OPERATING AND SERVICE MANUAL

VHF OSCILLATOR

3200B

HEWLETT hp PACKARD

HP 3200B

Table 1-1. Specifications

Frequency range: 10 to 500 MHz in six bands: 10 to 18.8 MHz; 18.5 to 35 MHz; 35 to 68 MHz; 68 to 130 MHz; 130 to 260 MHz; 260 to 500 MHz.

Frequency accuracy: within ±2% after ½ hour warmup.

Frequency calibration: increments of less than 4%.

Frequency stability (after 4-hour warmup under 0.2 mw load): short term (5 minutes) ±0.002%; long term (1 hour) ±0.02%; line voltage (5-volt change) ±0.001%.

RF output:

Maximum power (across 50-ohm external load): >200 mw (10 to 130 MHz); >150 mw (130 to 260 MHz); >25 mw (260 to 500 MHz).

Range: 0 to >120 db attenuation from maximum output.

Load impedance: 50 ohms nominal.

RF leakage: sufficiently low to permit measurements at 1 μv. **RFI:** meets requirements of MIL-I-6181D.

Amplitude modulation: externally modulated.

Range: 0 to 30%.

Distortion: <1% at 30% AM.

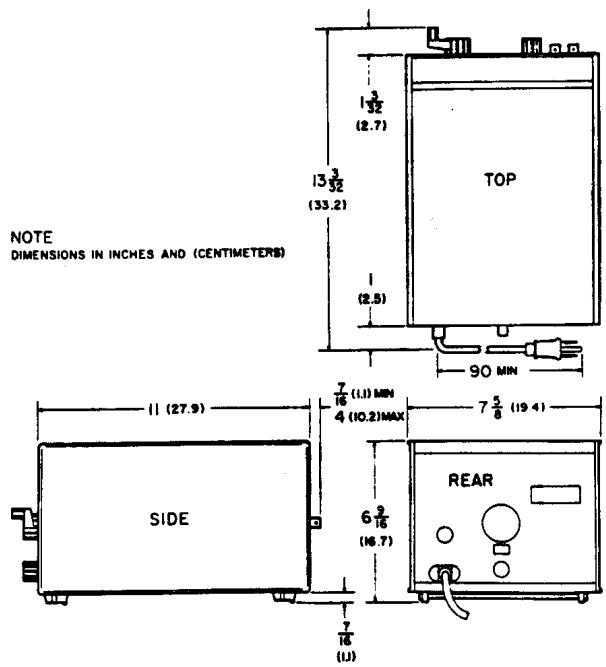
External requirements: approximately 20 volts rms into 600 ohms for 30% AM, 200 Hz to 100 kHz.

Pulse modulation: externally modulated.

External requirements: 2.5 volt negative pulse into 2000 ohms.

Power: 105 to 125 v or 210 to 250 v, 50 to 1000 Hz, 30 w.

Dimensions:



Weight: net 15 lbs. (6,8 kg), shipping 19 lbs. (8,6 kg).

Accessories available: 13515A Frequency Doubler Probe; 00501B, 00514B, 00517B Output Cables; 00502B, 00506B Patching Cables.

SECTION IV
PRINCIPLES OF OPERATION

4-1. GENERAL

4-2. The 3200B VHF Oscillator, shown in the block diagram (Figure 4-1), covers the frequency range from 10 to 500 MHz with six overlapping bands. This instrument was designed primarily as a high output source of CW. Circuitry has been incorporated to allow both amplitude and pulse modulation. A variable, piston-type, waveguide-below cutoff attenuator is used to control the output.

4-3. RF OSCILLATOR

4-4. The oscillator circuit, shown in Figure 4-2, generates all of the radio frequencies in the 10 to 500 MHz range of the instrument. The circuit employs two 6DZ4 triodes with push-pull connected plates and grounded cathodes. Simple, fixed feedback is accomplished by means of capacitive dividers consisting of C102 and C104, together with the grid-to-cathode capacitance of the triodes. Chokes L109 and L110, along with good cathode grounding and short grid connections, serve to maintain high grid circuit impedance, preventing phase shift in the feedback voltage divider and consequential oscillation in the circuit at parasitic frequencies.

4-5. Tuning of the oscillator is accomplished by means of a tank circuit which includes coils L101 to L106 and capacitors C103A and C103B. There are six different tank coils; one for each frequency range. The coils are wrapped on a specially formed turret which is detented into one of six frequency range positions by the RANGE switch on the front panel. Wiping contacts are used to connect the selected coil into the tank circuit. The center of each tank coil is neutral and is used as a feed point for plate power, which is connected through a switch operated by the turret drive and a common supply ring on the turret. One hundred ohm resistors (R101 to R106) are connected between the coils and the B+ feed point to break up undesirable RF paths, without introducing appreciable plate voltage or RF loss.

4-6. ATTENUATOR

4-7. The output from the oscillator is coupled to a pickup loop (L107) mounted at the end of a piston in the waveguide-below-cutoff attenuator. The distance between the pickup coil and the output coils on the turret is a fixed amount with the probe fully inserted. With this dimension fixed on each frequency range, the coupling is different. On the high range, with the attenuator probe at maximum penetration, the pickup coil becomes overcoupled to the output coil. In some instances, this overcoupling loads the tuned output circuit to an extent which causes the oscillator to stop. Overcoupling will also cause frequency "pulling" creating dial errors. With this type of attenuator setup, the maximum penetration does not mean maximum output.

