

**Application for Certification  
For an RF Power Amplifier**

**TPL Communications  
3370 San Fernando Rd. #206  
Los Angeles, CA 90065**

**VHF Amplifier:**

**Part # PA3-2EG-HMS**

**FCC ID: BBD3-2XG-H**

**REPORT # RA054894/10078**

This report was prepared in accordance with the requirements of the FCC Rules and Regulations Part 2, Subpart J, 2.1031 through 2.1057, Part 90 and other applicable sections of the rules as indicated herein.

**Prepared By:**

**Fred Gurule**

**DNB Engineering, Inc.  
3535 W. Commonwealth Ave.  
Fullerton, CA 92833**

**20 JANUARY 2001**

## TABLE OF CONTENTS

Section	Title	Sheet #
1.0	ADMINISTRATIVE DATA	3
1.1	Certifications and Qualifications	3
1.2	Measurements and Repeatability Information	3
 Note: Paragraph numbers in this report follow the application section numbers found in the FEDERAL COMMUNICATIONS COMMISSION Rules and Regulations, Part 2, Subpart J for Certification of electronic equipment.		
2.1033 (C) (1)	Application for Certification	4
2.1033 (C) (2)	FCC Identifier	4
2.1033 (C) (3)	Installation and Operating Instructions	4
2.1033 (C) (4)	Type of Emissions	4
2.1033 (C) (5)	Frequency Range	5
2.1033 (C) (6)	Operating Power	5
2.1033 (C) (7)	Maximum Power Allowed in Applicable part(s) of the Rules	5
2.1033 (C) (8)	Final RF Amplifier Input Power Characteristics	5
2.1033 (C) (9)	Tune Up Procedure	5
2.1033 (C) (10)	Schematic Diagram and Circuit Description	6 - 9
2.1033 (C) (11)	Equipment Identification Plate	10
2.1033 (C) (12)	Equipment Photographs	11 - 14
2.1033 (C) (13)	Digital Modulation Techniques	15
2.1033 (C) (14)	Test Data	16
2.1046	Measurement of RF Power Output	15
2.1049	Measurement of Occupied Bandwidth	17 - 19
	FIGURE 1: BLOCK DIAGRAM (Occupied Bandwidth tests)	18
2.1051	Spurious Emissions at Antenna Terminals	20 - 24
	FIGURE 2: BLOCK DIAGRAM (Spurious Emissions tests)	21
2.1053	Measurement of Field Strength of Spurious Radiation	25
	Table 1: Field Strength of Spurious Radiation	26
2.1055	Measurement of Frequency Stability	28
2.1057	Frequency Spectrum to be Investigated	28
APPENDIX A	Service/Operating Manual	A1 - A18

## 1.0 ADMINISTRATIVE DATA

---

### 1.1 Certifications and Qualifications

---

I certify that DNB Engineering, Inc conducted the tests performed in order to obtain the technical data presented in this application. Also, based on the results of the enclosed data, I have concluded that the equipment tested meets or exceeds the requirements of the Rules and Regulations governing this application.

### 1.2 Measurement Repeatability Information

---

The test data presented in this report has been acquired using the guidelines set forth in FCC Part 2.1031 through 2.1057, Part 90. The test results presented in this document are valid only for the equipment identified herein under the test conditions described. Repeatability of these test results will only be achieved with identical measurement conditions. These conditions include: The same test distance, EUT Height, Measurement Site Characteristics, and the same EUT System Components. The system must have the same Interconnecting Cables arranged in identical placement to that in the test set-up, with the system and/or EUT functioning in the identical mode of operation (i.e. software and so on) as on the date of the test. Any deviation from the test conditions and the environment on the date of the test may result in measurement repeatability difficulties.

All changes made to the EUT during the course of testing as identified in this test report must be incorporated into the EUT or identical models to ensure compliance with the FCC regulations.



Bryan Broaddus (Para. 1.1)  
Manager, Test Dept.  
DNB Engineering, Inc.  
Tel. (714) 870-7781 FAX (714) 870-5081

**2.1033 (C) (1) Application for Certification**

---

Name of Applicant:	TPL Communications 3370 San Fernando Rd. #206 Los Angeles, CA 90065
Applicant is:	<input checked="" type="checkbox"/> Manufacturer <input type="checkbox"/> Vendor <input type="checkbox"/> Licensee <input type="checkbox"/> Prospective Licensee <input type="checkbox"/> Other
Description:	VHF Amplifier
Part Number:	PA3-2EG-HMS
Anticipated Production Quantity:	Multiple Units

**2.1033 (C) (2) FCC Identifier**

---

FCC ID: BBD3-2XG-H

**2.1033 (C) (3) Installation and Operating Instructions**

---

See the Service Manual Included in Appendix A herein for the complete description.

**2.1033 (C) (4) Type of Emission**

---

F3E

**2.1033 (C) (5) Frequency Range**

---

160 MHz

**2.1033 (C) (6) Operating Power**

---

500 Watts

**2.1033 (C) (7) Maximum Power Allowed in Applicable Part(s) of the Rules**

---

RULES PART	MAXIMUM POWER (WATTS)
Part 90.205	500 Watts (ERP)

**2.1033 (C) (8) Final RF Amplifier Input Power Characteristics**

---

Input Voltage:	26.4 Vdc Nominal
Input Current:	33.6 Adc Nominal

**2.1033 (C) (9) Tune Up Procedure**

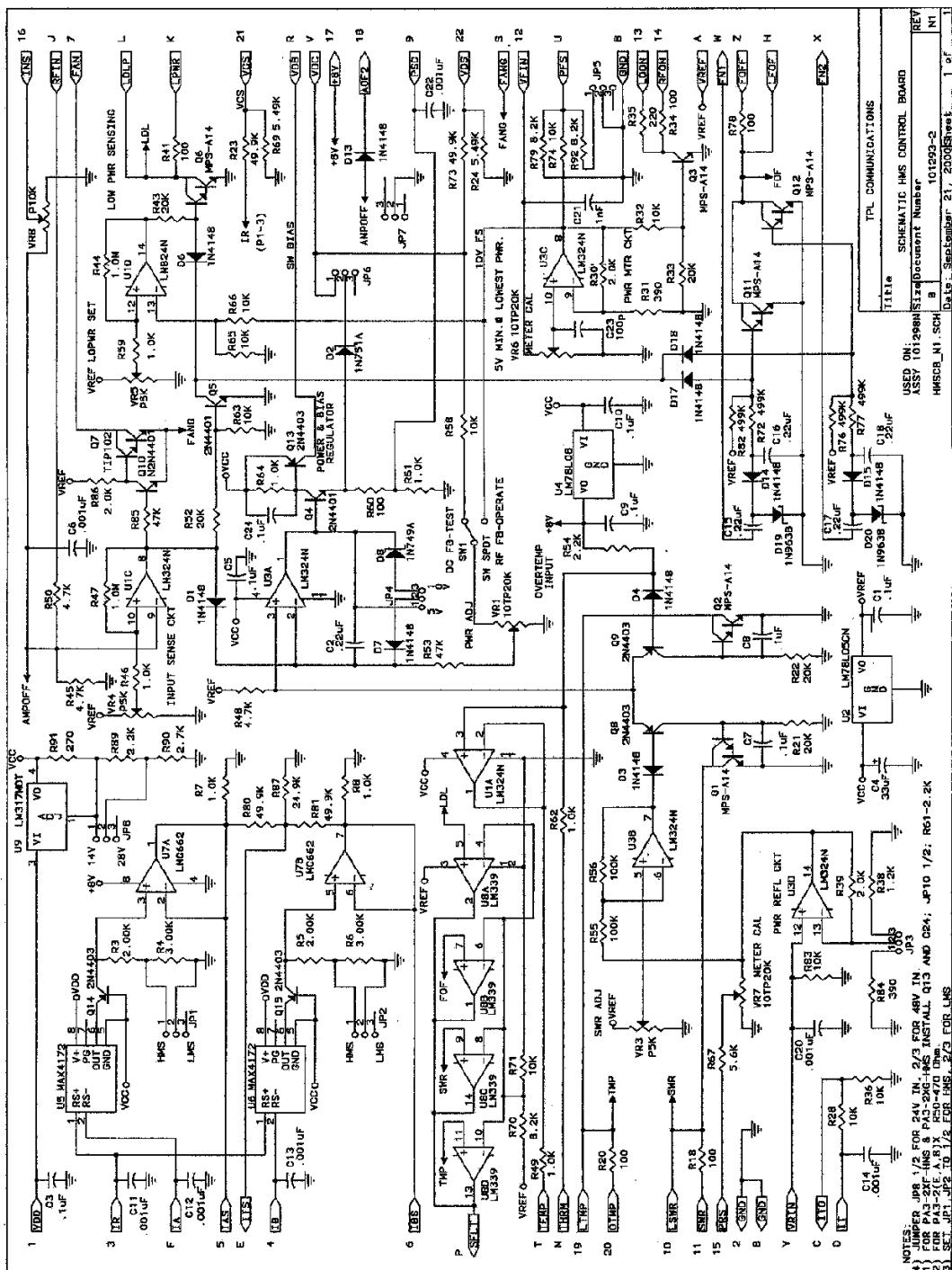
---

Refer to Figure in Appendix A.

