

# **MODEL 300L BROADBAND RF POWER AMPLIFIER**

## 1.0 INTRODUCTION

The Model 300L is a broadband solid state power amplifier, covering the frequency range of 250 KHz to 110 MHz.

Three watts of RF power can be produced at the output, with low harmonic and intermodulation distortion. The amplifier will accept inputs of AM, FM, SSB, Pulse and other complex modulations, over its entire frequency range. The 40 dB gain of the unit permits it to be driven to its full power output by any signal or sweep generator capable of supplying a minimum -5 dBm (.13 volts) signal level into its 50 ohm input. Virtually all commercial signal and sweep generators are capable of supplying this signal.

The Model 300L operates over its entire bandwidth without tuning or other adjustments. It is capable of supplying useful power output up to 150 MHz, at reduced gain.

It is unconditionally stable and will not oscillate for any possible combination of source and load impedances. This feature is especially useful where highly reactive loads are encountered. Reflected power due to output load mismatch is absorbed in the amplifier.

The Model 300L is protected against failure due to output load mismatch and/or overdrive. The unit will withstand a +20 dB overdrive (input signal of +15 dBm), for all output load conditions including both short and open circuit loads.

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

## 2.0 SPECIFICATIONS

Frequency Coverage:	250 KHz to 110 MHz without tuning
Maximum Power Output:	3 watts CW and PEP (Peak Envelope Power)
Input Signals:	unit will accept CW, AM, FM, SSB, Pulse, Wideband Sweep and other complex modulations, limited only by their bandwidth and peak input level
Gain:	40 dB nominal
Gain Variation:	less than +1 dB over the entire frequency range at power outputs below .5 watts; less than +1.5 dB for power outputs between 0.5 and 3 watts
Harmonic Distortion:	less than 10% THD (total harmonic distortion) at full power output, lower at reduced power output
Intermodulation Distortion:	30 dB down (typical) from .25-30 MHz at full power output; 25 dB down (typical) from 30-110 MHz, lower at reduced power output
Input Impedance:	50 ohms
Input VSWR:	less than 1.5

Matched Output Load Impedance:	50 ohms
Noise Figure:	8 dB typical
Output Metering:	Average reading voltmeter, calibrated in RMS volts with an accuracy of +5% (0-17 volts); also calibrated in watts into 50 ohms (0-5 watts)
Stability:	unconditionally stable; unit will not oscillate for any conditions of load and source impedances
Protection:	unit will withstand a +20 dB overdrive (input signal of +15 dBm) for all output load conditions including short and open circuit loads
Power Requirements:	105/125 VAC at 60 cps 110/230 VAC at 50/60 cps (optional)
Operating Temperature Range:	0 to +50° C
Size:	6 1/4 x 8 3/4 x 8 1/4 inches
Weight:	7.5 lbs.
Input and Output Connectors:	BNC

### 3.0 OPERATING INSTRUCTIONS MODEL 300L

The Model 300L is easy to connect and use. The input and output are connected via the front panel BNC connectors to the signal source and load respectively.

The input signal should be increased gradually while observing the output voltage on the output RF voltmeter. Input voltage should not be allowed to exceed 1.4 volts (peak).

When the Model 300L is connected to a 50 ohm load, the CW power output of the unit may be read directly from the meter scale. The red portion of the meter indicates that the amplifier is no longer operating in its linear region and excessive distortion will result. This occurs at 3 watts (PEP or CW) of RF output power into 50 ohms (17.2 volts peak).

When the amplifier is connected to an arbitrary or unknown load impedance, the following procedure will insure low output distortion.

- (1) Disconnect the load from the output BNC connector.
- (2) Adjust CW input signal until meter reads into the red portion of the scale (12.3 volts RMS).
- (3) Connect the output of the amplifier to the unknown load.

If the output of the amplifier is monitored by a high frequency oscilloscope (or spectrum analyzer), the input signal may be increased until the point of maximum undistorted power output of the unit is observed.

