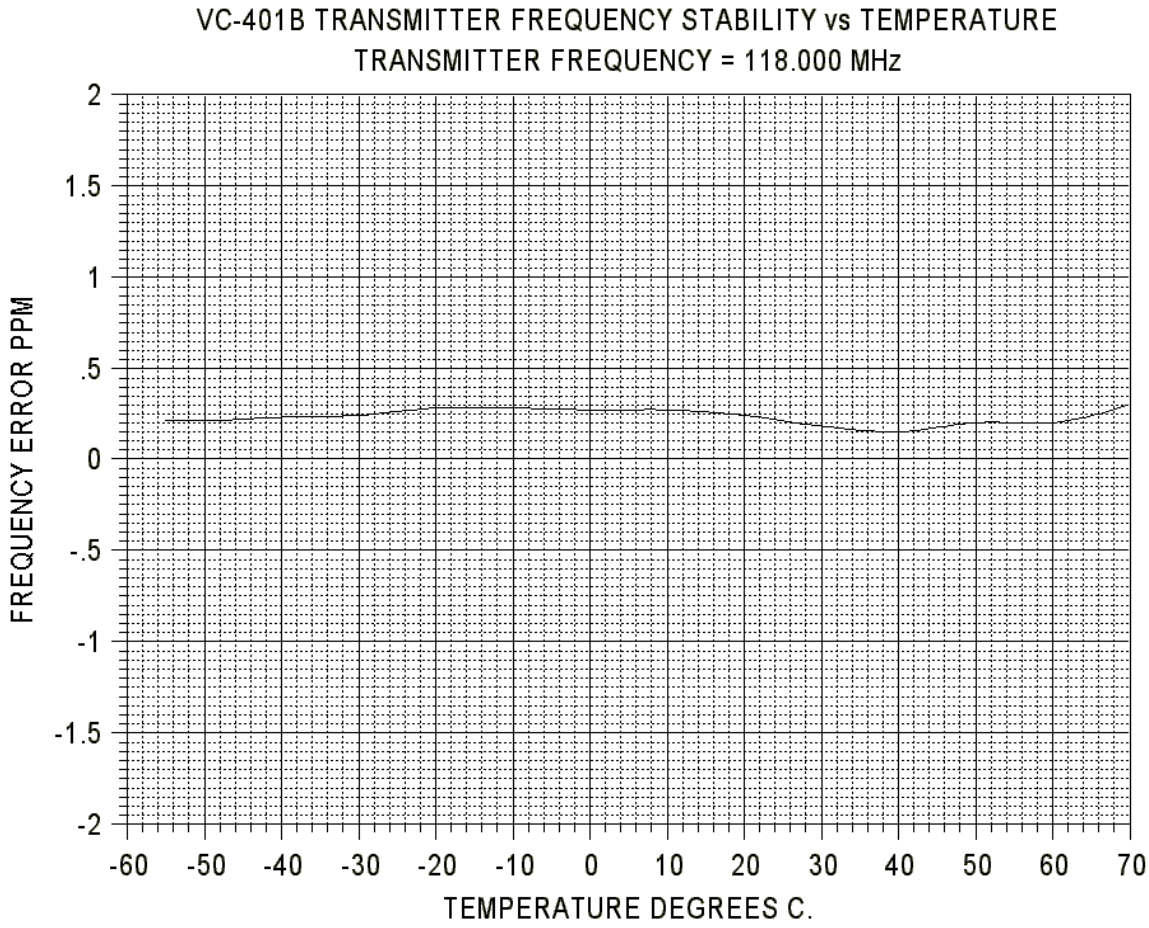
6.5.1 Test Setup for Frequency Stability:



6.5.2 Temperature; § 2.995 (a) and (b):

The VCS 40A system was placed in an environmental chamber with the power to the UUT turned off. The temperature was varied over the range of -55º C to +70º C, in ten-degree steps. Temperature of the radio was allowed to stabilize at each step. When stabilization was verified the unit power was applied and the transmitter was keyed for at least 5 seconds and the frequency was measured at the end of the period.

