



16 TESTA PLACE SO. NORWALK, CT 06854-4613 USA
TEL: 203-866-4283 FAX: 203-853-3513

APPLICATION FOR CERTIFICATION

OF

RF-715D

MICROWAVE AMPLIFIER

November 18, 1998

INNOVATORS IN MICROWAVE COMMUNICATIONS

TABLE OF CONTENTS

	<u>PAGE</u>
INTRODUCTION	1
TECHNICAL DESCRIPTION	1
MEASUREMENT DATA	1
Spurious Emission at antenna terminal	1
Field strength of spurious radiation	2
Occupied bandwidth	2
RF Power output	3
ENGINEERING CERTIFICATION	3

LIST OF FIGURES

<u>FIGURE</u>	<u>DESCRIPTION</u>	<u>PAGE</u>
1	Spurious Emission at Antenna Test Set-up	4
2	Field Strength of Spurious Radiation Test Set-up	5
3	Modulation Signal for Occupied Bandwidth Measurement	6
4	Occupied Bandwidth Spectrum	7
5	RF Output Power Set-Up	8
6	Photograph of RF-715D amplifier, front view includes FCC ID label	10
7	Photograph of RF-715D amplifier, rear view	11

<u>TABLE</u>	<u>DESCRIPTION</u>	<u>PAGE</u>
1	Test equipment	9

INTRODUCTION

The RF-715D is a all solid-state amplifier, having an input power range of 10mW to 40mW with a saturated power output of 8watts maximum, operating in the 5925 to 7125 MHz frequency band under parts 21, 74, 78, and 101 of the FCC Rules and Regulations. It is designed to be used with FM transmitters that are used for the transmission of television video and audio subcarriers.

TECHNICAL DESCRIPTION

A technical description is contained in the manual.

MEASUREMENT DATA

In order to demonstrate compliance to the FCC Rules and Regulation, measurements were taken at RF Technology's facilities. The results of these measurements show that the RF-715D amplifier meets or exceeds all requirements for parts 21, 74, 78 and 101.

SPURIOUS EMISSION AT ANTENNA TERMINAL

The antenna conducted spurious emission test set-up is shown in Figure 1. The analyzer was first tuned for a reference carrier level at the fundamental operating frequency. The output spectrum was then slowly scanned from 50MHz to 26GHz. Special attention was given to those frequencies which corresponded to possible harmonics and sub-harmonics.

The FCC limit for antenna conducted spurious emission is $43+10\text{LOG } P$ below the main carrier. For the RF-715D with $P=8\text{W}$ (+39dBm), this corresponds to 52dB below the main carrier, or a level of -13dBm. The second harmonic was at a level of -25dBm and the third harmonic was at a level of -27dBm no other signals were noted within 20dB of the FCC limit and therefore, the amplifier meets the requirements set forth in Paragraphs 21.106, 74.637, 78.103 and 101.111.

FIELD STRENGTH OF SPURIOUS RADIATION

Case radiated spurious emission test set-up is shown in Figure 2. Observations were made at one meter from the amplifier in all planes of polarization. The output spectrum, as received at one meter, was slowly scanned upward from 50MHz to 26GHz. Special attention was given to those frequencies which corresponded to possible harmonics and sub-harmonics.

A radiated reference level can be calculated using the formula:

$$E = \sqrt{\frac{30 \times G \times P}{R}}$$

Where: G = Power Gain of Antenna

P = Amplifier Power in Watts

R = Distance from radiator at which field intensity is measured.

In this case: G = 1.64 (gain of dipole over isotropic)

P = 8 Watts

R = 1 meter

$$\text{Therefore: } E = \sqrt{\frac{30 \times 1.64 \times 8}{1}} = 19.84 \text{ V/meter} = 145.9 \text{ dBuV/M}$$

The FCC requires case radiated signals to be attenuated by a factor of $43 + 10 \log P$ or $43 + 10 \log 8 = 52 \text{ dB}$. Thus, 145.9 dBuV/M reduced by $52 \text{ dB} = 93.9 \text{ dBuV/M}$. No case radiated signals were detected within 20 dB of the FCC limit and therefore the amplifier meets the requirements set forth in Paragraphs 21.106, 74.637, 78.103 and 101.111

OCCUPIED BANDWIDTH

To measure the occupied bandwidth, the equipment was set up as shown in Figure 1, and the transmitter was modulated by a multiburst signal, shown in figure 3, and the audio subcarrier was modulated by a 1KHz sinewave, which produced the spectrum output shown in Figure 4. Since the spectrum is symmetrical, about F_o , calculations were performed on one-half of the spectrum and then doubled to find the occupied bandwidth. A reference level was set at F_o and the amplitude readings were taken every 0.5 MHz from F_o to $F_o + 12 \text{ MHz}$. The readings were then converted to a linear scale and the total power was then calculated using Simpson's Rules of Numerical Integration.