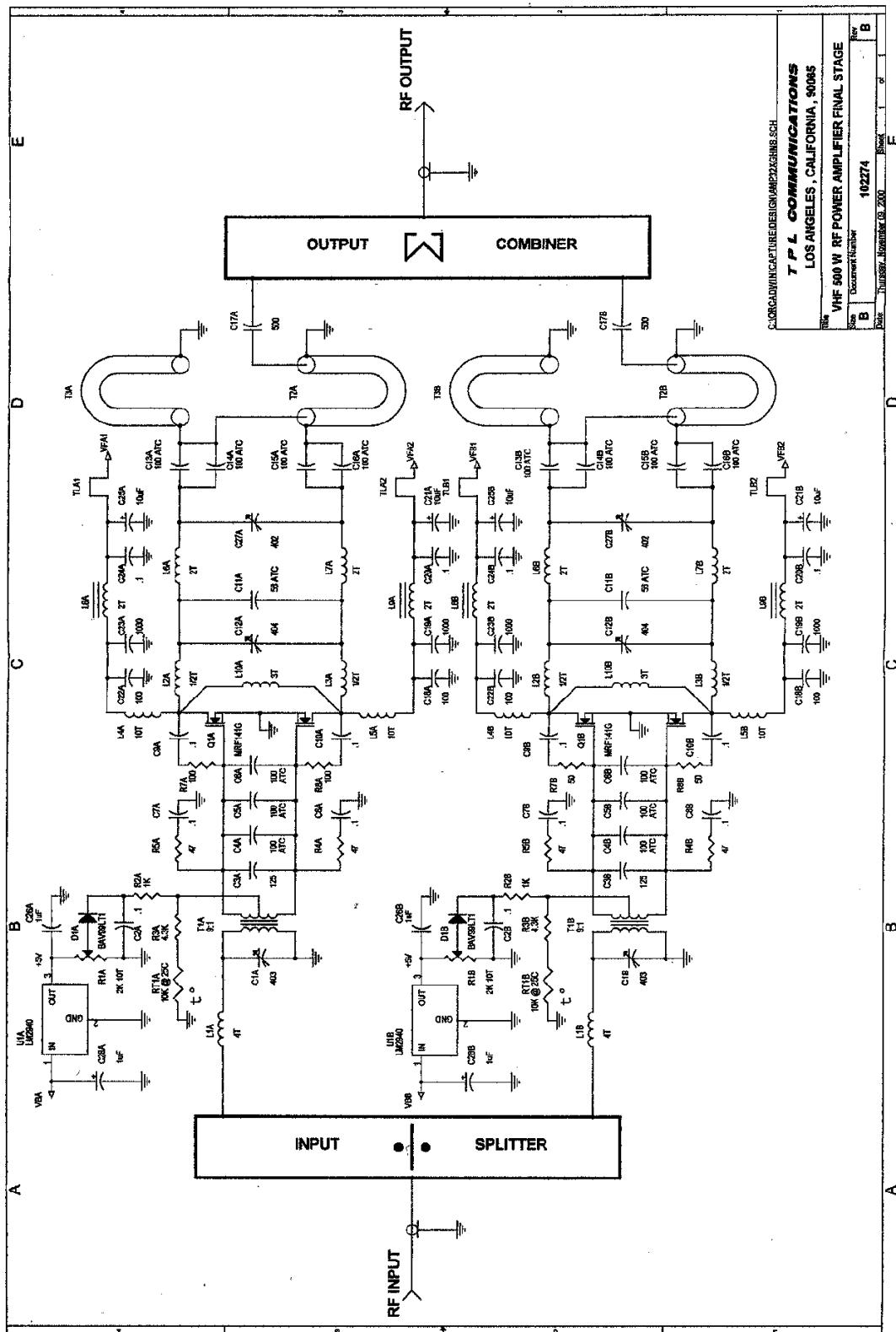
2.1033 (C) (10) Schematic Diagram and Circuit Description