4-8. MODULATION

4-9. Amplitude modulation of the 3200B is accomplished by capacitance coupling a modulating signal to the oscillator plate supply. This is shown in block diagram form (Figure 4-3). With this type of modulation, up to 30% AM is possible with less than 1% distortion at input frequencies from 200 Hz to 100 kHz.

4-10. Pulse modulation of the 3200B is explained by the circuitry of Figure 4-4. With no signal input, a -32 volt bias is applied to the oscillator tube grids through R401, junction A, L109, L110, R107, and R108. This bias will stop tube conduction, thereby stopping oscillation. Thus, with no input signal, there will be no output from the 3200B.

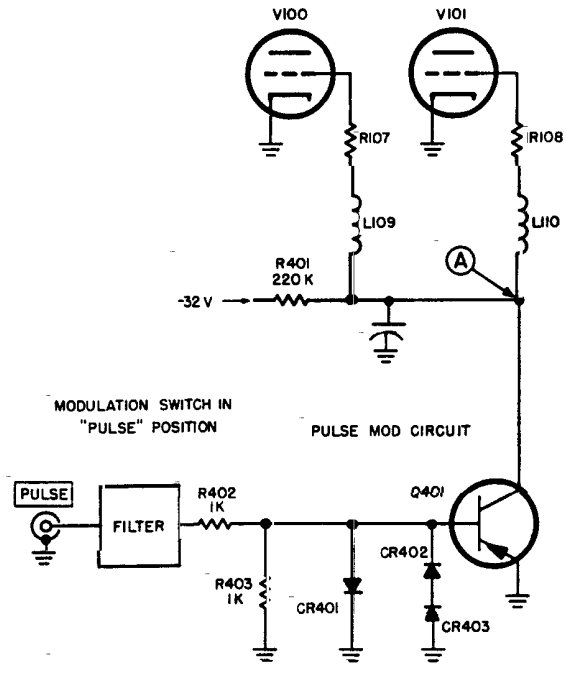


Figure 4-4. Pulse Modulation 3200B

4-11. A 2.5 volt negative-going pulse applied to the base of transistor Q401 will cause the transistor to conduct as the pulse approaches the negative peak. The impedance between the emitter and collector will decrease sufficiently to dissipate the -32 volt bias across R401. This puts junction A at a very low impedance with respect to ground, allowing the tubes to oscillate. As the pulse starts in the positive direction returning to zero potential, the transistor stops conduction, restoring the -32 volt bias to the oscillator tube grids which stops the oscillator. Essentially, the transistor becomes a fast action switch controlling the -32 volt bias to the oscillator grids.

4-12. The circuitry to the base of the transistor has resistors to limit the input impedance of the PULSE input connector and diodes to limit voltage, which could cause damage to the transistor.

4-13. Positive-going pulses to the pulse input connector, with Mod Input Switch in "PULSE" position, will result in no output from the instrument.

4-14. EXTERNAL B+ OPERATION

4-15. In the external B+ mode of operation, the internal plate voltage supply is disconnected. The plate supply lead is connected to the AM/B+ connector. A controlled external power supply connected to the AM/B+ connector will produce CW operation of the instrument. During external B+ operation a -6 volt bias is connected internally to the grid switch transistor, Q401, to keep it in the "ON" condition removing the -32 V bias from the oscillator grids. This circuitry is shown in the block diagram (Figure 4-5).

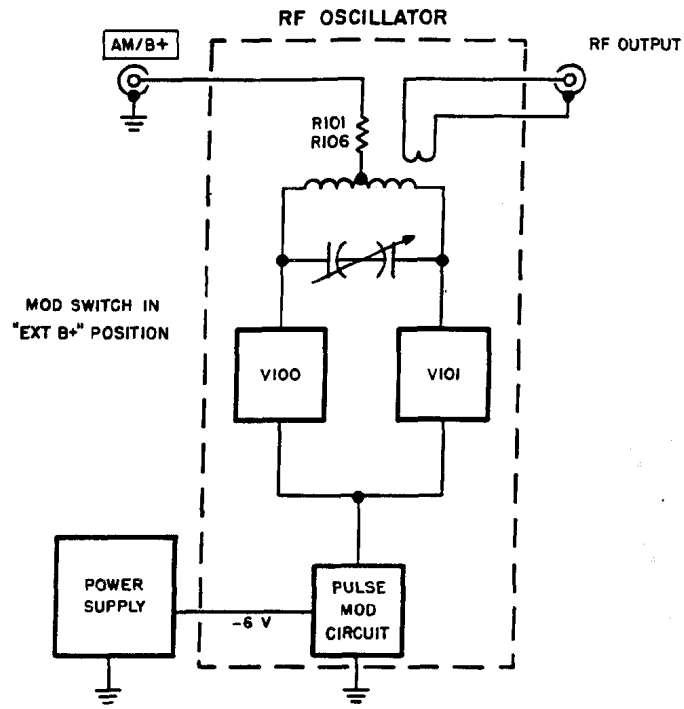


Figure 4-5. External B+ Operation

4-16. The Power Supply consists of two regulated supplies having a common power transformer. The outputs are 150 vdc, 40 mA for the oscillator tube plate supply, and 6.6 vdc, 450 mA for the oscillator tube heater supply. The regulated supplies are also a source of bias for operating the pulse modulation circuit (Z400). A -6 V bias is provided to operate the pulse modulation circuit, and -32 V is provided to turn off the oscillator. A block diagram of the complete supply is shown in Figure 4-6.