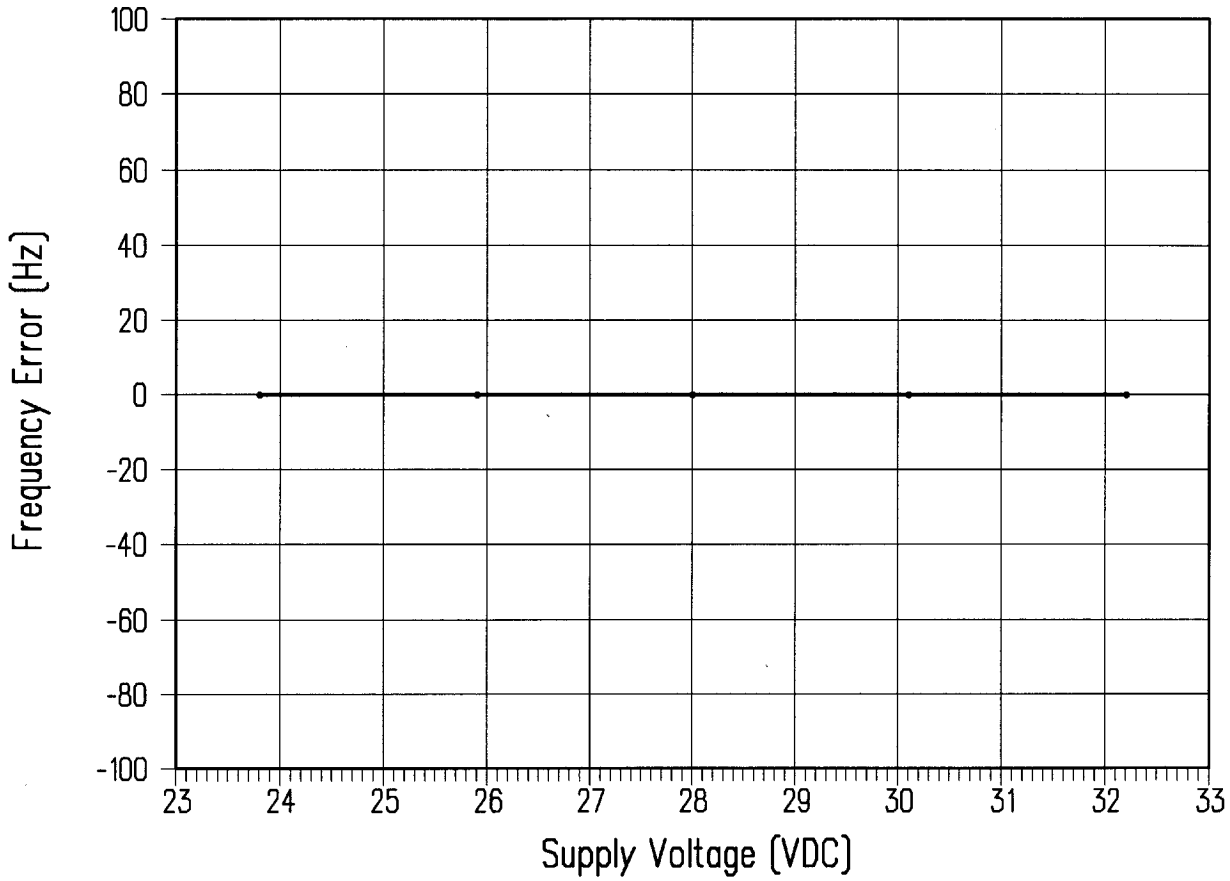
6.5.3 Measured Temperature Data:



6.5.4 Frequency Stability Under Voltage Variation; § 2.995 (d)

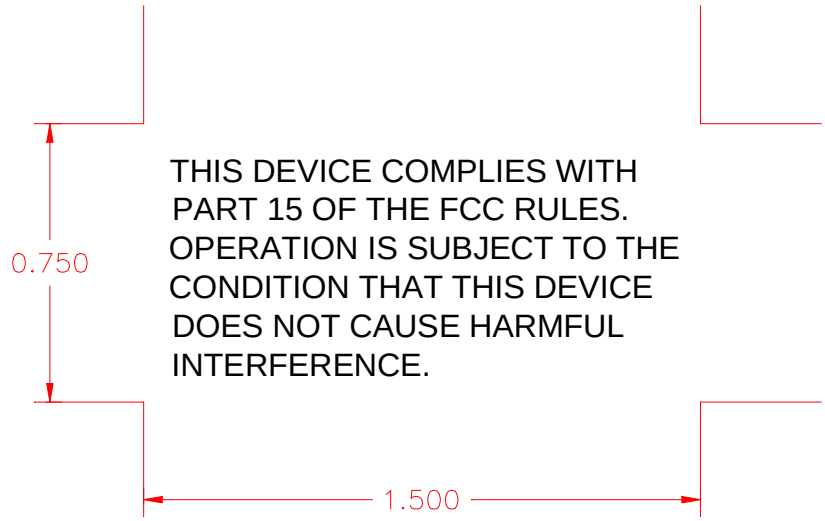
The variation of frequency with supply voltage was measured at room temperature. The voltage was varied from 85% to 115 % of the nominal input value. The radio was set to transmit and the output frequency was measured.

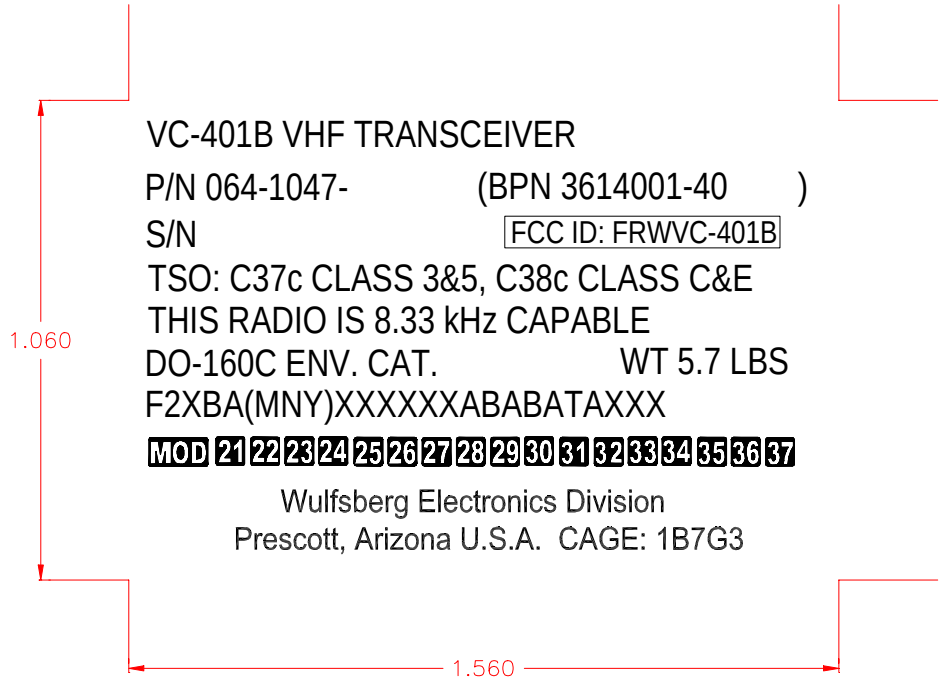
6.5.5 Measured Frequency Stability Under Voltage Variation Data:



The transmit frequency was 134.000 MHz with no modulation applied.

