HP Archive

INSTRUCTION AND OPERATING MANUAL

FOR

MODEL 200H

AUDIO OSCILLATOR

Serial ~~438~~ 613 and Above

HEWLETT-PACKARD COMPANY
395 PAGE MILL ROAD, PALO ALTO, CALIFORNIA, U.S.A.

General Description

The Model 200H Wide Band Audio Oscillator is a general purpose oscillator which uses the resistance-tuned circuit to generate sine wave voltages from 60 to 600,000 cycles per second.

This audio oscillator provides a source of voltage for amplifier testing, audio response of transmitters, a voltage source for bridge measurements and equipment operating in the supersonic and low radio frequency ranges.

Parts Substitutions

Difficulties in procuring some of the parts used in this instrument may cause the electrical or physical values to deviate from those shown in this instruction manual. These substitutions have been made so as not to impair the performance of this instrument. Whenever replacement of any of these parts is necessary, either the substitute value or the original value may be used.

INSTRUCTIONS

MODEL 200H

WIDE BAND AUDIO OSCILLATOR

Specifications

Frequency Rating --

Frequency Range - 60 to 600,000 cycles/sec.
Frequency Dial Calibration - 60 to 600
Range -

X1	60 - 600 cycles/sec.
X10	600 - 6000 cycles/sec.
X100	6000 - 60,000 cycles/sec.
X1000	60,000 - 600,000 cycles/sec.

Frequency Stability - ±1%, over a period of one or two hours with the ambient temperature held to ±10°F. during this period.

Output Rating --

Power Output - 10 milliwatts into rated load
Distortion - Less than 3% from 60 to 600,000 cycles/sec.
Less than 1% from 100 to 100,000 cycles/sec.
Load Impedance - 100 ohms resistive
Approximate Internal Impedance - 100 ohms resistive
Output vs. Frequency - ±1 db from 60 to 600,000 cycles/sec.
Output Stability - ±1 db over a period of one or two hours with the ambient temperature held to ±10°F. during this period.

Power Supply Rating --

Voltage - 115/230 volts
Frequency - 50/60 cycles
Wattage - 115 watts

Overall Dimensions --

Cabinet Model - 18-3/4" wide x 8-5/8" high x 11-3/4" deep
Rack Model - 19" wide x 8-3/4" high x 11-3/4" deep
Panel - 19" wide x 8-3/4" high
Depth behind panel - 10-1/2"

Weight --

Cabinet Model - 25 pounds
Rack Model - 25 pounds

Operating Instructions

Inspection --

This instrument has been thoroughly tested and inspected before being shipped and is ready for use when received.

After the instrument is unpacked, the instrument should be carefully inspected for damage received in transit. If any shipping damage is found, follow the procedure outlined in the "Claim for Damage in Shipment" page at the back of this instruction book.

Controls and Terminals --

OFF - ON - This rotary switch, which is located in the lower left corner of the control panel, controls the power supplied to the instrument from the power line.

FREQ. RANGE - This rotary switch inserts various values of resistance in the frequency determining circuit of the oscillator. The position of this switch indicates the multiplying factor for the frequency dial calibration.

Frequency Dial - This dial, located in the middle of the control panel, is calibrated directly in cycles per second for the lowest frequency range of the oscillator. The dial and tuning capacitor are driven by the knobs below the dial escutcheon. The upper knob is the direct drive and the lower knob the vernier drive.

AMPLITUDE - This variable resistor controls the amplitude of the oscillator voltage admitted to the amplifier and therefore the output voltage of the instrument. This control is calibrated from "0" to "100" in arbitrary units.

FUSE - The fuseholder, located on the back of the chassis, contains a one ampere cartridge fuse. The fuse may be replaced by unscrewing the fuseholder cap and inserting a new fuse. For 230V operation use a .5 ampere fuse.