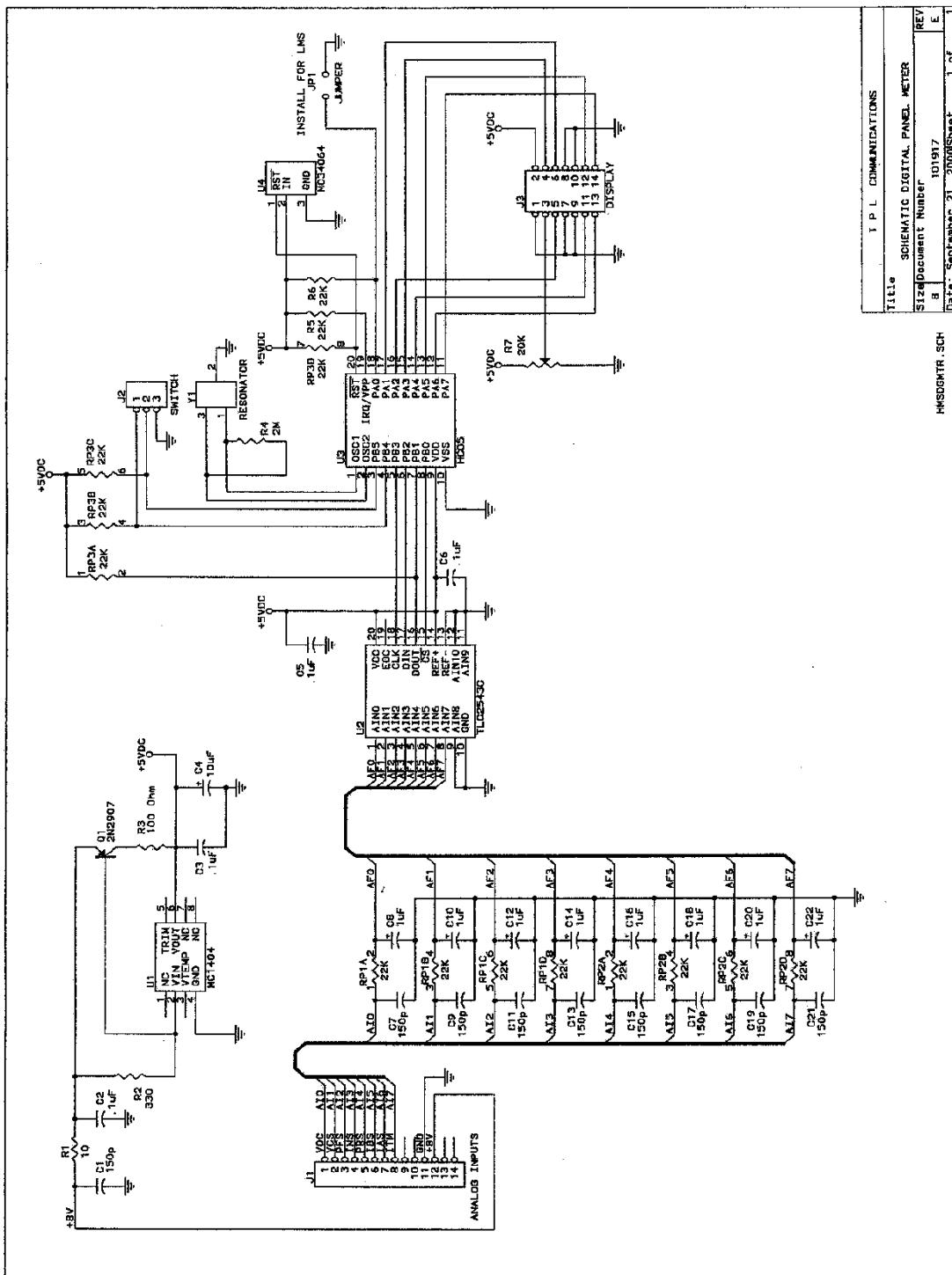
---

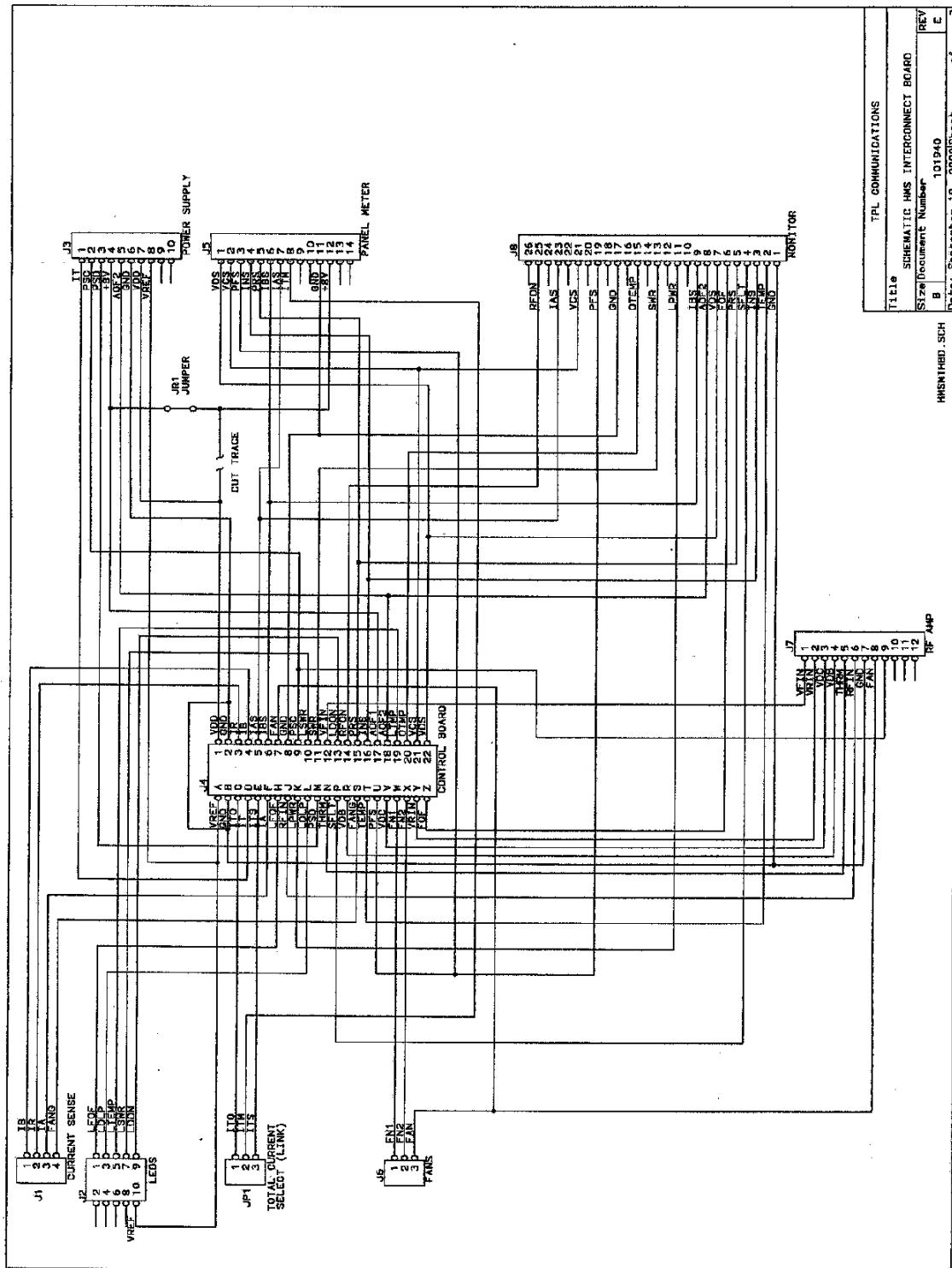




NOTE  
JULY  
FD  
FD  
SE

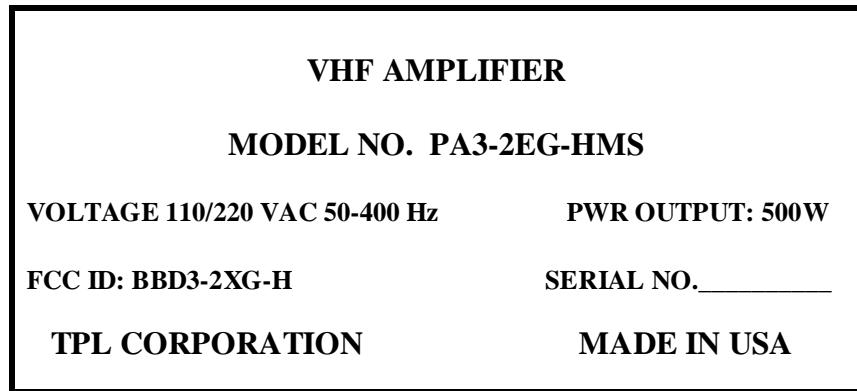






2.1033 (C) (11) Equipment Identification Plate

---



**NOTES:**

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

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

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

**2.1033 (C) (11) Equipment Photographs**

---

Note: The Main Circuit Board shown in these photos has no components on the reverse side.

Photo 1      Main Circuit Board (Overall View)

Photo 2      Main Circuit Board (Detail)

Photo 3      External Front and Back View

Photo 1 Main Circuit Board (Overall View)