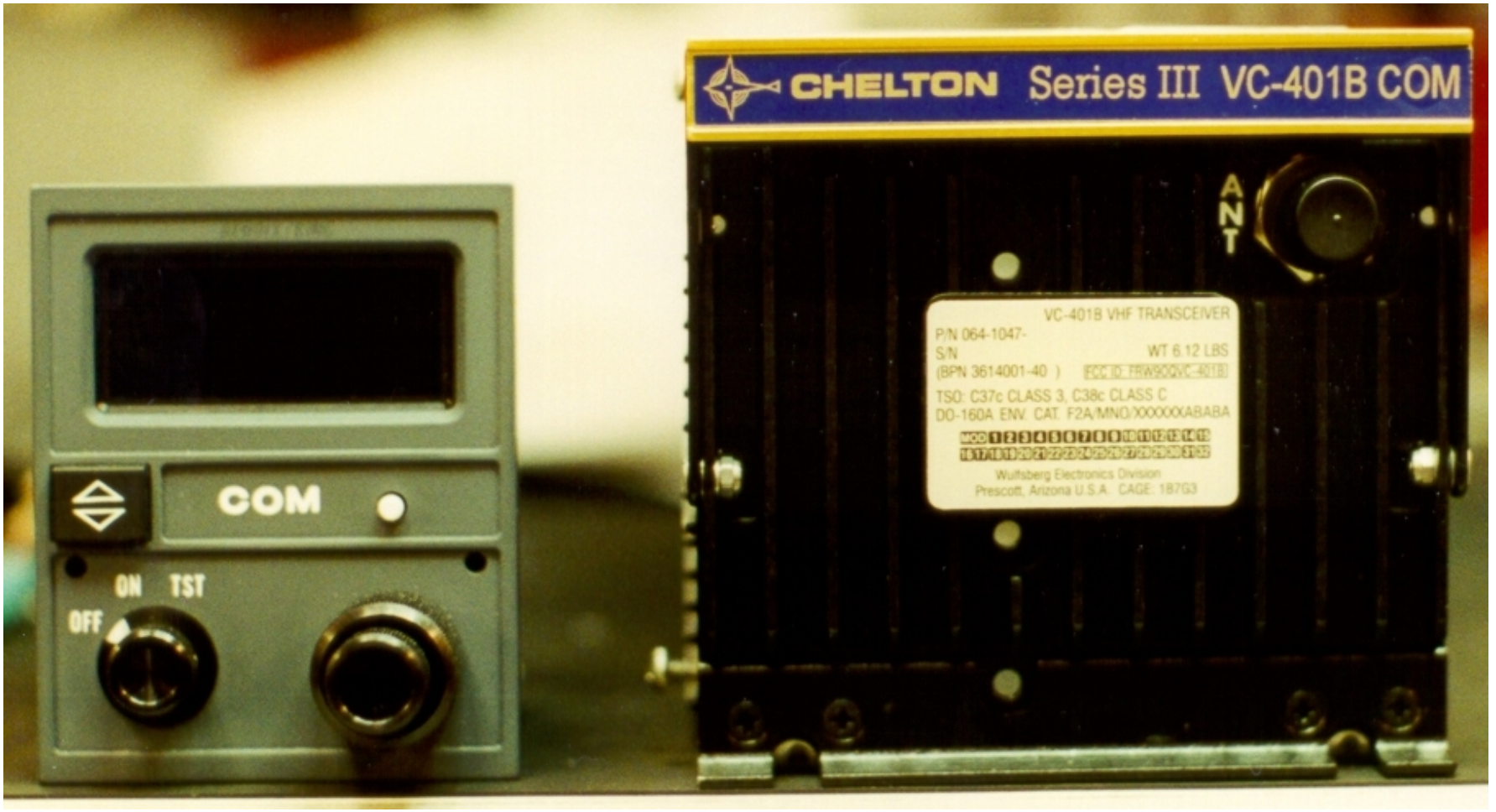
7 EQUIPMENT IDENTIFICATION LABELS:





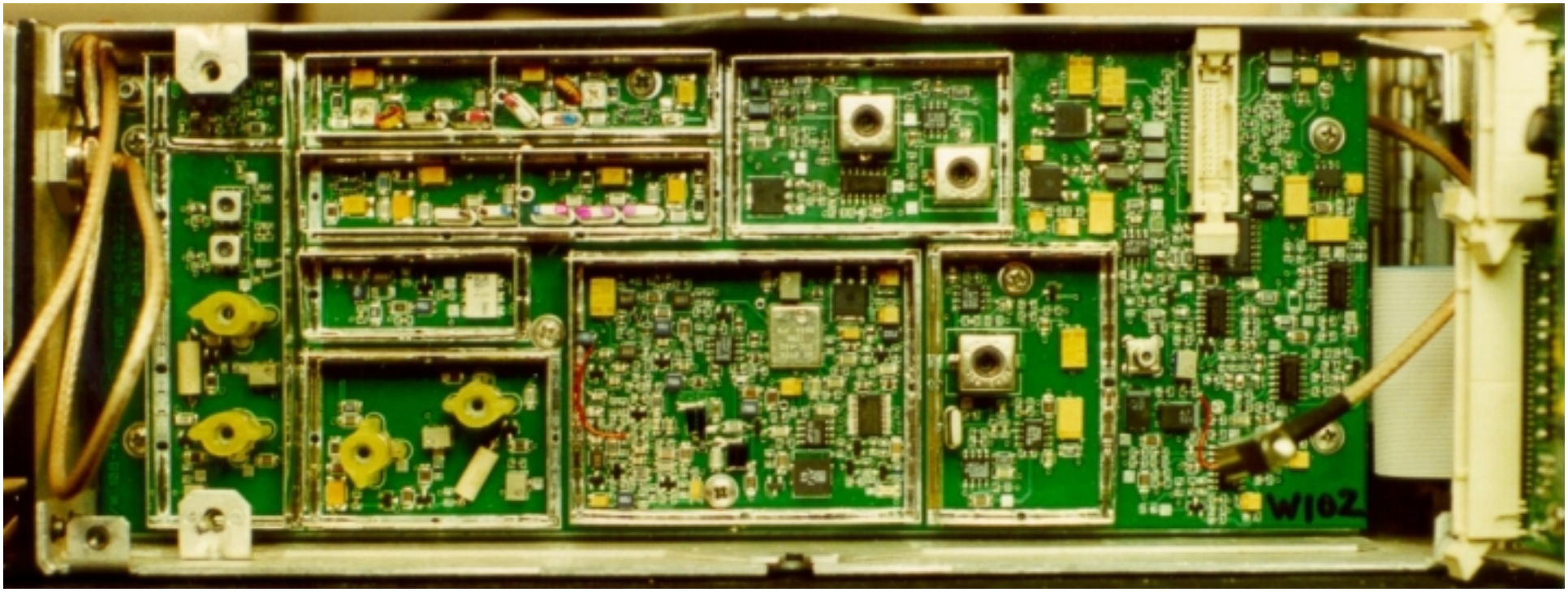
8 PHOTOGRAPHS OF EQUIPMENT:

8.1 Typical VC-401B Transceiver and CD-402B Control head.



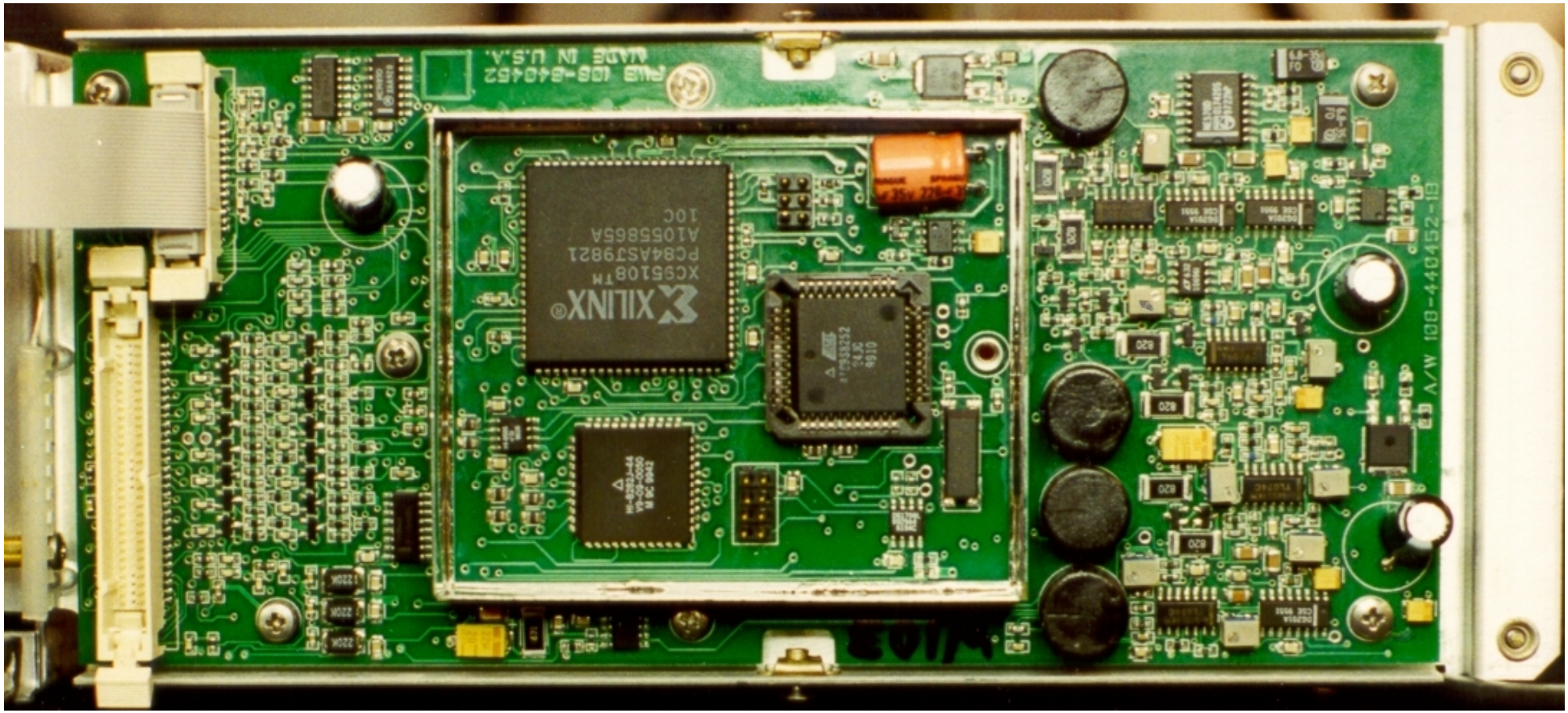
8.2 Synthesizer and Receiver board.

Only three surface mount resistors are mounted on the backside. They act as heating elements for the TCXO chamber. This photo is taken with eight shield covers removed to show parts. The shield walls are visible.