Power Cable - The power cable consists of three conductors. Two of these conductors carry power to the instrument while the third conductor (green wire) is connected to the instrument chassis. The third wire projects from the cable near the plug end of the cable and may be connected to a ground when it is desirable to have a grounded chassis.

OUTPUT - The two binding posts, in the lower right corner of the control panel, are the output terminals for the oscillator. The binding post marked "G" is connected to the chassis of the instrument as well as to the output transformer.

Operation --

NOTE - The Model 200H is shipped from the factory with the power transformer connected for 115 volts operation. If it is desired to operate the instrument on 230 volts, refer to the transformer detail on the schematic wiring diagram for changing the power transformer primary connections.

The procedure for operating the Model 200H Wide Band Audio Oscillator is as follows:

1. Connect the instrument power cable to the power line and the output terminals to the equipment being tested.

2. Turn the power switch to ON and allow about five minutes (thirty minutes or more the extreme accuracy) for the instrument to reach operating temperature. Set the FREQ. RANGE control and the frequency dial so that their indications when multiplied together, equal the desired frequency. For example: RANGE control set at X100 times the frequency dial setting of 60 = 6000 cycles/sec.

3. Set AMPLITUDE control for the desired output voltage.

The Model 200H should be operated with its rated load for best results. The oscillator may be operated with loads other than 100 ohms without damage to the instrument. Any load of less than 100 ohms will cause an increase in distortion while loads of greater than 100 ohms will result in less power output.

Circuit Description

The circuit of the Model 200H consists of an oscillator section, an amplifier section, and a regulated power supply

The oscillator section includes V1 and V2, and is basically a two-stage resistance-coupled amplifier over which both positive and negative feeback are applied. The positive feedback network is a frequency-selective resistance-capacitance combination which is used to control the frequency of oscillation. Negative feedback is used to stabilize the operation of the circuit. The magnitude of the negative feedback is determined by a resistance network which contains a non-linear element in the form of a 3-watt incandescent lamp. This element controls the amount of feedback in accordance with the amplitude of oscillation and consequently maintains the proper operating point for the system.

The amplifier section is a conventional two stage audio amplifier. Negative feedback is used in this circuit to minimize distortion and to provide a uniform frequency response over the entire range of the instrument.

The power supply includes a conventional full-wave rectifier and a voltage-regulating circuit.

Maintenance

Cover and Bottom Plate Removal --

The cover is removed by unscrewing the eight screws which fasten the cover to the top and back of the instrument.

The bottom plate is removed by unscrewing the four screws, one in each corner of the bottom plate, which fasten the plate to the chassis.

Tube Replacement --

When replacing any of the tubes except the power rectifier, it is desirable to measure the distortion in the output if maximum performance of the instrument is desired, because a poor tube can cause excessive distortion without seemingly affecting the operation. Retain original tube in the socket if replacement does not improve operation.

Distortion --

Excessive distortion in the output voltage of the oscillator may be caused by leaking coupling capacitors, defective tubes, or open by-pass capacitors.

Lubrication of Tuning Capacitor Drive Assembly --

The tuning capacitor drive assembly should be oiled once a month if the instrument is in constant use, otherwise once every six months.

The vernier drive shaft bearing should have one drop of oil put on each end of the bearing. See Fig. 2.

The idler pulley should have a drop of oil and the spring loaded take-up pulley should have a drop of oil at each end of the pulley. See Fig. 1.

A satisfactory lubricant for the tuning capacitor drive is Lubriplate #2, manufactured by the Fiske Brothers Refining Co., Newark, New Jersey.

Voltage Regulator Circuit Adjustment --

When a tube (V5, V6 or V7) has been replaced in the voltage regulator circuit, the direct current voltage between the junction of R43, R44 and the chassis should be measured. If this voltage is not 240 volts, variable resistor R42 should be adjusted to bring the regulated voltage back to 240 volts. The regulated voltage should also be checked to see that it remains at 240 volts when the power supply voltage is varied from 105 to 125 volts or 210 to 250 volts. If the regulated voltage does not hold constant, replacement of one or all of the tubes in the voltage regulator circuit will usually be the remedy.