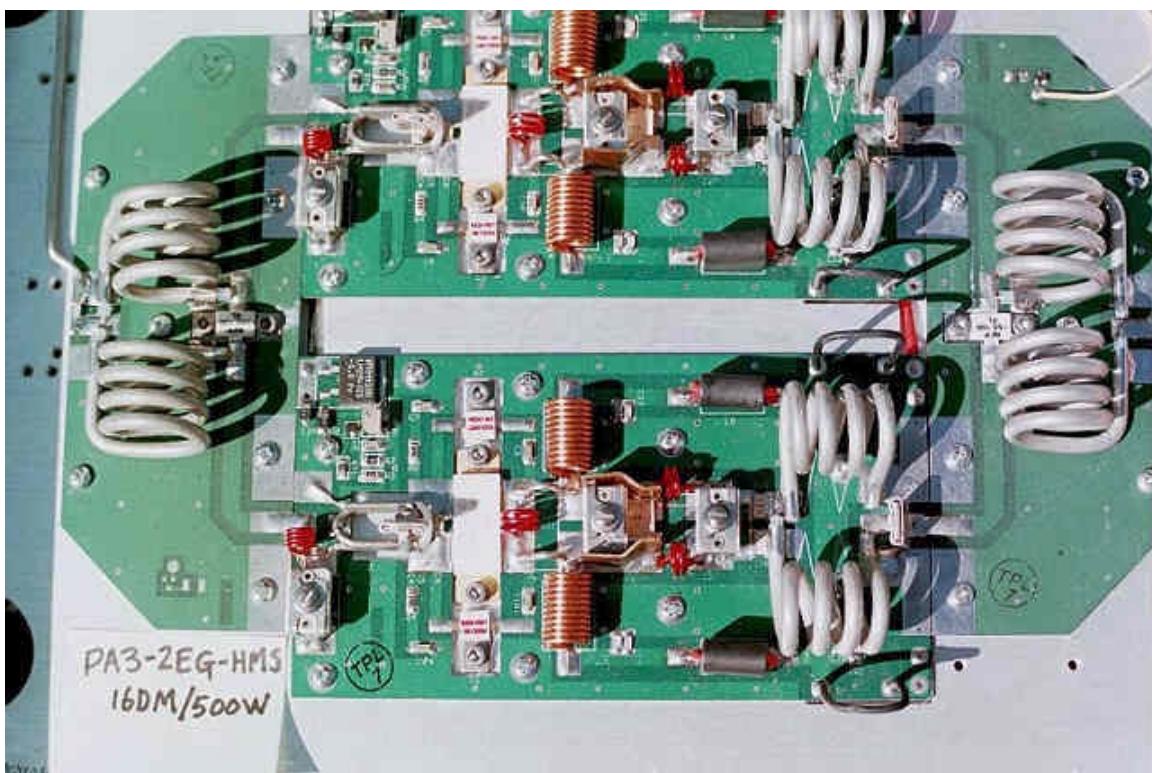
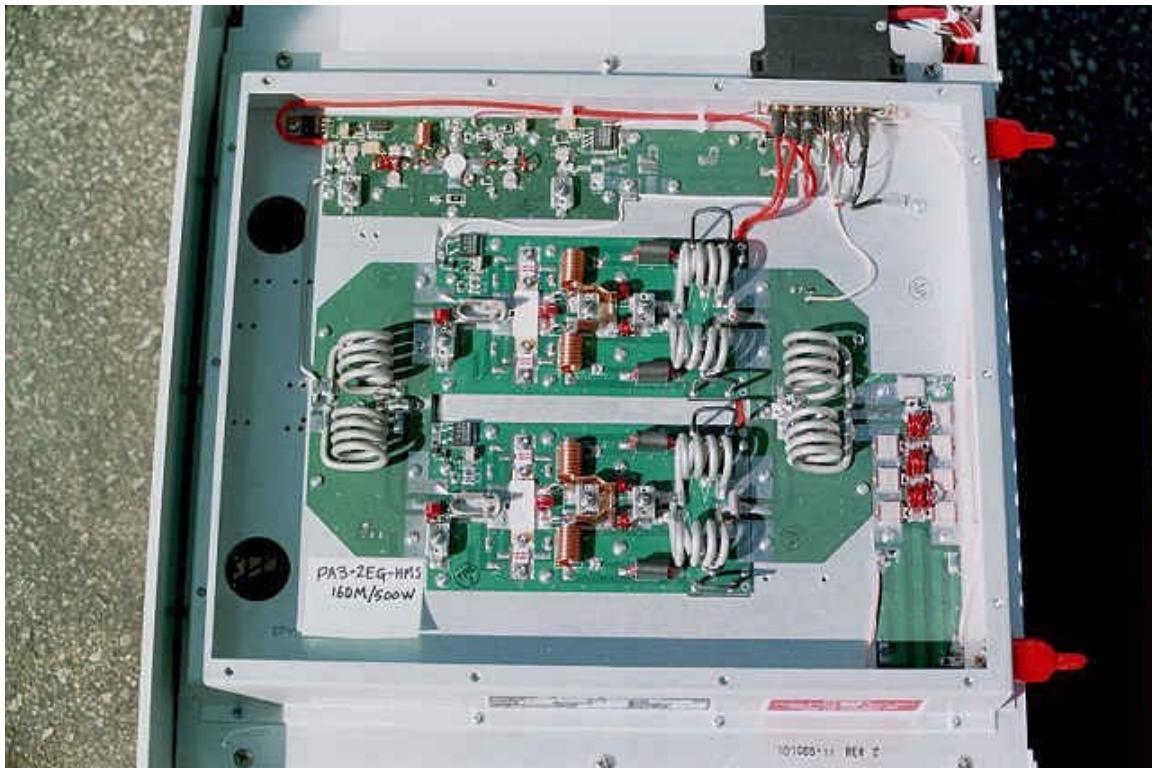


Photo 2 Main Circuit Board (Detail)

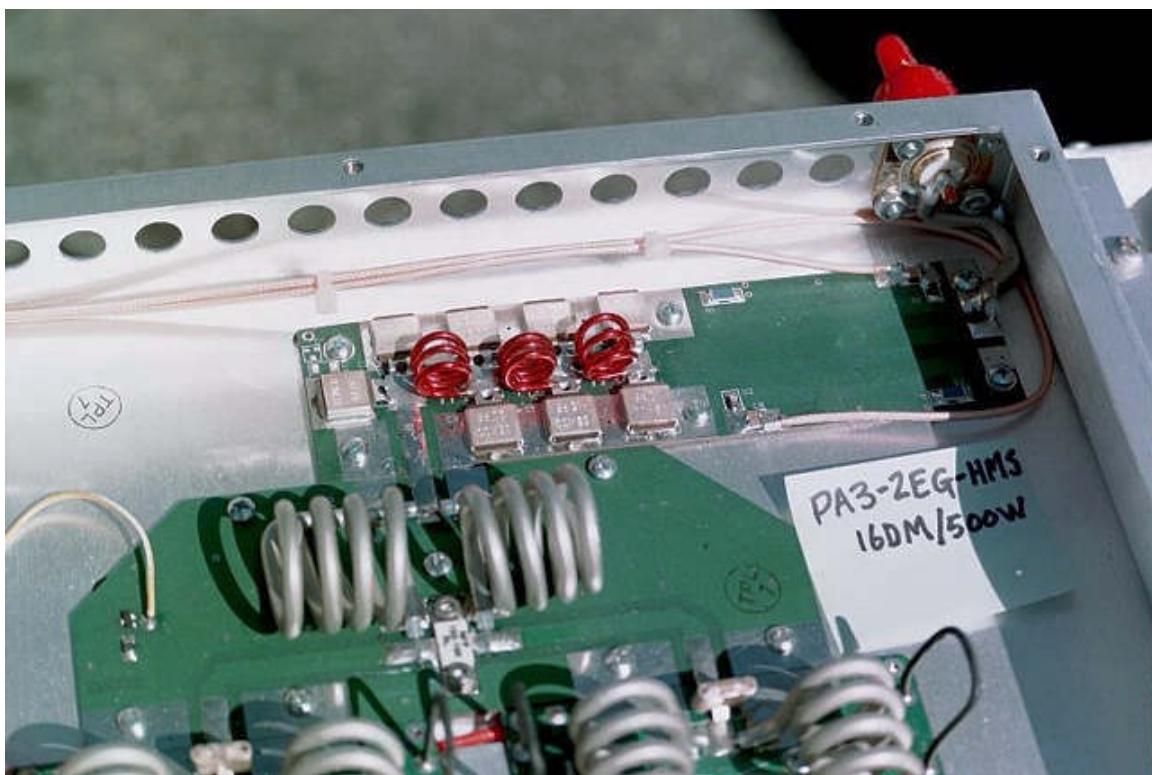
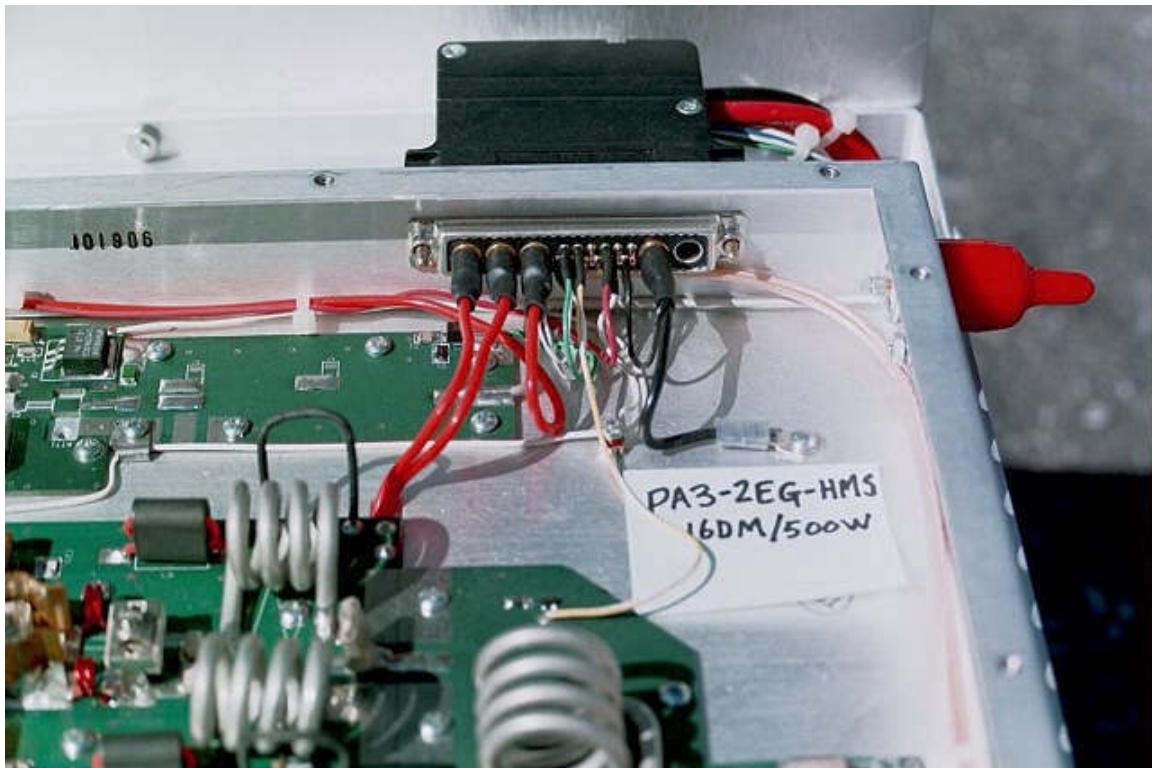
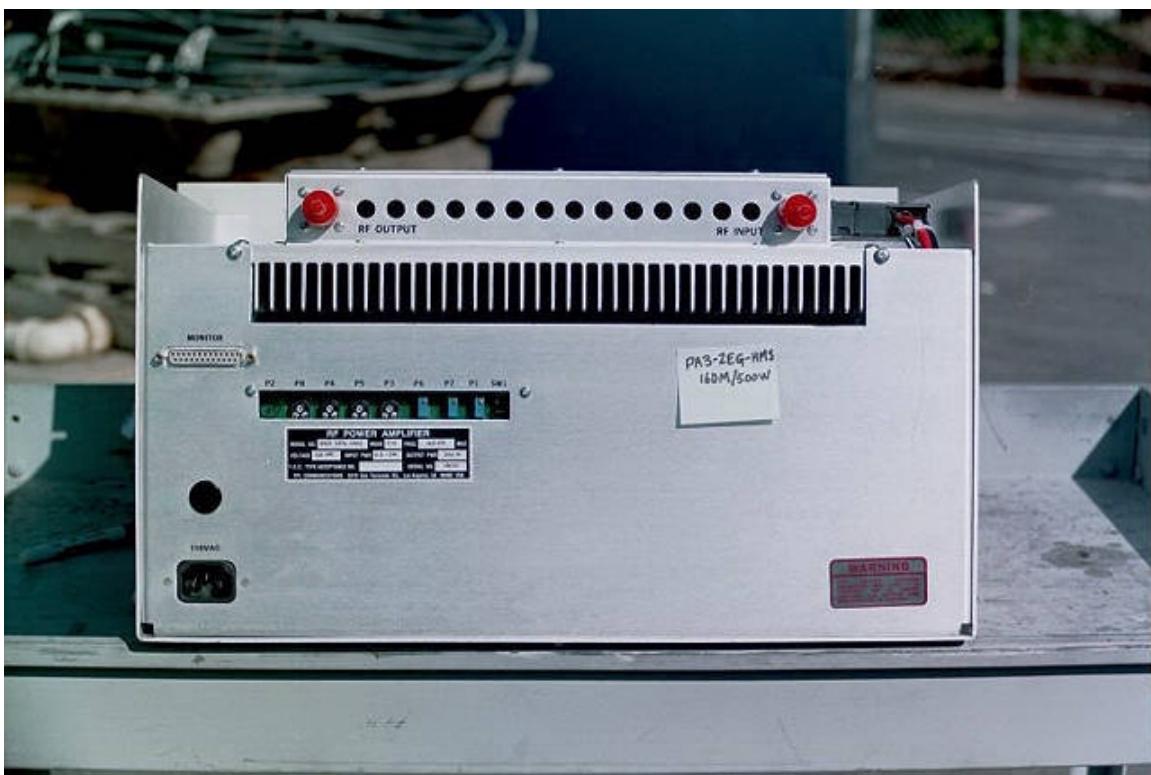