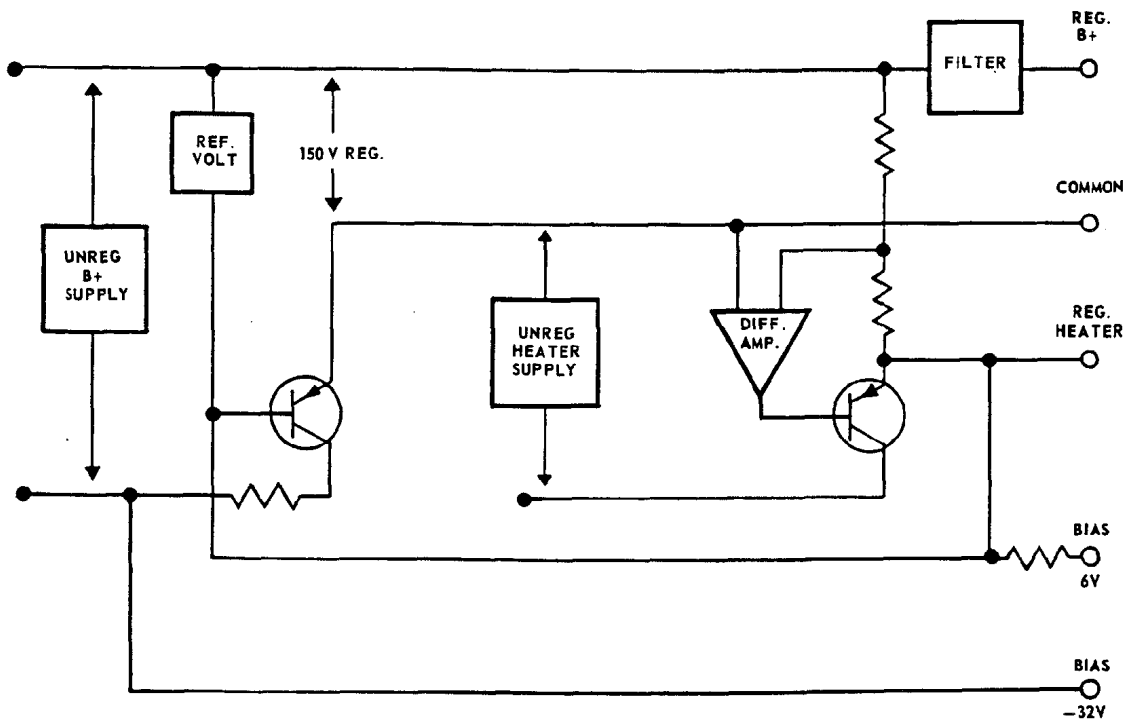


Figure 4-6. Power Supply 3200B

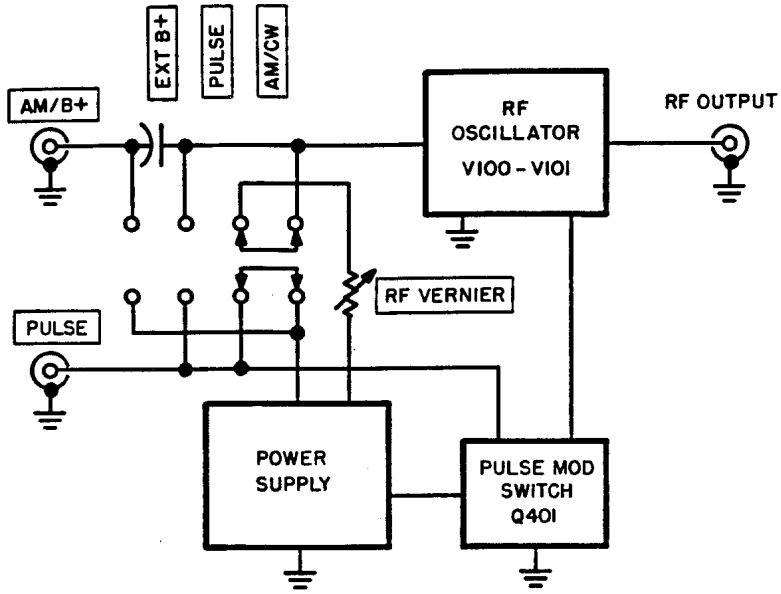


Figure 4-1. Block Diagram 3200B

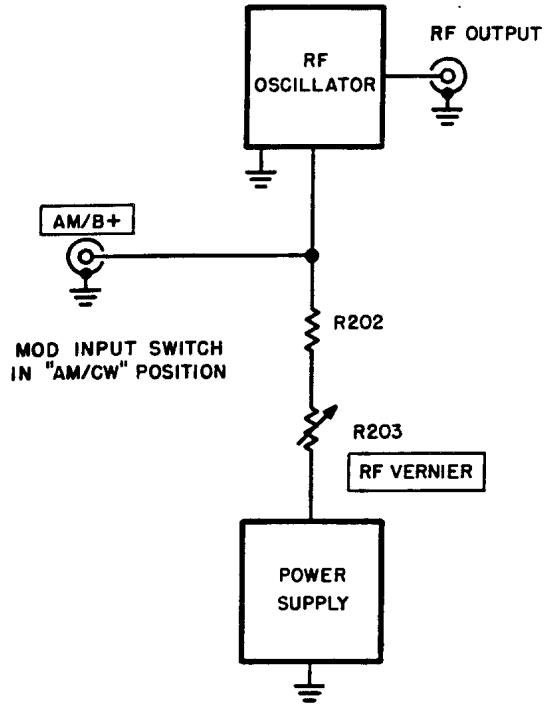


Figure 4-3. Amplitude Modulation 3200B

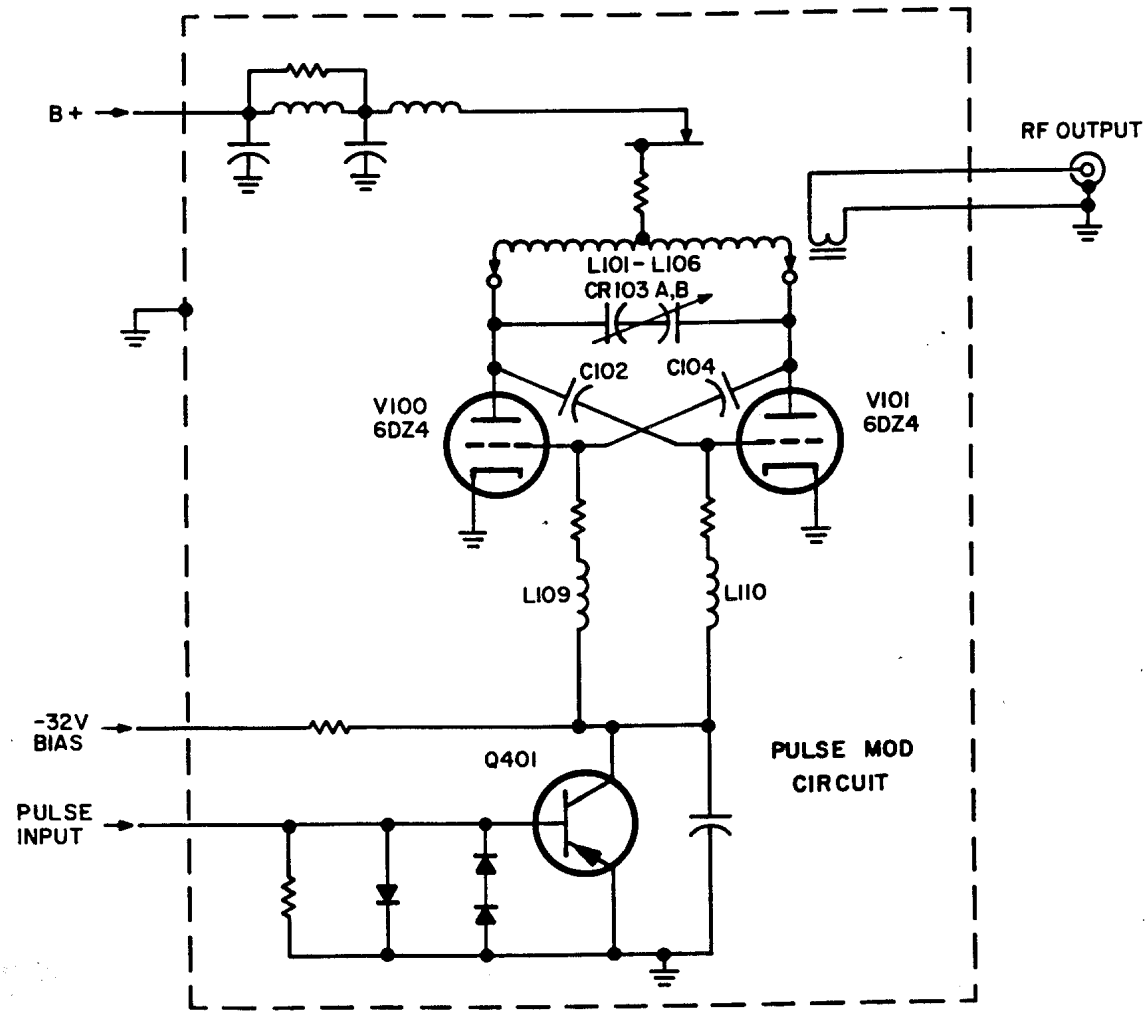


Figure 4-2. RF Oscillator Circuits

SECTION VII
SCHEMATIC DIAGRAMS

7-1. INTRODUCTION

7-2. This section includes manual backdating changes, the schematic diagram and component identification illustrations. Table 7-1 contains the notational information for the schematic diagram of Figure 7-1. The DC voltages drawn on the schematic are typical voltages and are not to be construed as specifications. They were measured with an -hp- 410B Voltmeter.

7-3. For location and identification of mechanical components, refer to Figures 6-1 through 6-5.

TABLE 7-1. SCHEMATIC DIAGRAM NOTES

Resistance is in ohms, capacitance in picofarads and inductance in microhenries unless otherwise specified.