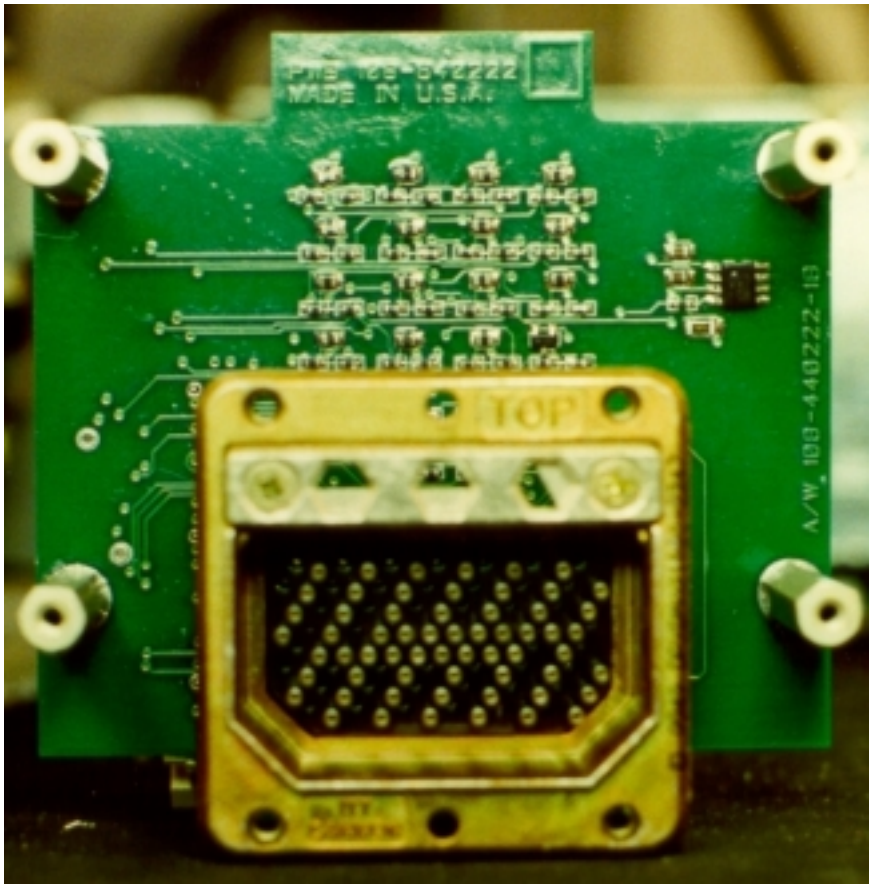
8.3 Audio and Microcontroller Board

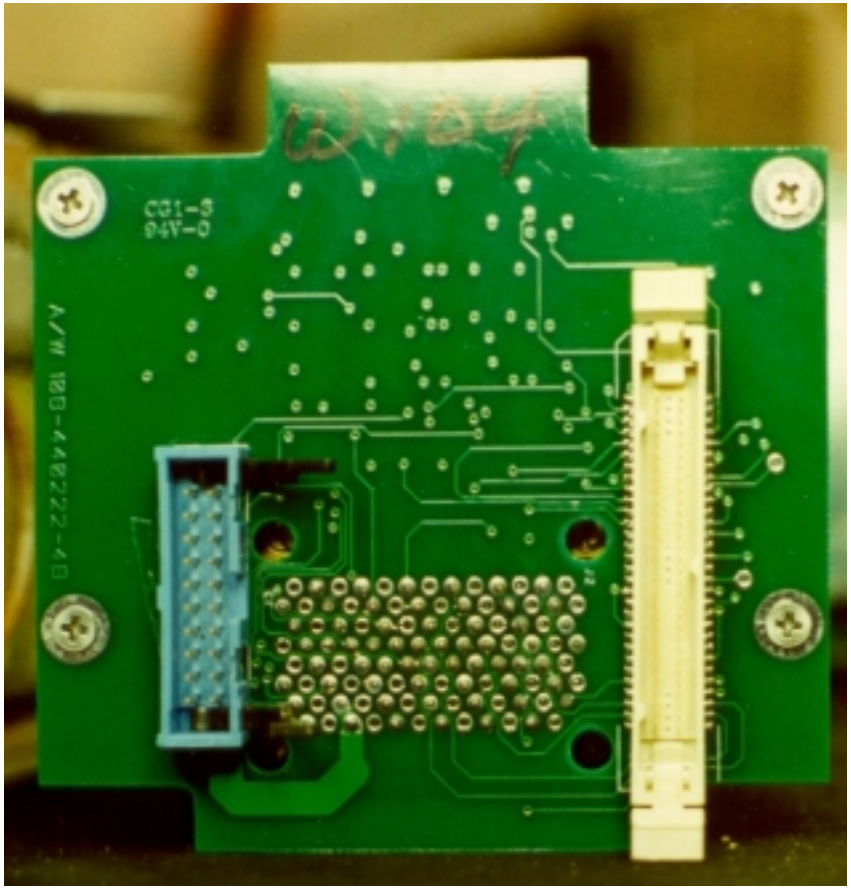
No parts are on the backside of this board. Photo taken with center shield cover removed.