Hum Balance Adjustment R46 --

This variable resistor is used to minimize the beat between the oscillator and the power supply frequency. This variable resistor, which is located as shown in Fig. 2, is adjusted for minimum beat between the oscillator and power supply frequency. The oscillator should be tuned to the power supply frequency.

Replacement of Lamp R19 --

The 10-watt lamp R19 is operated at a very low level and should have an almost infinite life. Therefore, the lamp should not be changed indiscriminately. However, should the lamp require changing, it is necessary to check the alternating current voltage from the junction of R29 and C9 to the chassis with the new lamp in the circuit. As measured with a high-impedance vacuum tube voltmeter, this voltage should be within the range of approximately 18-22 volts when the Model 200H is tuned to 1000 cps. If the voltage is not within this range, it may be corrected by adjusting R25. If the voltage cannot be brought within the range from 18-22 volts by means of R25, the new lamp should be rejected in favor of another.

Trouble Shooting --

The following is a listing of possible symptoms, causes and remedies.

Symptoms	Causes	Remedies
Instrument inoperative (Indicator lamp won't light, no audio output)	Blown fuse	Clear short circuit and replace fuse.
Instrument inoperative (Indicator lamp lights, no audio output)	Defective tube; check the 5Y3GT tube first.	Replace tube (see "Tube Replacement" in Maintenance section).
	Short circuit in DC power circuit capacitor (C14, C15, C17, C6abc)	Replace capacitor
Intermittent Output	Capacitors C7, C9, C10, or C11 intermittently open.	Replace capacitor

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INSTRUCTIONS FOR RECTIFIER TUBE REPLACEMENT

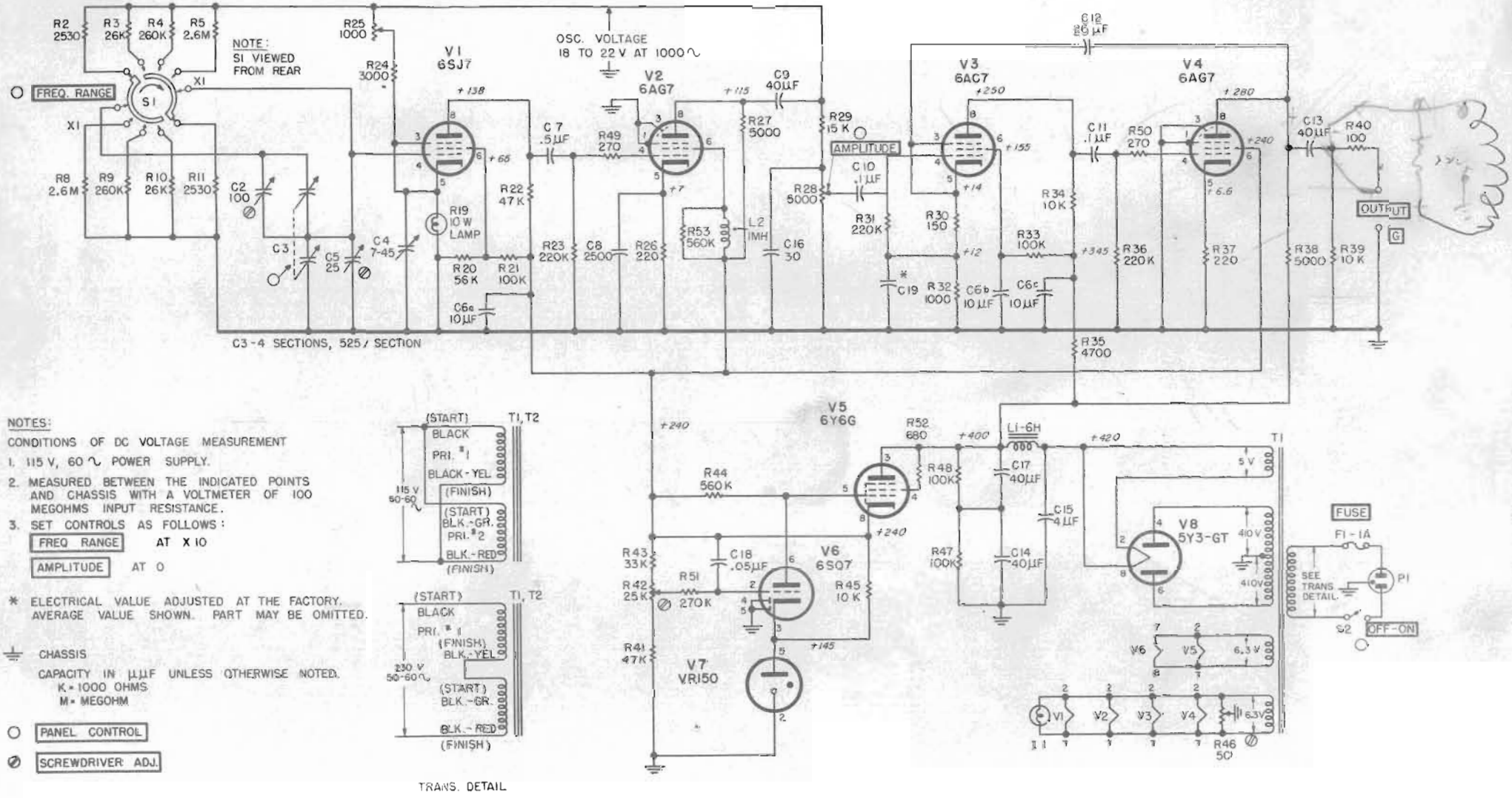
These instructions apply to any Hewlett-Packard instrument in which a 5V4 tube is mounted in the power rectifier tube socket. When it is necessary to replace the rectifier tube, a 5Y3GT tube may be used as a replacement if the following instructions are followed.