RF TECHNOLOGY, INC.

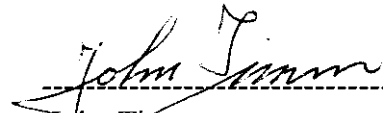
The total power was then multiplied by 99.5% to obtain the 0.5% power point. Calculations were then performed to find the frequency that corresponds to the 0.5% power point. From these calculations the occupied bandwidth was determined to be 17.2MHz.

RF POWER OUTPUT

The RF power output test set up is shown in Figure 3. The input power to the RF-715D amplifier was varied across its input range from 10mW to 40mW with no change in its output power of 8 watts. The DC input voltage was varied across the range of 10.6 to 18V with no change in output power.

ENGINEERING CERTIFICATION

It is hereby certified that the Certification Tests on RF Technology's RF-715D Microwave Amplifier were made under my supervision and that all the data submitted in the attached report is true and correct to the best of my knowledge and belief.


John Timm
Technical Sales Manager

QUALIFICATIONS

Mr. Timm has been employed by RF Technology Inc. for over 19 years. He received an A.A.S. degree from Norwalk State Technical College in 1971. He has been in the Engineering Department and has worked on the development and testing of equipment that has been submitted to the FCC for approval.

PRODUCTION

RF Technology, Inc. is planning a quantity production of the RF-715D Microwave amplifier.