2 S101 is operated by cam on turret; contacts close on 10 - 18.8 MHz and 18.5 - 35 MHz ranges only.

3 Grid voltage varies with frequency -9 to -25 Vdc.

4 S200 is part of R203.

5 Use 1/2 amp. SLO BLO fuse for 115 V operation and 1/4 amp. SLO BLO fuse for 230 V operation.

6 Due to the interlock feature of V300 (OA2), the Power Supply will not operate with this tube removed from its socket.

7 The following capacitors are special and the values are not critical:

Ref. Sym.	Description
C117	Capacitance between ring on pulley and base plate
C119	Capacitance between resistor leads and Rotor Shaft
C120	Capacitance across Rotor thrust bearing
C121	Capacitance between C103 tie rod and C103 Rotor

Z100 Inductor vs. Range:

L101	10 - 18.8 MHz
L102	18.5 - 35 MHz
L103	35 - 68 MHz
L104	68 - 130 MHz
L105	130 - 260 MHz
L106	260 - 500 MHz

9 (6·0·2) Color code of wires using RETMA standard colors vs. numbers, e.g., 6 · 0 · 2: Blue-Black-Red

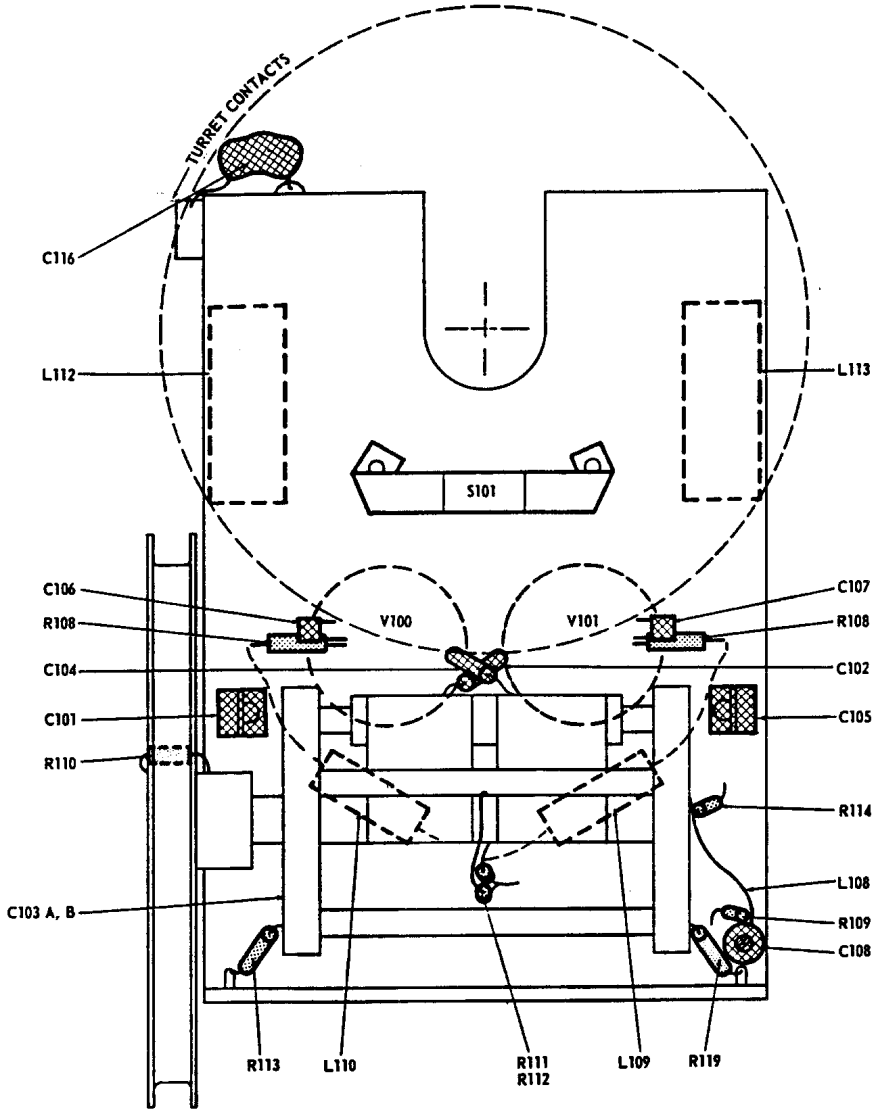
10 Front Panel Designation

11 Rear Panel Designation

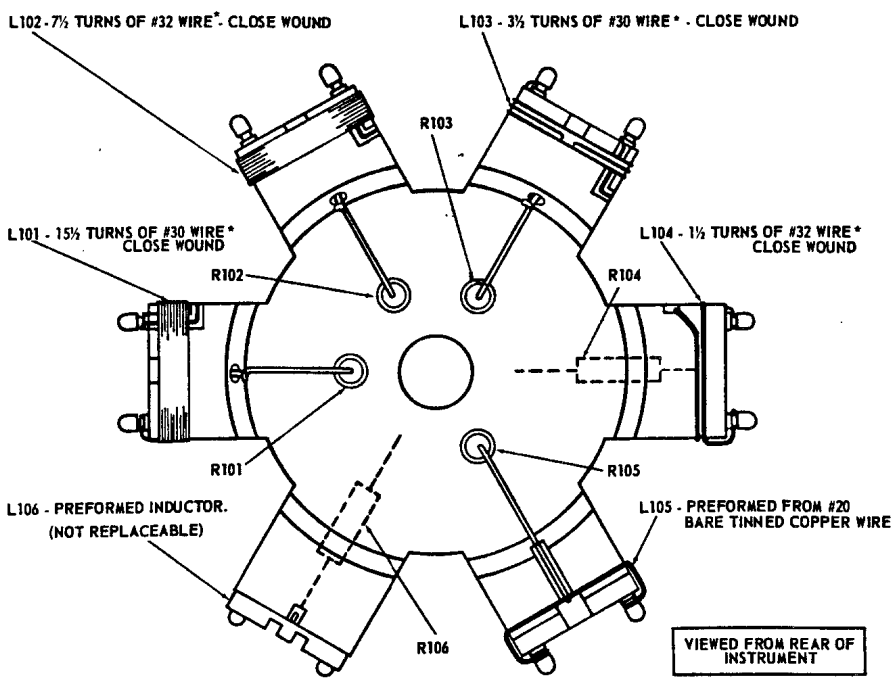
12 Knob Control

13 Screwdriver Adjustment

14 CW Wiper moves toward CW when control is rotated clockwise



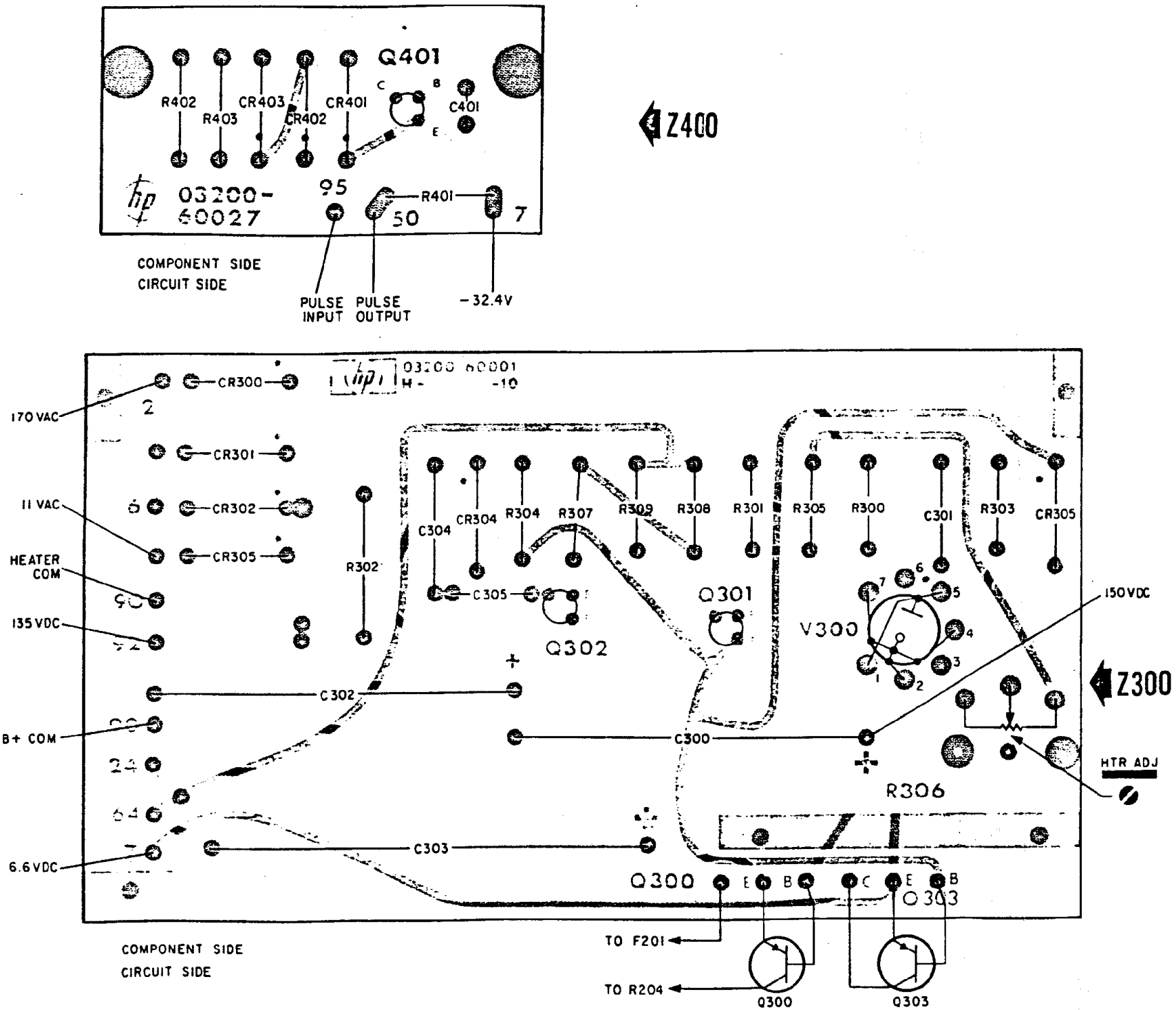
RF TUBE SHELF

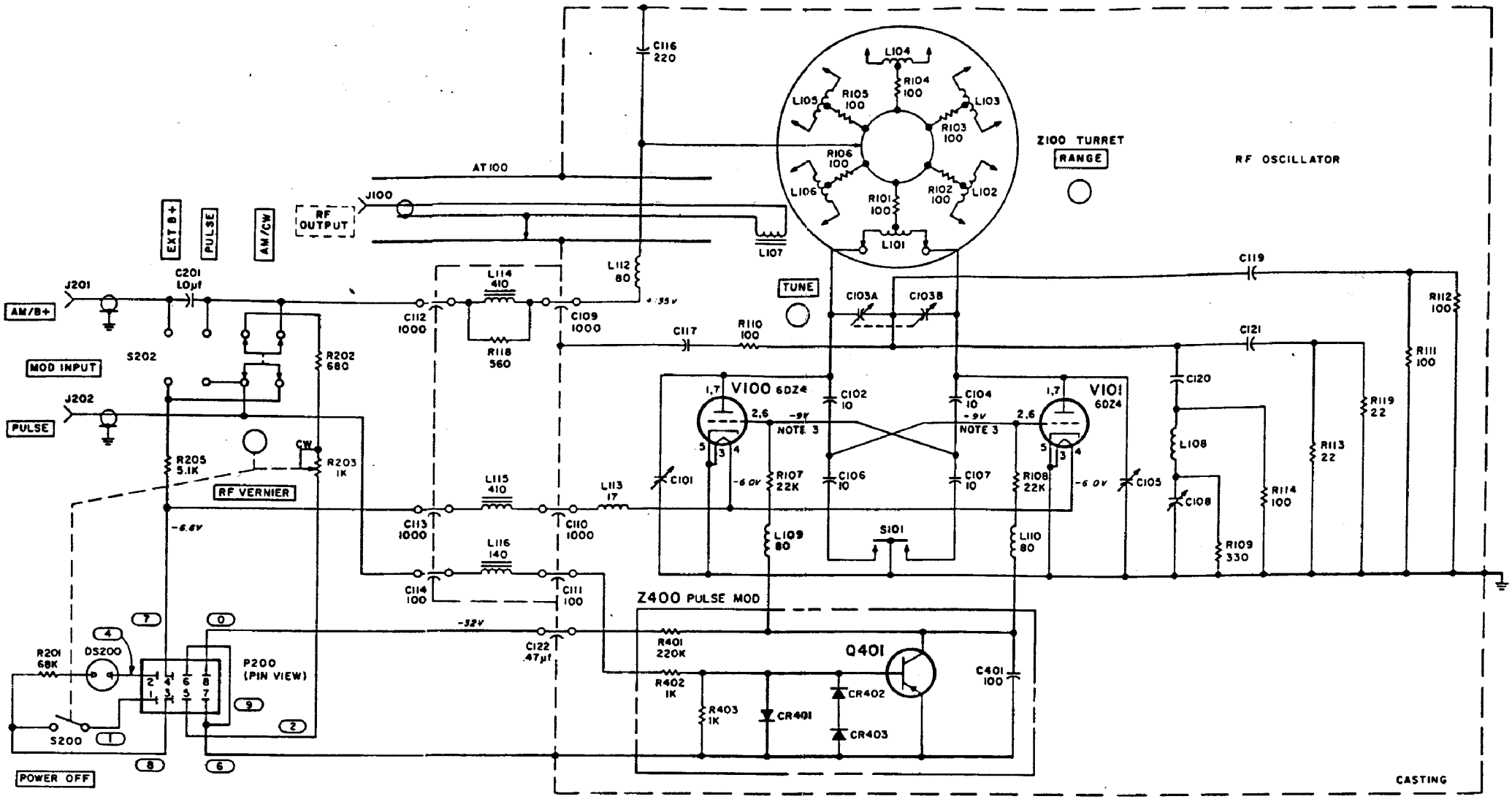


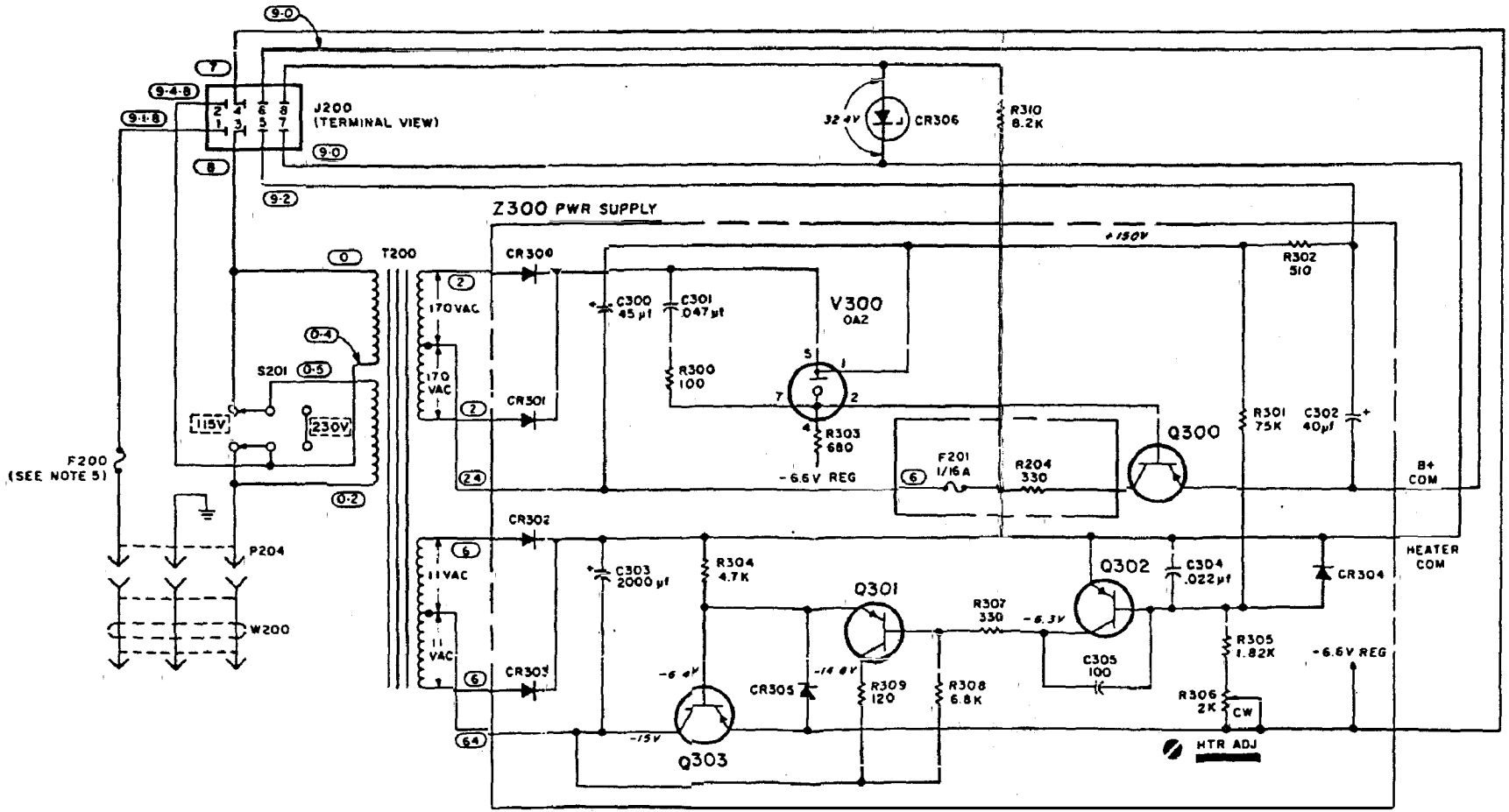
Z100

* SINGLE POLYURETHANE COVERED

RF TURRET ASSEMBLY


Q401
R402
R403
CR403
CR402
CR401
C401
C
B
E
hp 03200-60027
95
R401
50
7
COMPONENT SIDE