INSTRUMENTS WITH DC VOLTAGE REGULATOR CIRCUIT -

The 5V4 tube may be replaced by a 5Y3GT tube without any circuit changes After the 5Y3GT tube has been installed, the regulated voltage should be measured to see if it agrees with the voltage shown on the schematic wiring diagram in the instruction book. If the regulated voltage is incorrect, it may be corrected by following the instructions in the instruction book.

INSTRUMENTS WITHOUT DC VOLTAGE REGULATOR CIRCUIT -

The 5V4 tube may be replaced by a 5Y3GT tube providing the resistor, in series with the DC output of the rectifier, is removed. This resistor does not appear in the schematic wiring diagram in the instruction book. The following instruments use a 500 ohms series resistor: Models 200C, 200D, 202D, 210A, 300BCD, and the 400A.



NOTES:

CONDITIONS OF DC VOLTAGE MEASUREMENT

1. 115 V, 60 ~ POWER SUPPLY.
2. MEASURED BETWEEN THE INDICATED POINTS AND CHASSIS WITH A VOLTMETER OF 100 MEGOHMS INPUT RESISTANCE.
3. SET CONTROLS AS FOLLOWS:
   - FREQ RANGE — AT X 10
   - AMPLITUDE — AT 0

* ELECTRICAL VALUE ADJUSTED AT THE FACTORY. AVERAGE VALUE SHOWN. PART MAY BE OMITTED.