Photo 3 External Front and Back View



**2.1033 (C) (13) Digital Modulation Techniques**

---

---

Not Applicable

**2.1033 (c) (14) Test Data**

---

Refer to 2.1046 through 2.1057

**2.1046 Measurement of RF Power Output**

---

Definition: For VHF Amplifiers.

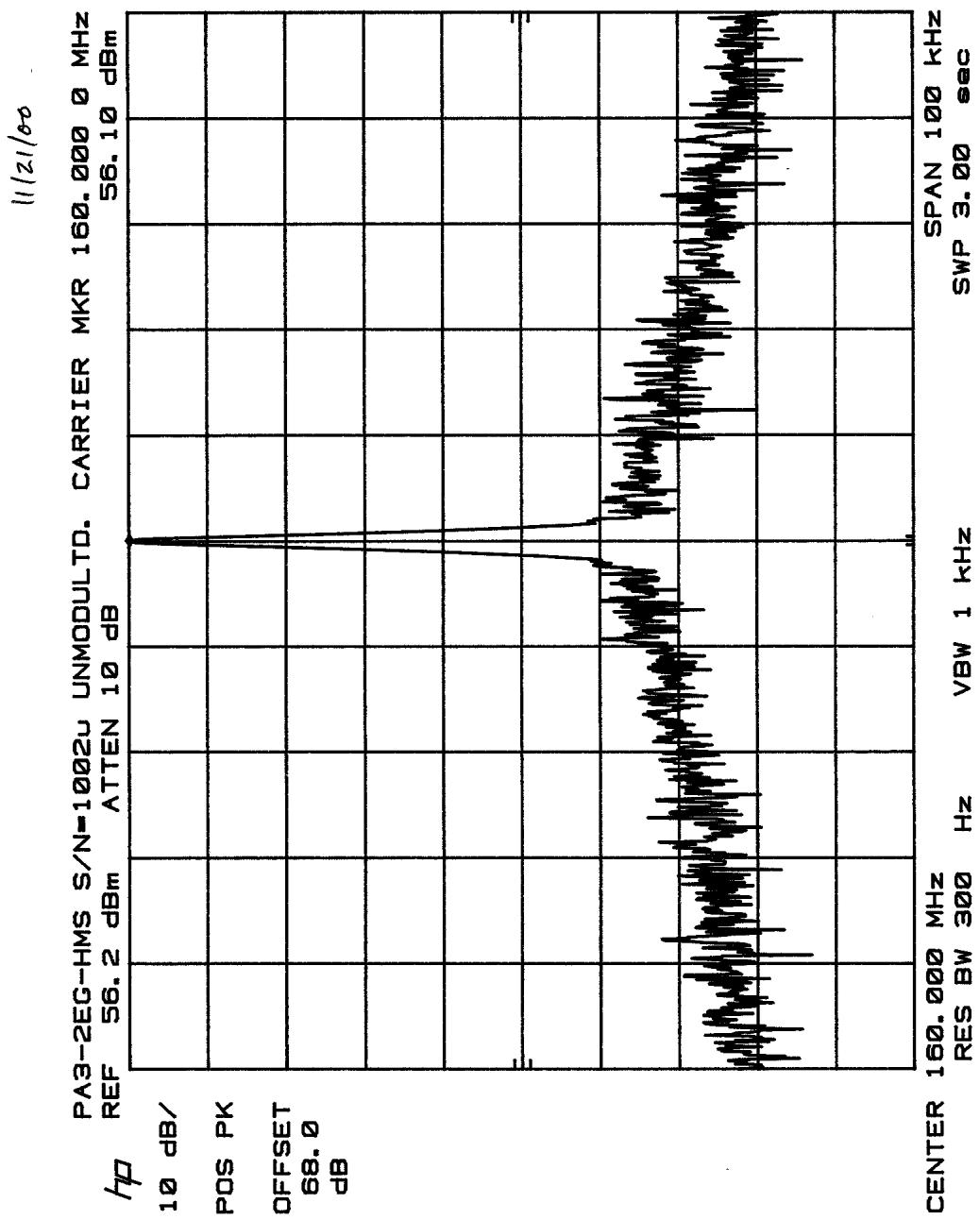
Test Method: See FIGURE 1.

Output Power is measured across a precision 50 ohm load with a Spectrum Analyzer

Test Results:

POWER OUTPUT MEASURED AT NOMINAL VOLTAGE WAS:

<u>Frequency (MHz)</u>	<u>Power (dBm)</u>	<u>Power (W)</u>
160	56.1	407.4



## 2.1049 Measurement of Occupied Bandwidth

---

### Definition:

Occupied Bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are equal to 0.5 percent of the total mean power radiated by a given emission.