CIRCUIT SIDE
PULSE INPUT
PULSE OUTPUT
-32.4V
Z400
hp 03200 60001
170 VAC
CR300
CR301
11 VAC
CR302
CR305
HEATER COM
135 VDC
B+ COM
6.6 VDC
R302
C304
CR304
R304
R307
R309
R308
R301
R305
R300
C301
R303
CR305
C305
Q302
Q301
V300
C302
C300
C303
150 VDC
Z300
HTR ADJ
R306
Q300
Q303
TO F201
TO R204
COMPONENT SIDE
CIRCUIT SIDE


Z100 TURRET
RANGE
RF OSCILLATOR
L104
R104 100
L105
R105 100
L103
R103 100
R106 100
L106
R101 100
R102 100
L102
L101
C116 220
AT100
J100
RF OUTPUT
L107
EXT B+
PULSE
AM/CW
J201
AM/B+
C201 LOμf
L114 410
L112 80
C112 1000
C109 1000
R118 560
TUNE
C103A
C103B
C119
C117
R110 100
C121
R112 100
R111 100
MOD INPUT
S202
R202 680
J202
PULSE
V100 6DZ4
C102 10
C104 10
NOTE 3
V101 6DZ4
C120
R205 5.1K
CW
R203 1K
RF VERNIER
C101
R107 22K
C106 10
C107 10
R108 22K
C105
L108
R119 22
R113 22
L115 410
L113 17
C113 1000
C110 1000
C108
R114 100
L109 80
S101
L110 80
R109 330
L116 140
C114 100
C111 100
Z400 PULSE MOD
-32V
C122 .47μf
R401 220K
Q401
C401 100
R201 68K
DS200
P200 (PIN VIEW)
R402 1K
R403 1K
CR401
CR402
CR403
S200
POWER OFF
CASTING



REFERENCE DESIGNATORS

RF OSC	CHASSIS	Z300	Z400
C101-114, 116-117, 119-122	C201	C300-305	C401
	DS 200	CR300-305	CR401-403
	F200,201	Q300-303	Q401
J100	J200-202	R300-309	R401-403
L101-110, 112-116	P200,204	V300	
	R201-205		
R101-115, 118, 119	S200-202		
	T200		
S101	W200		
V100,101			
NOT USED C115, 118 L111 R113-117	NOT USED P201-203		

MODEL 32008
VHF OSCILLATOR
SER PREFIXED 735

Figure 7-1
SCHEMATIC DIAGRAM