⏚ CHASSIS

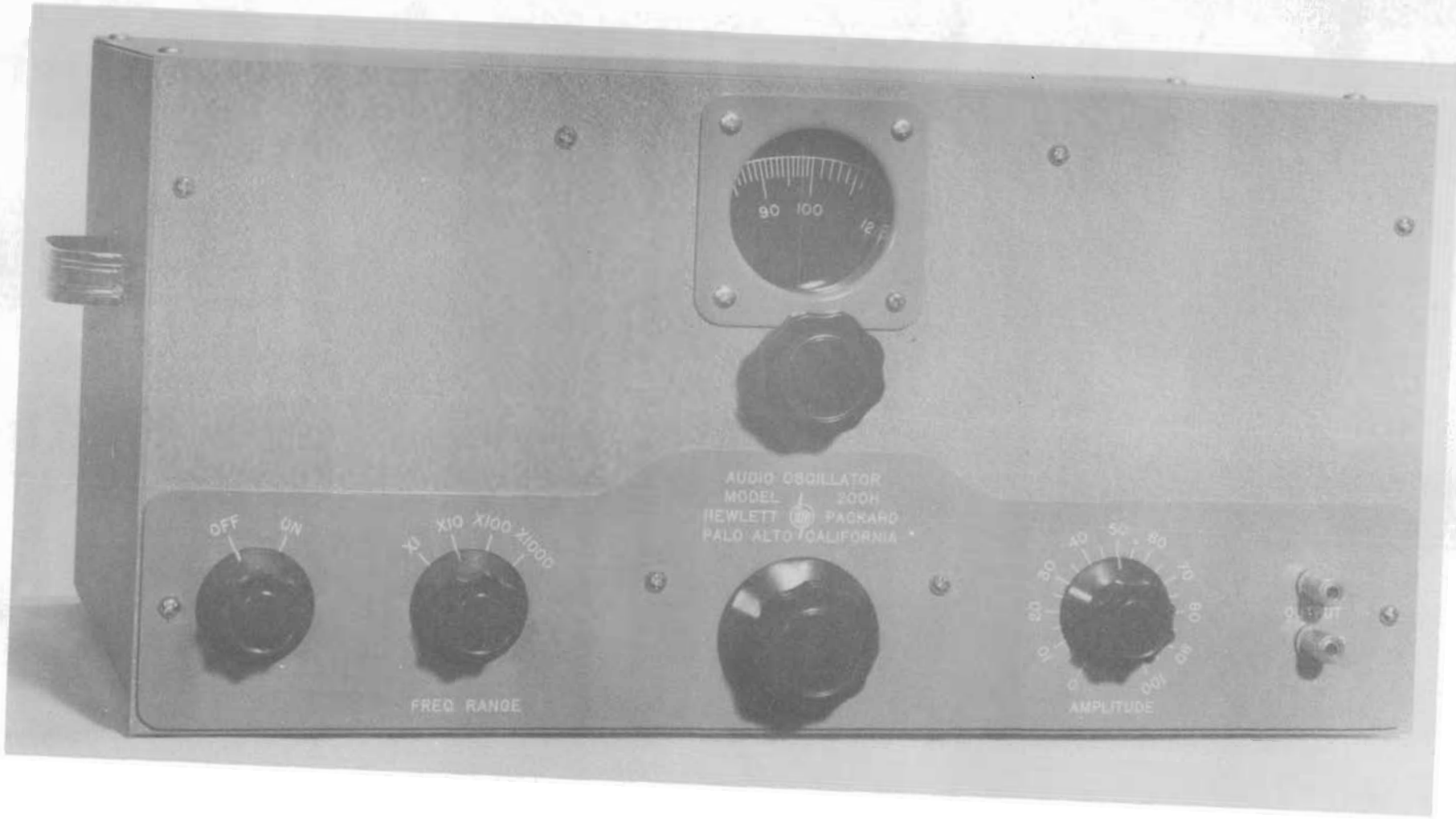
CAPACITY IN µµF UNLESS OTHERWISE NOTED.
K = 1000 OHMS
M = MEGOHM

○ PANEL CONTROL

⊘ SCREWDRIVER ADJ.

