



POWER AMPLIFIER

MODEL 230B

OPERATING AND SERVICE MANUAL

FOR SERIALS 935-02700 - up*

*For Serials Above 935-02700
A change page may
be included.

Green Pond Road, Rockaway, New Jersey 07866

SECTION I GENERAL INFORMATION

1-1 DESCRIPTION

1-2 The Model 230B Signal Generator Power Amplifier, shown on the cover, is manufactured by Hewlett-Packard. The amplifier offers a convenient way of obtaining high level RF from the output of conventional signal generators. When used in 50 ohm systems, it is capable of producing up to 4.5 Watts output in the 10MHz to 500MHz frequency range and will reproduce AM, FM, Pulse or CW modulation within its bandwidth capabilities. The 230B employs three grounded grid amplifiers to produce linear, class AB, operation with a typical noise figure of 6 to 9dB. The entire 10 to 500MHz is covered in six ranges and an RF voltmeter is provided which indicates the voltage at the front panel RF OUTPUT connector. Complete specifications are provided in Table 1-1.

1-3 INSTRUMENT IDENTIFICATION

1-4 Each Model 230B carries a two-section, eight-digit serial number (e. g. , 000-00000) which is stamped on a plate fastened to the rear panel. The five-digit number is an identification unique to each instrument, and the three-digit number is a serial prefix used to document instrument revisions.

1-5 When the SERIALS PREFIXED number on the title page of this manual is the same as the first three digits of the instrument serial number, the manual applies directly to the instrument. A change sheet will be included with the manual for newer instruments having a higher serial prefix than shown on the title page. If a change sheet is missing, it can be supplied by any Hewlett-Packard Sales Office listed at the back of this manual.

Table 1-1. Specifications

<p>FREQUENCY RANGE: Range 1: 10 to 18.5MHz Range 2: 18.5 to 35MHz Range 3: 35 to 65MHz Range 4: 65 to 125MHz Range 5: 125 to 250MHz Range 6: 250 to 500MHz</p> <p>RF GAIN 30dB (10 to 125MHz) 27dB (125 to 250MHz) 24dB (250 to 500MHz) (with 10 Volts output into 50 ohms)</p> <p>RF BANDWIDTH >700kHz (10 to 150MHz) >1.4MHz (150 to 500MHz) (with 10 Volts output into 50 ohms)</p> <p>RF OUTPUT Level: Up to 15 Volts across external 50 ohm load (4.5 Watts).</p> <p>LEVEL MONITOR Ranges: 3, 10, 30 Volts full-scale Accuracy: 10% from 10 to 500MHz</p>	<p>FREQUENCY CALIBRATION: Calibration: Increments of approximately 10% accurate to $\pm 10\%$.</p> <p>AM CHARACTERISTICS AM Range: Reproduces 0 to 100% modulation of driving source. AM Distortion: <10% added to distortion of driving source, up to 5 Volts maximum carrier output for up to 100% AM.</p> <p>FM CHARACTERISTICS FM Range: Reproduces modulation of driving source, except as limited by RF bandwidth. Incidental AM: <10% added to modulation of driving signal generator at 150kHz deviation. FM Distortion: Negligible distortion added to distortion of driving signal generator for <150kHz deviations and modulation frequencies.</p> <p>POWER REQUIREMENTS 105 to 125 Volts or 210 to 250 Volts, 50 or 60Hz, 150 Watts.</p> <p>CONNECTORS: Type N Female.</p>
---	---