### Test Method: Connect the Equipment per FIGURE 1.

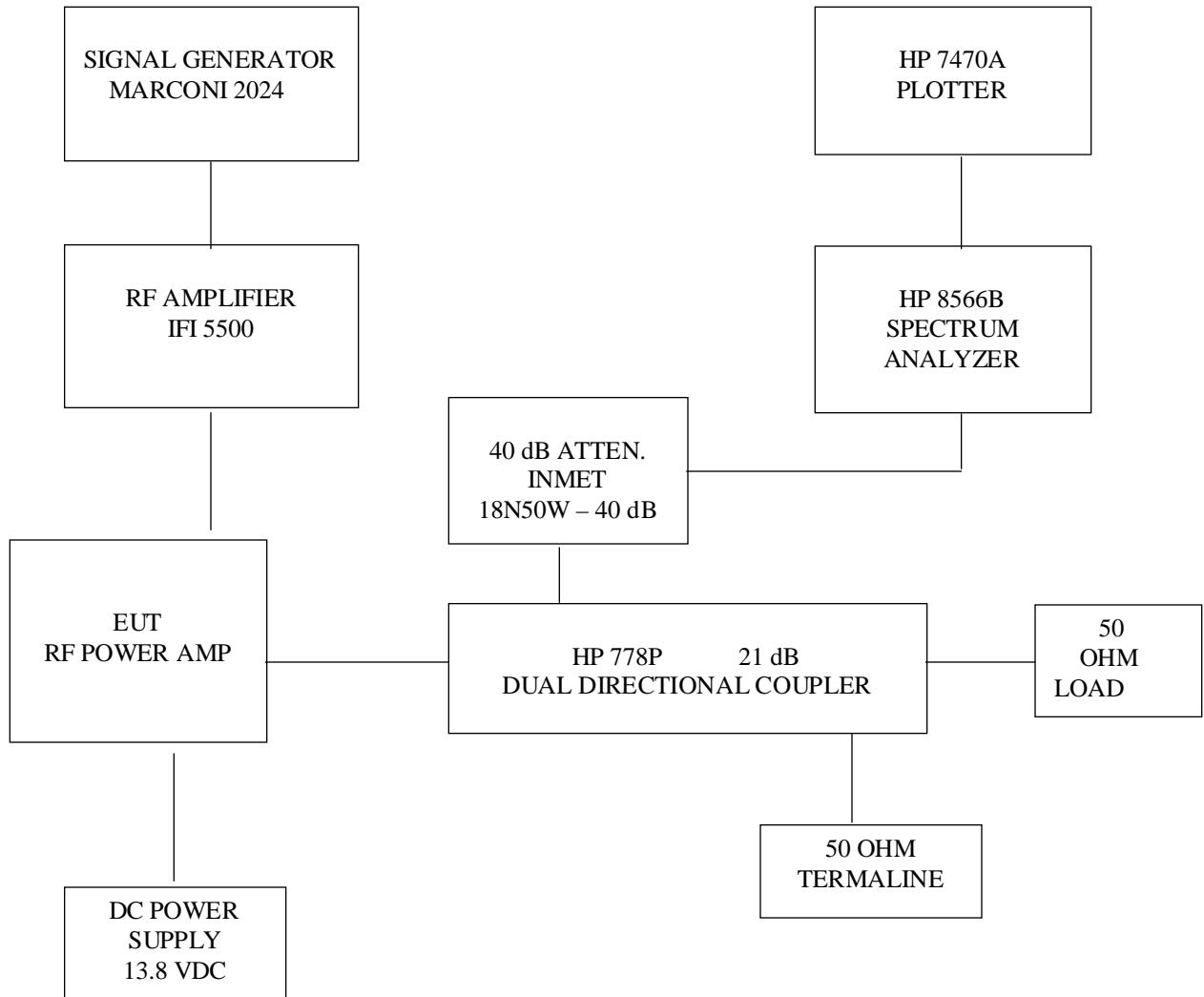
Measurements were made with the modulating signal at 2.5 kHz with 5 kHz of FM deviation.

### Test Results: See Plots following FIGURE 1.

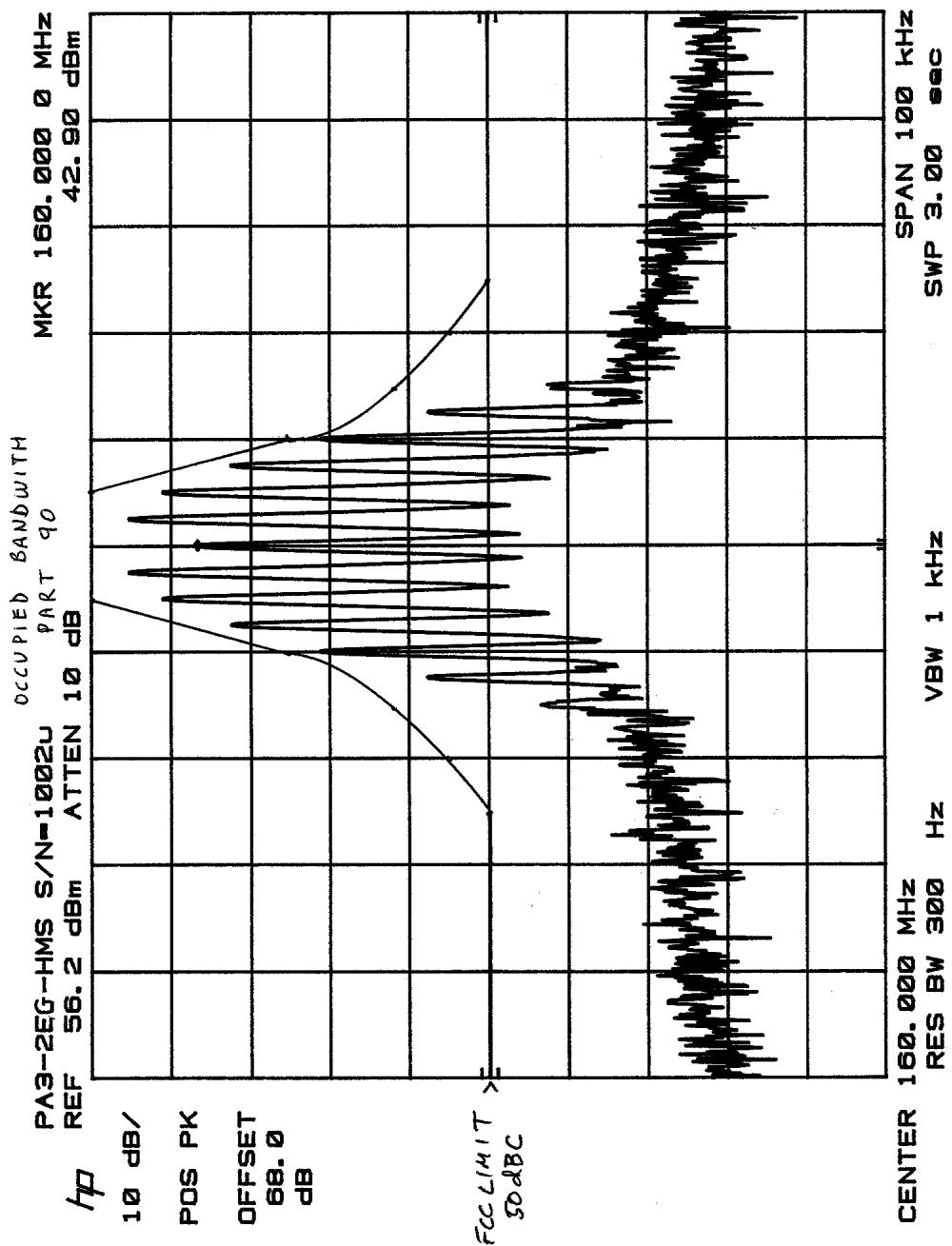
The center frequency of the signal did not shift with modulation. The Spectrum Bandwidth was well within the limits specified in the FCC Regulations.

FIGURE 1: Block Diagram  
(Occupied Bandwidth tests)

---







2.1051 Spurious Emissions at Antenna Terminals

---

Definition:

Conducted Spurious Emissions are emissions at the antenna terminals on a frequency or frequencies which are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communication desired. The reduction in the level of these spurious emissions will not affect the quality of the information being transmitted.

Conducted Spurious Emissions shall be attenuated below the maximum level of the carrier frequency in accordance with the following formula:

$$\text{Spurious attenuation in dB} = 43 + 10 \log_{10} P_o$$

Where  $P_o$  = Output in Watts

$$= 43 + 10 \log_{10} (500)$$

$$= 70 \text{ dB}$$

Note: The actual limit line has been adjusted to correspond to the actual measured power.