8.4 H & L Interconnect Board

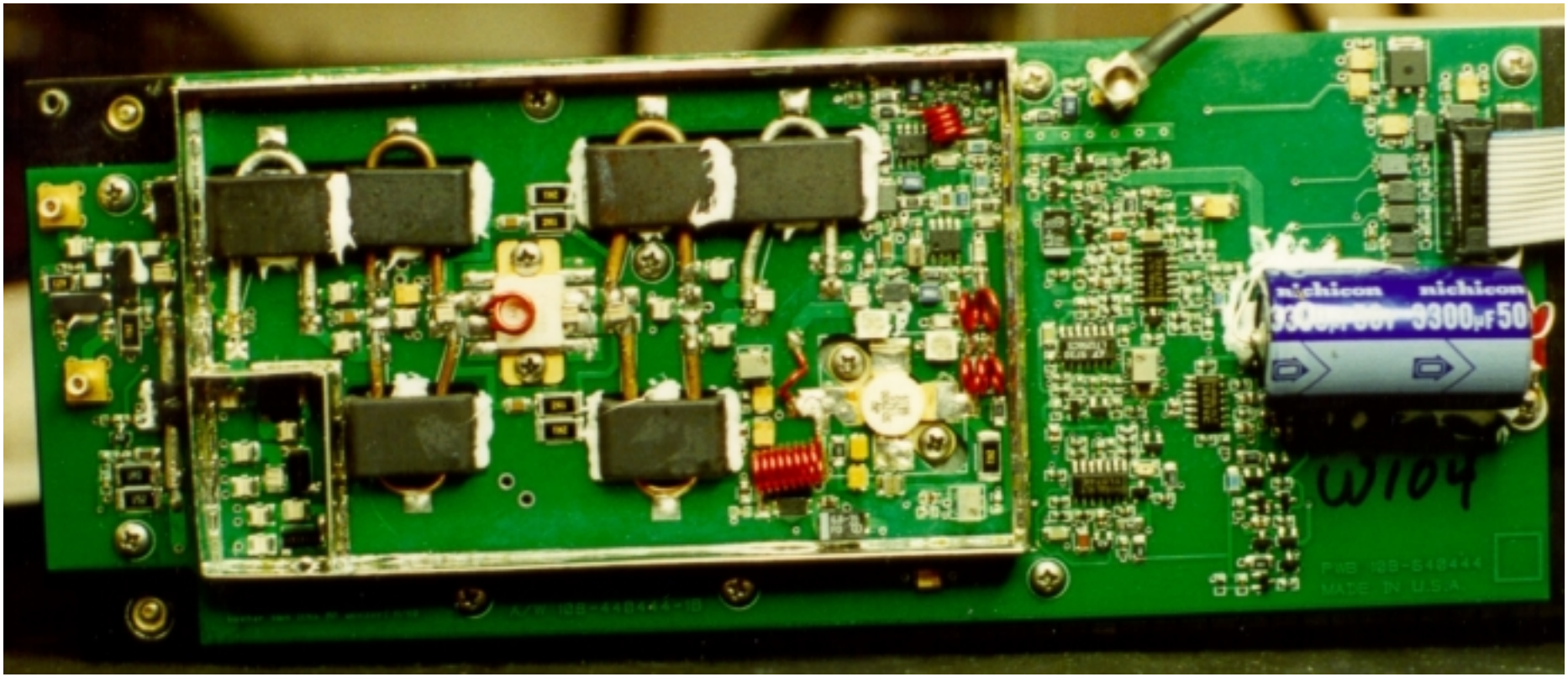
Front and backsides are shown.





8.5 Power Amplifier Board.

No parts are located on the backside of this board. This board is directly mounted to the heat sink, which forms part of the outside cover. This board has one shield cover, which is removed for this picture.



8.6 Power Supply Board.

No parts are located on the backside of this board.