SECTION IV THEORY OF OPERATION

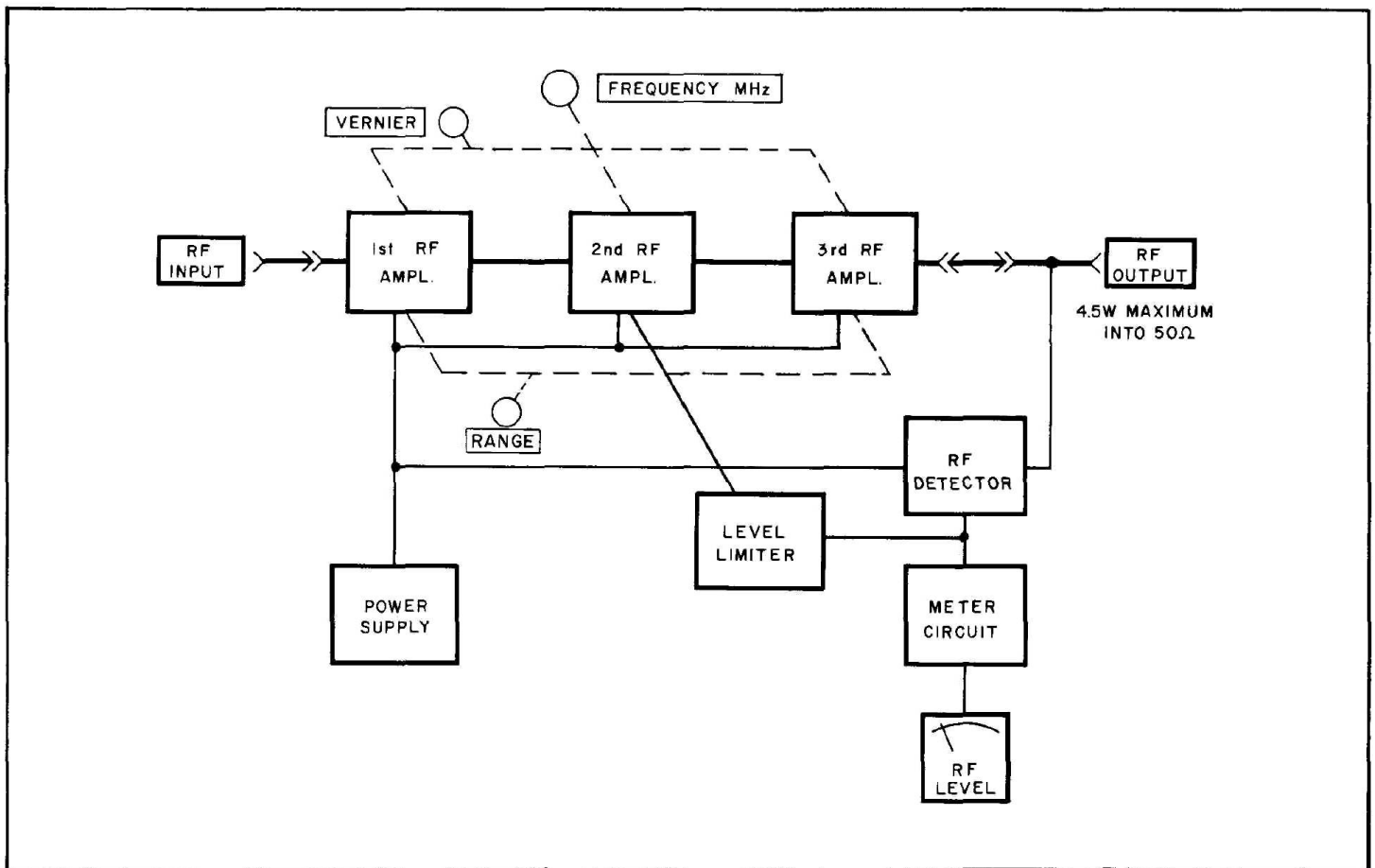


Figure 4-1. 230B Block Diagram

4-1 INTRODUCTION

4-2 The Model 230B Power Amplifier is capable of increasing low level signals up to 30dB. It employs three grounded-grid amplifiers, tuneable from 10MHz to 500MHz, in three ranges, and an RF voltmeter to monitor the output.

4-3 OVERALL DESCRIPTION

4-4 Figure 4-1 is a block diagram of the 230B. The input signal is amplified by the three grounded-grid amplifiers, the first being operated class A and the second and output amplifiers operated class AB.

4-5 At the output, a portion of the RF output is detected and used to drive the RF voltmeter. The voltmeter is calibrated to read rms Volts.

4-6 DETAILED DESCRIPTION

4-7 RF AMPLIFIERS

4-8 The RF amplifiers in the 230B use conventional grounded-grid circuitry. Special 2C39A tubes with reduced size radiators are used in all three stages to increase coupling efficiency at 500MHz. Since all three stages are alike only the second stage will be discussed.

4-9 Transistors Q1 and Q2 and associated components form an output level limiter. During normal operation, VR6 is non-conducting. Q1-Q2 are held in saturation by the positive current source through R11. The cathode current of V2 flows through CR7 and Q2 (normally saturated) and provides a fixed bias of approximately +1.4V at the cathode of A2V2.

4-10 When the RF output voltage exceeds approximately 30Vrms (43V pk) VR6 begins to conduct. This reduces the current flow into the base of Q1 thus causing Q2 to go out of saturation. Since the cathode current of V2 is flowing through Q2, its Vce increases. This in turn increases the + voltage at the cathode of V2 which reduces the output to a point not exceeding 30Vrms. This action reduces the possibility of any internal damage that might occur if the output exceeded 30Vrms.

4-11 The tuned plate circuit consists of C11 and C12 in series across the plate circuit inductance. As the 230B is tuned from the low end of a range to the high end, a point is reached (approx. 320 MHz on range 6) at which C12 becomes ineffective as part of the tuning process. At this point the circuit changes from series-parallel tuned to series tuned. This is accomplished by making the piston of C12 (C4 and C18) physically shorter than C11 (C4 and C18). The results of this tuning method are greater tuning ratio, and less compression of frequencies at the high end of the dial. The complete frequency range is covered by inserting different value plate circuit inductors, by means of a turret switching assembly.

4-12 The plate circuit inductors for the first and output stages are identical while those of the second stage are wound in the reverse direction from the other two stages. This reduces the possibility of regeneration occurring.

4-13 METER CIRCUIT

4-14 The meter circuit provides an indication of

the rms output. The RF detector provides the input to the circuit. The METER RANGE switch selects the desired range by providing the proper voltage dividing resistor in series with the meter. R13 allows calibration of the meter sensitivity.