#### 4.0 TEST AND CALIBRATION

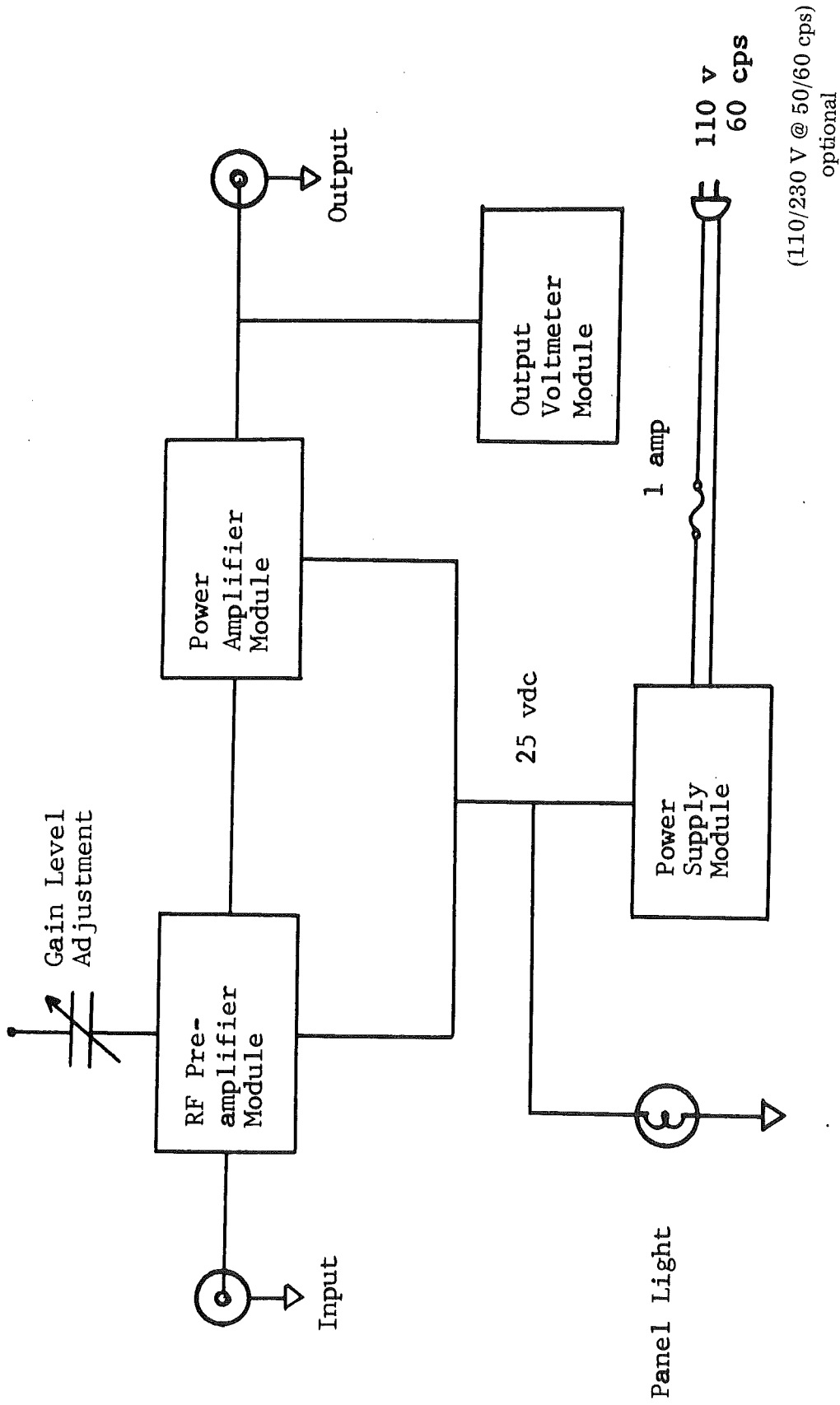
There is only one externally available adjustment on the Model 300L. It is used to level the gain versus frequency response of the unit. The following test and calibration procedure should be used:

- (1) Connect a sweep generator capable of sweeping the frequency range of 1 to 110 MHz at the input of the Model 300L.
- (2) Adjust the output level of the sweep generator so that the video detector will not be damaged by excessive output power.
- (3) Connect a 50 ohm video detector at the output of the Model 300L.
- (4) Observe the gain versus frequency ripple on an oscilloscope calibrated in decibels.
- (5) If the gain versus frequency response shows a variation greater than  $\pm 1$  dB, push out the access plug on the heat sink.
- (6) Adjust the variable capacitor accessible through the plug hole with a plastic alignment tool, until maximum gain flatness occurs.

#### 5.0 MODEL 300L BLOCK DIAGRAM

The Model 300L amplifier consists of four circuit modules. Figure 1 is the block diagram of the unit.

RF signal fed to the input BNC is amplified in the "RF Preamplifier Module." The low noise circuit has a gain



BLOCK DIAGRAM  
Model 1 300L

Figure 1

of 20 dB from 250 KHz to 50 MHz. The trimmer capacitor (externally adjustable) provides varying amounts of over-peaking from 50 MHz to 120 MHz. Output of the preamplifier module is fed to the input connector (UG 1619) of the power amplifier.

The "Power Amplifier Module" consists of two identical pushpull hybrid connected transistor circuits. The amplifier chains are balanced at the factory to insure proper operation of the combining transformer networks. Overall gain of the module is 20 dB at the low end of the frequency range, decreasing to 17 dB at 110 MHz.

The "Output RF Voltmeter Module" samples the RF output voltage and provides a D.C. voltage proportional to its average value. The D.C. voltage is fed to the front panel meter, which is calibrated in RMS volts for a sine wave. Average CW power into 50 ohms is calibrated on the bottom scale of the meter. The RF sample is isolated from the output connector by a series .033 mfd capacitor. This provides isolation from the effects of any D.C. voltage fed into the output connector from an external source.

The "Power Supply Module" is a regulated D.C. power supply adjusted for approximately 25 volts and capable of supplying 1.0 amp of current. The output of the supply is fed directly to the other three modules and to the front panel light.

