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Operation and Service Manual

A150

**Broadband
Power Amplifier**

Chapter 1

Introduction

1.1 Introduction

The Model A-150 is a completely solid state RF power amplifier, capable of providing more than 150 W of linear power and up to 250 W of CW and pulse power from .3 to 35 MHz. The amplifier operates over its entire frequency range without bandswitching or other adjustments.

A highly linear class A design, the Model A-150 will amplify of AM, FM, SSB, pulse and other complex modulations with minimum distortion. Flat gain response permits the unit to be driven to its full power output by virtually all commercial signal and sweep generators.

Although most power amplifiers are designed to deliver their rated power into a matched load, their mismatch. The Model A-150 is designed to provide a constant forward power, regardless of output load mismatch. The Model A-150 is designed to provide a constant forward power, regardless of output load impedance. Power reflected due to mismatch is absorbed in the unit's output circuitry.

Output RF voltage level as well as power into 50Ω is monitored by a front panel meter. An integral power supply permits operation directly from the AC line.

1.2 Specifications

Physical and electrical specifications are listed in Figure 1.

Chapter 2

Operation

2.1 Introduction

The ENI A150 RF amplifier is used to increase the RF output level of signal sources in the .3 to 35 MHz range. No tuning or any other form of adjustment is required other than the selection of the correct power supply input voltage.

The A150 produces rated power output at its output connector, regardless of load impedance. Any power reflected due to output load mismatch is absorbed in the amplifier. Therefore, although the output impedance is 50Ω (typical VSWR:1:5:1), the amplifier will work into any load impedance.

2.2 Rack Installation

Rack mounting brackets are supplied with the A150 for installation in any standard nineteen inch relay rack cabinet. To attach the brackets to the A150, remove the three #8-32 screws on each side of the cover nearest the front panel and reinsert them through the corresponding holes in the brackets. Tighten securely. The bottom feet may be unscrewed and removed if the minimum vertical usage of the relay rack is necessary.

2.3 Operation

Determine and adjust the voltage setting and fuse rating as described in the previous sections 2.2.1 and 2.2.2 then proceed as follows:

- (i) Ensure input voltage is not excessive.

The 1V rms indicated maximum input voltage is 5 times the level of the input signal required to achieve maximum output. Input voltages in excess of 2V peak may permanently damage the instrument.

- (ii) Connect the input signal via a 50 Ω coaxial lead to the input connector.
 - (iii) Connect the output via a 50 Ω coaxial lead to the load.
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Chapter 3

Technical Description

3.1 General Description

The ENI Model A150 is designed to amplify signals by 55 dB in the frequency range of .3 to 35 MHz. The signal from the front panel connector is fed via a length of 50Ω coaxial cable to the input of the preamplifier module (A150-3215). See Reference 1. The signal is amplified by Q1, impedance matched by T1 and attenuated by R6,7, and R8. The signal is then fed to the base of the low noise transistor Q2. The output at the collector of Q2 is impedance matched and split into two equal phase and amplitude signals by reversing hybrid transformer T2 and fed to the bases of transistor Q3 and Q4. Transistors Q3 and Q4 further amplify the signal and couple it to the bases of Q5 and Q6 for the final stage of amplification. Reversing hybrid transformer T3 combines the outputs of Q5 and Q6 and couples even order harmonics to resistor R37. The signal is fed through matching transformers T4 and T5 to hybrid splitting transformers T6,7, and T8 where it is divided into four equal phase and amplitude signals. These signals are then fed to the inputs of the four power amplifier modules via 50Ω coaxial cables.

At each of the four power amplifier modules (A300-4381) signal is matched, split, and phase reversed by transformers T1 and T2. Two equal amplitude phase reversed signals are fed to the bases of Q1 and Q2 through transformers T3 and T4. The power outputs of Q1 and Q2 are matched through transformers T5 and T7 are combined in phase reversing transformer T8. Transformer T9 matches the output impedances to 50Ω. Transformer T6 is an RF choke which isolates the collectors of Q1 and Q2 from the power supply.