4-15 POWER SUPPLY

4-16 The 230B power supply consists of power transformer T1, bridge rectifier CR1-CR4, series regulator V1, error amplifier V2 and reference tube V3.

4-17 The cathode of V1 supplies a regulated + 320 Volts to the three RF amplifiers. Series regulator V1 serves as an adjustable impedance in series with the output, controlled by error amplifier V2. Error amplifier V2 samples a portion of the regulated output obtained from a voltage divider consisting of R4, R5 and R18. R18 is adjusted for + 320 Volts at the cathode of V1.

4-18 Regulation is accomplished by the application of the sampled voltage to the grid of V2. V2 amplifies any changes in the output and applies it in the proper phase and amplitude to the grid of V2. This causes V2 to conduct more or less in accordance with the error signal applied to it, thus obtaining the proper well-regulated output at the cathode of V1.

4-19 V3 supplies a constant voltage to the cathode of V2 and to the meter circuit which is used as a reference voltage.

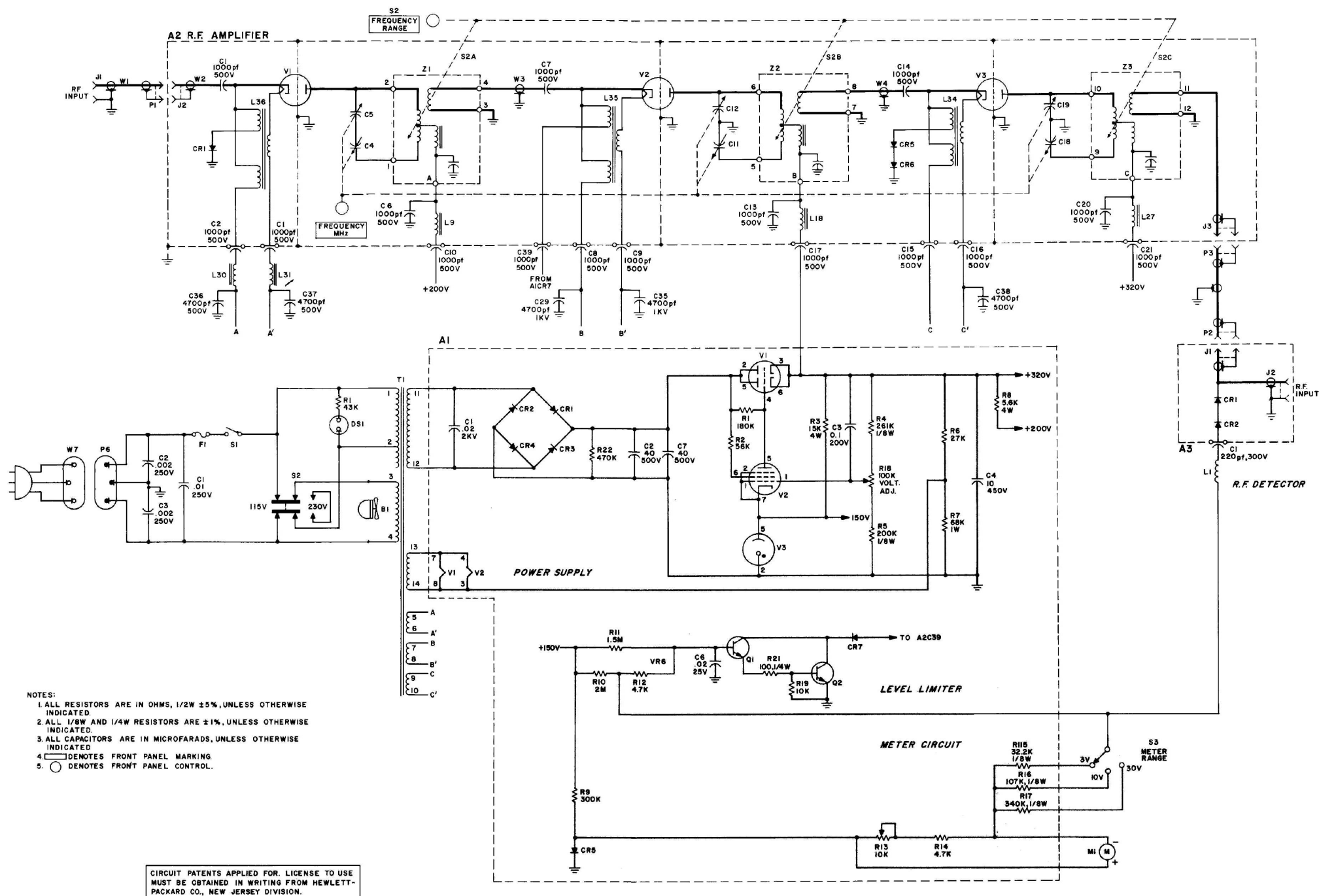


Figure 7-2. Model 230B, Schematic Diagram