Test Method: Per EIA RS 152-B, Paragraph 4.

Connect the equipment as shown in FIGURE 2.

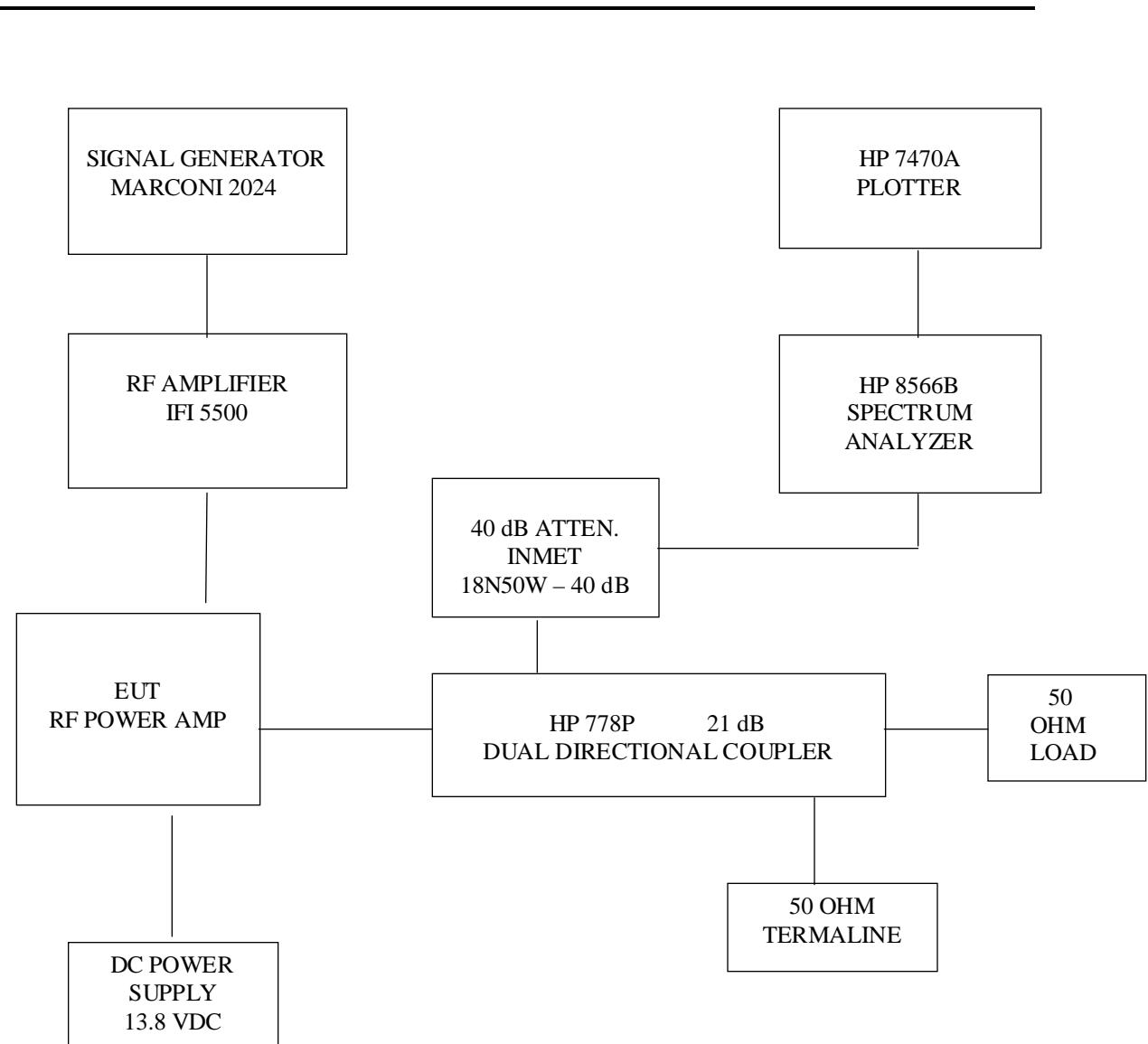
Adjust the Audio Oscillator so that the frequency deviation of the transmitter is a 5 kHz at a modulation frequency of 2.5 kHz. Adjust the Spectrum Analyzer to display the Modulated Carrier.

Scan the frequency spectrum from the lowest radio frequency generated in the equipment through the 10<sup>th</sup> harmonic of the carrier frequency.

Test Results: See Plots following FIGURE 2.

All spurious emissions at the antenna terminals are below the FCC specifications

FIGURE 2: Block Diagram  
(Spurious Emissions tests)