The bias regulator module (A300-4387) is mounted on the power amplifier module. It consists of an integrated circuit voltage regulator IC1 feeding buffer transistor Q1. The voltage regulated output of IC1 is adjusted by potentiometer R3. The DC output is fed to the base of transistor Q1 which is connected as an emitter follower. Q1 supplies the base current for RF output transistors Q1 and Q2.

Chapter 4

Maintenance

4.1 Introduction

The ENI A150 RF amplifier requires no periodic maintenance. The instrument is unconditionally stable and is failsafe under all load conditions. Damage can only be externally caused by the incorrect selection of the supply voltage or by an input signal in excess of the specified 1V rms maximum.

The chapter therefore, deals only with certain fundamental procedures for fault location and with the subsequent re-alignment procedures.

Performance limits quoted are for guidance only and should not be taken for guaranteed performance specifications unless they are also quoted in Figure 1.

- (iii) Adjust the output level of the sweep generator so that a 50Ω video detector connected at the output of the unit will not be damaged by excessive power output.
- (iv) Observe the gain versus frequency ripple on an oscilloscope calibrated in decibels. The gain variation must be not more than +1 dB over the frequency range.
- (v) Connect a calorimetric power meter (HP434 or equivalent) through a short length of 50Ω cable to the output connector. Adjust the input CW signal to any frequency between 1 and 35MHz for 125W output.
- (vi) Observe the harmonic distortion of the output on a spectrum analyzer. The harmonic components contributed by the amplifier should be at least 25 dB down from the fundamental.

If the requirements of this check are not met, verify that:

- (a) The mains supply Jumper on TB1 and fuse are correctly selected and that DS1 is illuminated.
- (b) The preamplifier voltage is set for 27.1VDC by R23 on the regulator module.
- (c) The power amplifier voltages are set for 27.1VDC by R21, 22, 24 and R25 on the regulator module.

If the above checks are found to be correct, then normal fault location procedures, with reference to the circuit diagram Reference 1 should be followed to determine the correct operation of the preamplifier and power amplifier modules.

- (f) Return sweep/generator output level to full deflection. Rotate the step attenuator on the sweep/generator (CCW) so that the output is reduced by 55 dB.
- (g) Reconnect the A150 into the test set-up of Figure 3.
- (h) Flip the A150 power switch to the "on" position.
- (i) Observe the gain versus frequency sweep on the oscilloscope. Adjust the output of sweep/signal generator so that trace is centered.
 - 1. The average gain should be 55 dB (within 1.5 dB).
 - 2. The gain variation should be within the 2 dB markings as shown on the oscilloscope.
- (j) If the gain versus frequency sweep is out of specification, adjust each 27.1VDC power supply located on the power supply regulator module (+.5V max) until the sweep observed on the oscilloscope is within the 2 dB markings.
- (k) Repeat steps (a) through (j) using the HP8601A sweep generator with start frequency at 300kHz and stop frequency a 1MHz.

Chapter 5

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A-150 Specifications

Frequency Coverage:	0.3 to 35MHz
Gain:	55dB, ± 1 dB Variation
Max. Class 'A' Linear Power Output:	150W
Harmonic Distortion:	2nd harmonic more tha 35dB below fundamental at 150W output. 3rd harmonic more than 25dB below fundamental at 125W. Lower at reduced power.
Max. CW and Pulse Power Output:	250W
Input/Output Impedance:	50 Ω
Input VSWR:	Less than 1.5
Output VSWR:	Less than 2
Stability:	Unconditionally stable; unit will not oscillate for any condition of load and source impedance
Typical 3rd Order Intermodulation Intercept Point:	+61 dBm
Noise Figure	10dB maximum
Power Requirement	115/230VAC +6, -12%, 50-60Hz, 950W
Size and Weight	15.5 x 19.7 x 8.5 inches, 58lbs. 39.4 x 50.1 x 21.6 cm, 26.3 Kg
Operating Temperature	0° to 40° C
Protection	Unit will withstand a 16dB overdrive (1V RMS) for all output load conditions.