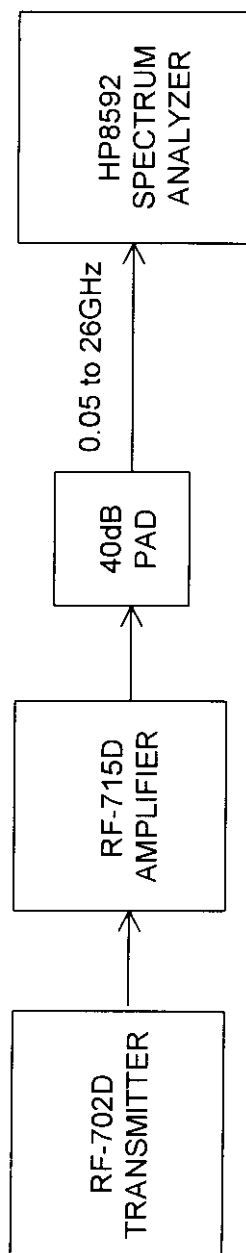


FIGURE 1 - SPURIOUS EMISSION AT ANTENNA TEST SET-UP

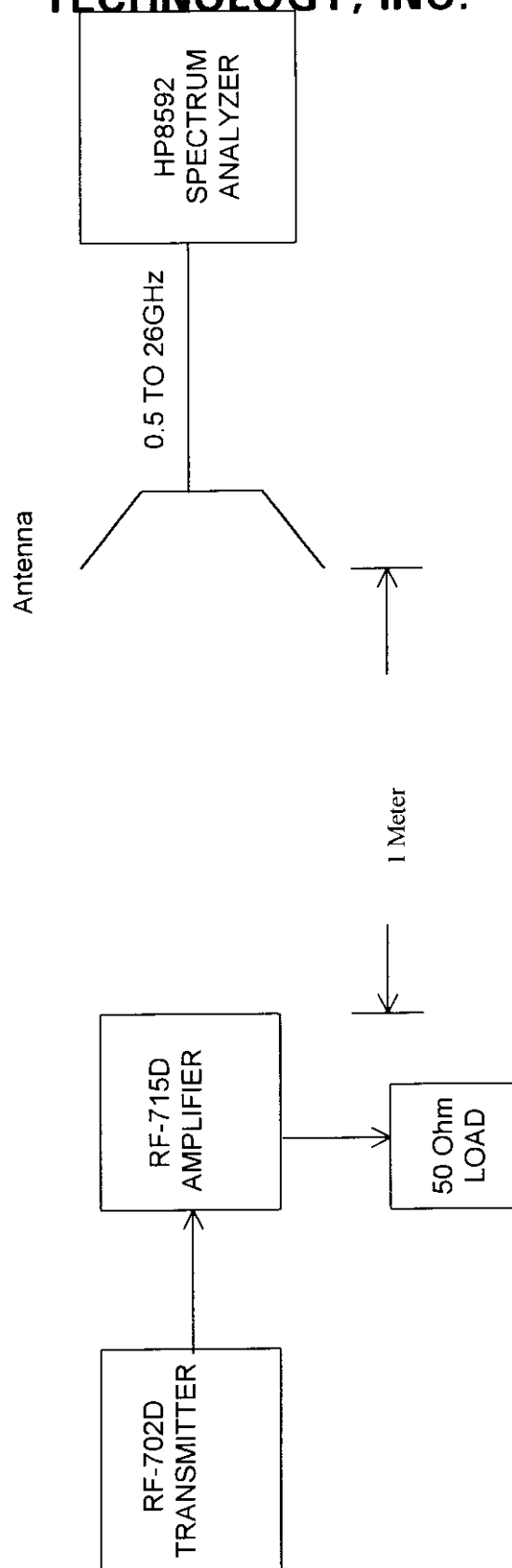


FIGURE 2 - FIELD STRENGTH OF SPURIOUS RADIATION TEST SET-UP

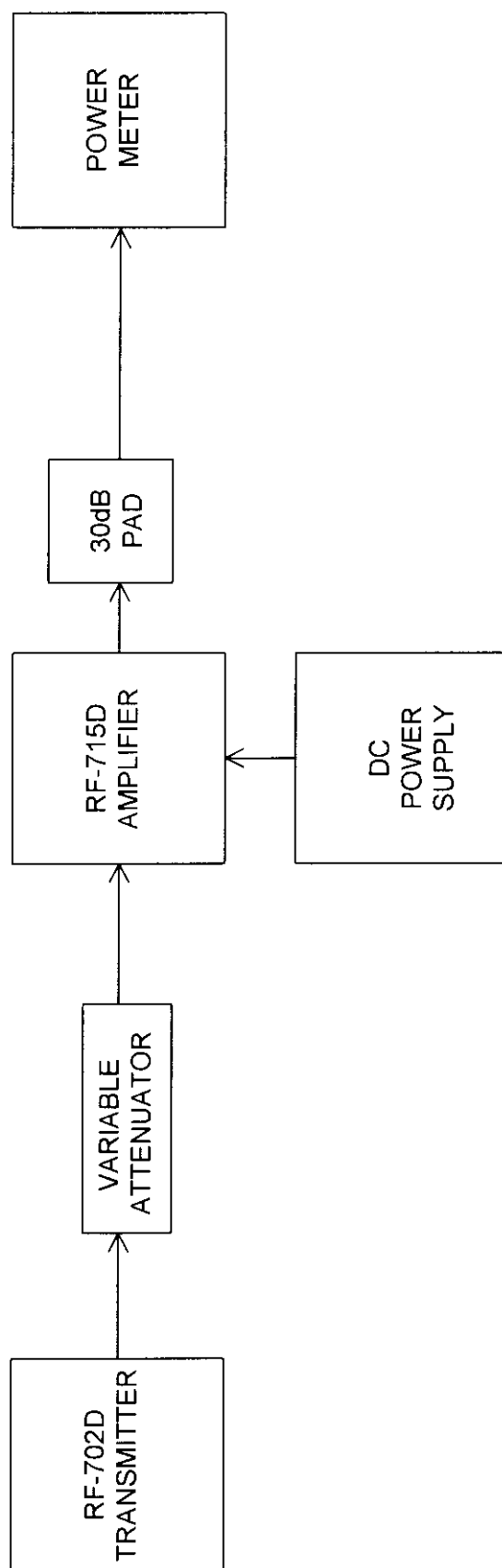


FIG. 3 – OUTPUT POWER VERSUS. DC VOLTAGE AND RF INPUT POWER TEST SET-UP

TABLE 1

The following test equipment or equal was used to perform tests.

<u>DESCRIPTION</u>	<u>MANUFACTURER</u>	<u>MODEL</u>
Spectrum analyzer	H.P.	8592
Power meter	Narda	447A
Thermistor mount	H.P.	8478B
Voltmeter	Fluke	8050A
Antenna	AEL	APN-101B
Antenna	Electro-Metrics	TDA-25
Antenna	Electro-Metrics	TDS-25
Antenna	Waveline	799
Antenna	AEL	H-1459
Power supply	Power Designs	3650-S