## 5.0 TROUBLE SHOOTING

Proper operation of the Model 300L can be determined by inserting a CW (at any frequency between 250 KHz



and 110 MHz) signal into the input and connecting a 50 ohm load to the output. Set the input signal level to -5 dBm; power output on the meter should indicate approximately 3 watts on the meter scale.

If the Model 300L should fail to operate, and the panel light does not glow, check the condition of the 1 amp fuse at the rear of the unit.

The Model 300L circuit modules should be serviced only by the factory or its authorized facility. However, ENI will supply pre-aligned and calibrated module boards as replacement items.

DO NOT ATTEMPT TO PROBE THE CIRCUIT MODULES WHILE THEY ARE MOUNTED IN THE AMPLIFIER CASE, AS EXTENSIVE DAMAGE MAY RESULT.

When factory service is required, the following steps should be taken:

- (1) Notify us, giving full details of the difficulty. Include the instrument serial number.
- (2) On receipt of shipping instructions, forward the instrument transportation prepaid, to the factory or to the authorized repair station indicated on the instructions.

If requested, an estimate of the charge will be made before the work begins, provided the instrument is not covered by the warranty.

## 6.0 REGULAR ADJUSTMENT AND MAINTENANCE

There are no periodic electrical adjustments required to maintain the amplifier gain and power output characteristics.

Periodic cleaning and lubrication of the fan filter should be done every six months under ordinary service conditions. To clean the fan filter, remove its four cap nuts and gently pry it off. The filter should be soaked in an industrial cleaner solution such as "Toluene" for two minutes. After drying thoroughly, lubricate it with a few drops of number 10 oil.

## 7.0 110-220 VOLT OPERATION

The optional power supply switch is located at the rear of the back panel through a snap plug. The 110

volt connector is the top position of the switch and is clearly labeled on the back panel. For 220 volt (foreign voltage) operation, the switch should be in the down position. Under no circumstances should this switch be thrown while power is connected. Before the Model 300L is connected to a 200 volt line, check the position of this switch. Extensive damage will result to the unit if it is placed in the wrong position.

If there is no voltage label (110-220) on the back panel, the Model 300L is permanently wired for 110 volt AC operation.

#### 8.0 CASE REMOVAL

The front panel may be disassembled by removing its four retaining screws. Access is provided through the front panel opening to the RF voltmeter and the RF voltmeter calibration controls.

The four screws located on both sides of the cover and the single screw recessed in the bezel must be removed as the first step in removing the cover. Slide the

cover backwards approximately one inch until it clears the front bezel and lift off. To reassemble, simply reverse the process. When replacing the cover, care should be taken that the case does not come in contact with the internal amplifier cabling.

#### 9.0 PRECAUTIONS

- (1) The Model 300L output is at DC ground potential through the final combining transformer. Therefore, the output should not be directly connected to a load on which there is a DC potential. If the output load has a DC potential, insert a series capacitor with the appropriate voltage breakdown rating (.1 mfd is the recommended value) between the load and the output cable.
- (2) The input and output of the Model 300L should not be connected together. This will cause oscillation and may damage the input preamplifier.
- (3) The 300L should not remain connected to an antenna when the unit is not in use. If thunderstorms are likely, it would be prudent to earth ground the unit's case.

- (4) When the input signal voltage of a drive source is unknown, insert an attenuator between it and the Model 300L input.

## 10.0 TROUBLESHOOTING

If the Model 300L should fail to operate, and the panel light does not glow, check the condition of the fuse at the rear of the unit (1 amp SB, 3 AG).

If the unit cycles on and off over a period of time, check the condition of the fan filter (see maintenance instructions).

The Model 300L circuit modules should be serviced only by the factory or its authorized facility. However, ENI will supply pre-aligned and calibrated module boards as replacement items.

DO NOT ATTEMPT to probe the circuit modules while they are mounted in the amplifier case, as extensive damage may result.

11.0 FACTORY SERVICE

When factory service is required, the following steps should be taken:

- (1) Notify us, giving full details of the difficulty. Include the instrument's serial number.
- (2) Upon receipt of shipping instructions, forward the instrument transportation prepaid to the factory or to the authorized repair station indicated on the instructions.

If requested, an estimate of the charge will be made before the work begins, provided the instrument is not covered by warranty.

## W A R R A N T Y

Electronic Navigation Industries, Inc. warrants each instrument to be free from defects in material and workmanship. Our liability under this warranty is limited to servicing and replacing any defective parts for a period of one (1) year after delivery to the original purchaser.

When warranty service is required, the instrument must be returned transportation charges prepaid to the factory or our authorized service facility. If in our opinion, the fault has been caused by misuse or abnormal conditions of operation, repairs will be billed at cost. In this case, an estimate will be submitted before the work is started.

There are no other warranties expressed or implied, including any warranty of merchantability or fitness. Seller shall not be responsible for any incidental or consequential damages arising from any breach of warranty.