Line Voltage Selection Chart

Nominal Line Voltage	Jumpers	
	White	Black
115 VAC	1-2	3-4
230 VAC	2-3	Remove

Figure 3

Gain Measurement

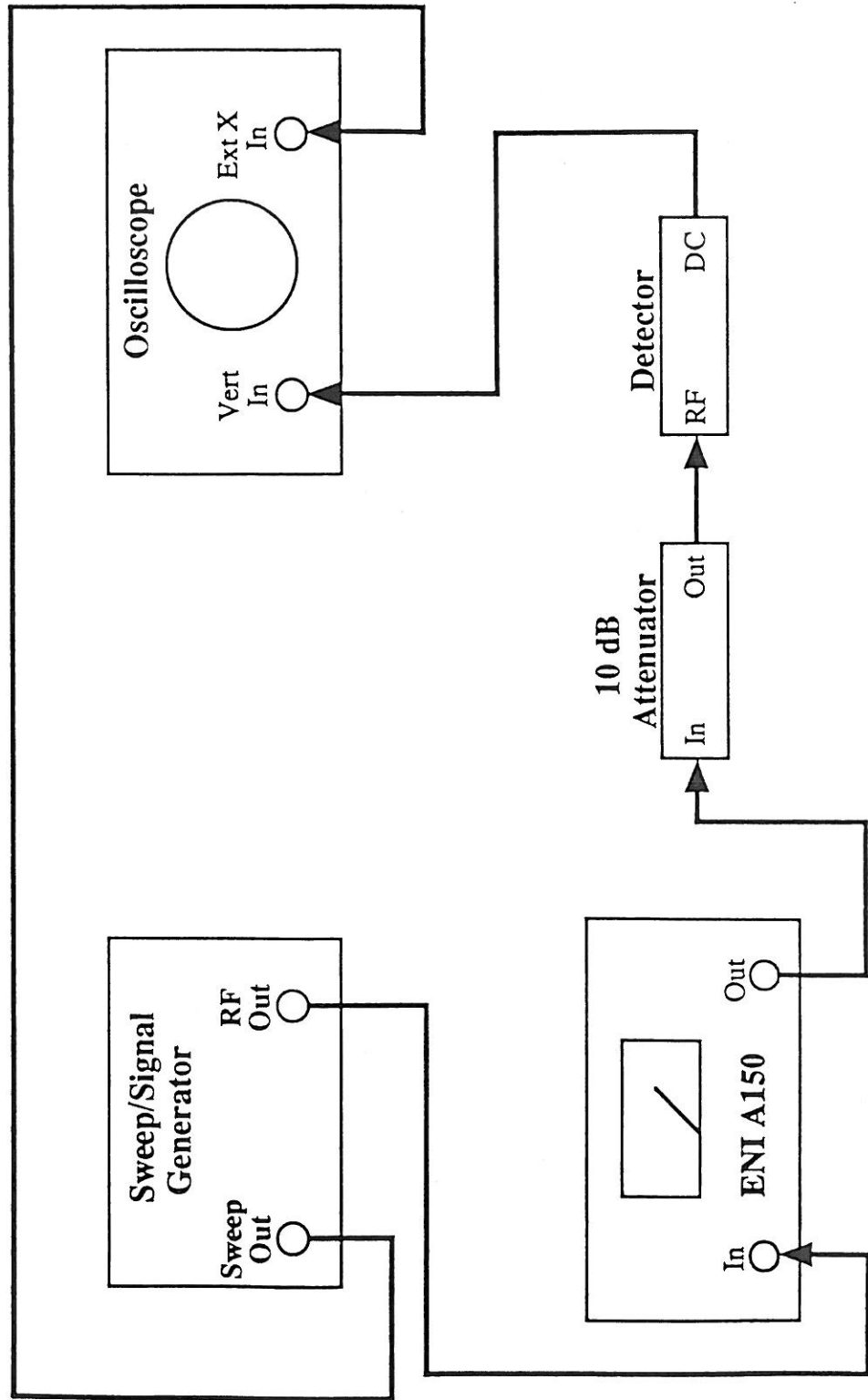


Figure 4

Harmonic Measurement