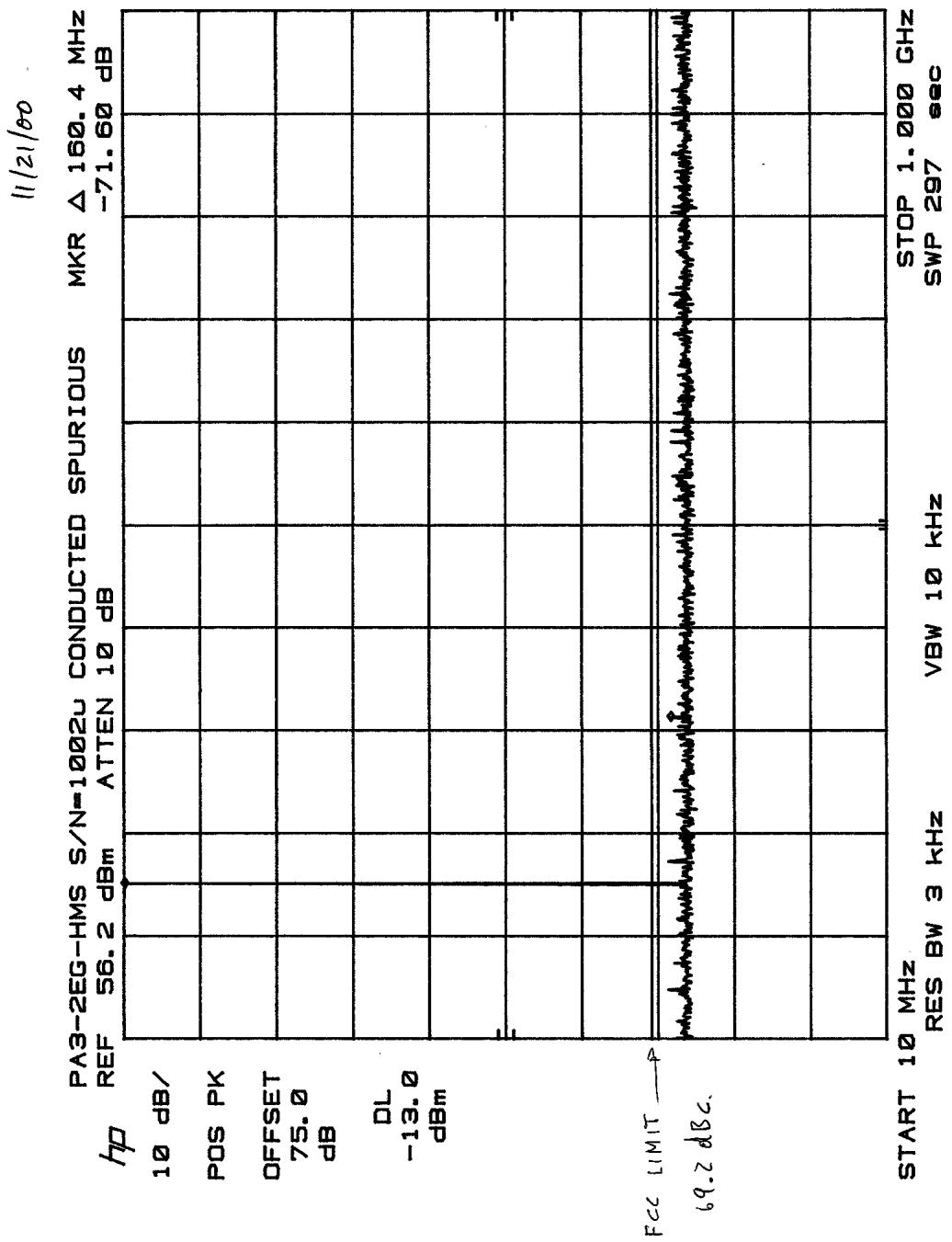


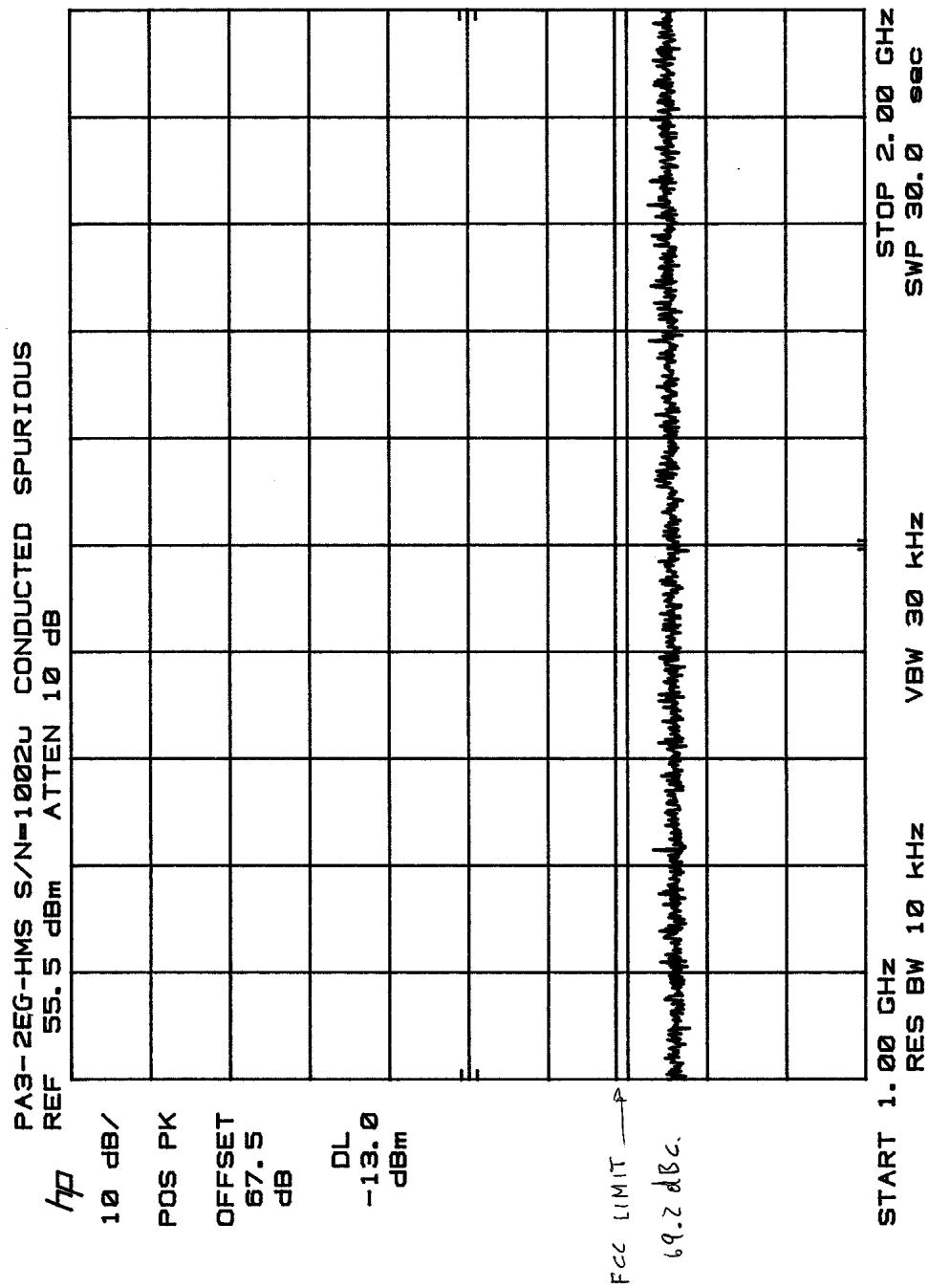


## TEST EQUIPMENT LOG

**Customer:** TPL Communications      **Test Procedure:** FCC, Part 90  
**EUT:** VHF Amplifier, 160 MHz, 500W      **Test Specification:** Conducted Spurious  
**Model / Part #:** PA3-2EG-HMS      **Test Engineer:** John Stanford  
**Serial #:** 1002u      **Customer Rep:** Jim Briggs

FORM 0010





## 2.1053 Field Strength of Spurious Radiation

Definition:

Emissions from the equipment when connected into a non-radiating load on a frequency or frequencies which are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communication desired. The reduction in the level of these spurious emissions will not affect the quality of the information being transmitted.

Test Method: Per EIA RS 152-B.

Connect the equipment and follow the procedure described in paragraph 2.2.1.1 and paragraph 5.0. Measure the amplitude of each spurious radiated signal through the 10<sup>th</sup> harmonic. The level in dBuV/m is calculated on the following page. The spurious signals are then measured on the 3 meter range.

$$\text{Spurious attenuation dB} = 10 \log \frac{\text{Po Watts}}{\text{Calc. Spurious power}}$$

Test Results: See TABLE on following Page.

All radiated spurious emissions are below the FCC Specifications.

RF Exposure

The information contained in "Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields", OET Bulletin 65; August 1997 is applicable when a radiating antenna is connected to this amplifier. Paging stations that utilize this amplifier authorized under Part 22 (Subpart E) and Part 90 are subject to routine environmental evaluation for RF exposure if an antenna is located on a rooftop and if its ERP exceeds 1000 watts.

This product is certified to meet the RF exposure guidelines of OET-65 as a stand-alone RF power amplifier. The RF spurious emissions recorded when the antenna output connector is terminated into a non-radiating 50 ohm load do not exceed the 27.5 V/m limit specified for General Population/Uncontrolled Exposure in OET Bulletin 65.

## TEST EQUIPMENT LOG

12/6/00

**Customer:** TPL Communications  
**EUT:** VHF Amplifier, 160 MHz, 500W  
**Model / Part #:** PA3-2EG-HMS  
**Serial #:** 1002U

**Test Procedure:** FCC, Part 90  
**Test Specification:** Radiated Spurious  
**Test Engineer:** Mike Green  
**Customer Rep:** Jim Briggs

**FORM 0010**

**SPIURIOUS RADIATED SIGNAL MEASUREMENTS**  
 (Ref. Part 2, Subpart J, 2.1053 and 2.1057)

Date	6-Dec-00
Customer	TPL Communications
EUT	RF Power Amplifier
PN	PA3-2EG-HMS
S/N	1002U
Pass/Fail	PASS
Operating Mode	FM, 2.5 kHz
Test Engineer	Mike Green
Fund. Freq.	160 MHz
Output Power	500 W
Output Impedance	50 ohms
Fund. Field Strength	52.7 V/m
Fund. Field Strength	154.4 dBuV/m
FCC Limit	70.0 dBc

Antenna Polarization	Freq (MHz)	Measured Signal (dBuV)	AF (dB/m)	Cable Loss (dB)	Amp Gain (dB)	Corrected Measurement (dBuV/m)	Corrected Field Strength (dBuV/m)	Fundamental Spurious Below Carrier (dBc)	FCC Limit (dBc)
H	320	56.1	16.2	0.42	0	72.72	154.4	81.7	70.0
H	480	26.9	21.6	0.53	0	49.03	154.4	105.4	70.0
H	640	28.2	23.5	0.64	0	52.34	154.4	102.1	70.0
H	800	31.1	25.0	0.75	0	56.85	154.4	97.6	70.0
H	960	38.3	25.3	0.87	0	64.47	154.4	90.0	70.0
H	1120	30.5	24.8	0.92	0	56.22	154.4	98.2	70.0
H	1280	22.6	25.3	1.00	0	48.90	154.4	105.5	70.0
H	1440	17.6	25.6	1.20	0	44.40	154.4	110.0	70.0
H	1600	19.0	26.3	1.40	0	46.70	154.4	107.7	70.0

**2.1055      Measurement of Frequency Stability**

---

The EUT is a power amplifier and contains no circuitry for generating or stabilizing the RF signal. The driver will be responsible for this task.

**2.1057      Frequency Spectrum to be Investigated**

---

The Frequency was searched from the lowest radio frequency generated in the equipment through the 10<sup>th</sup> harmonic of the carrier frequency.