SCHEMATIC DIAGRAM OF MODEL 200H

SERIAL 613 & ABOVE



Model 200H Audio Oscillator

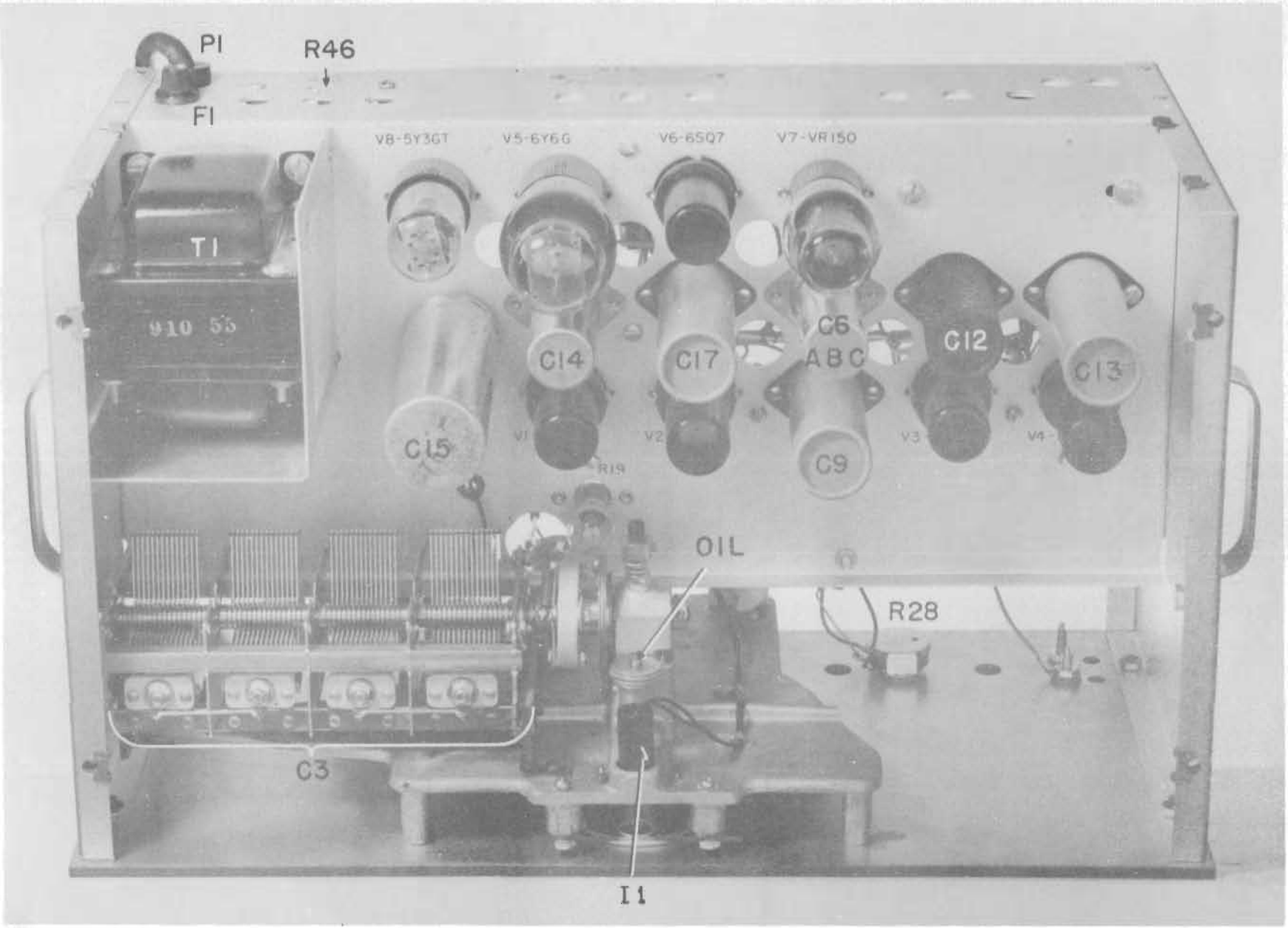


Fig. 1. Model 200H Top View Cover Removed

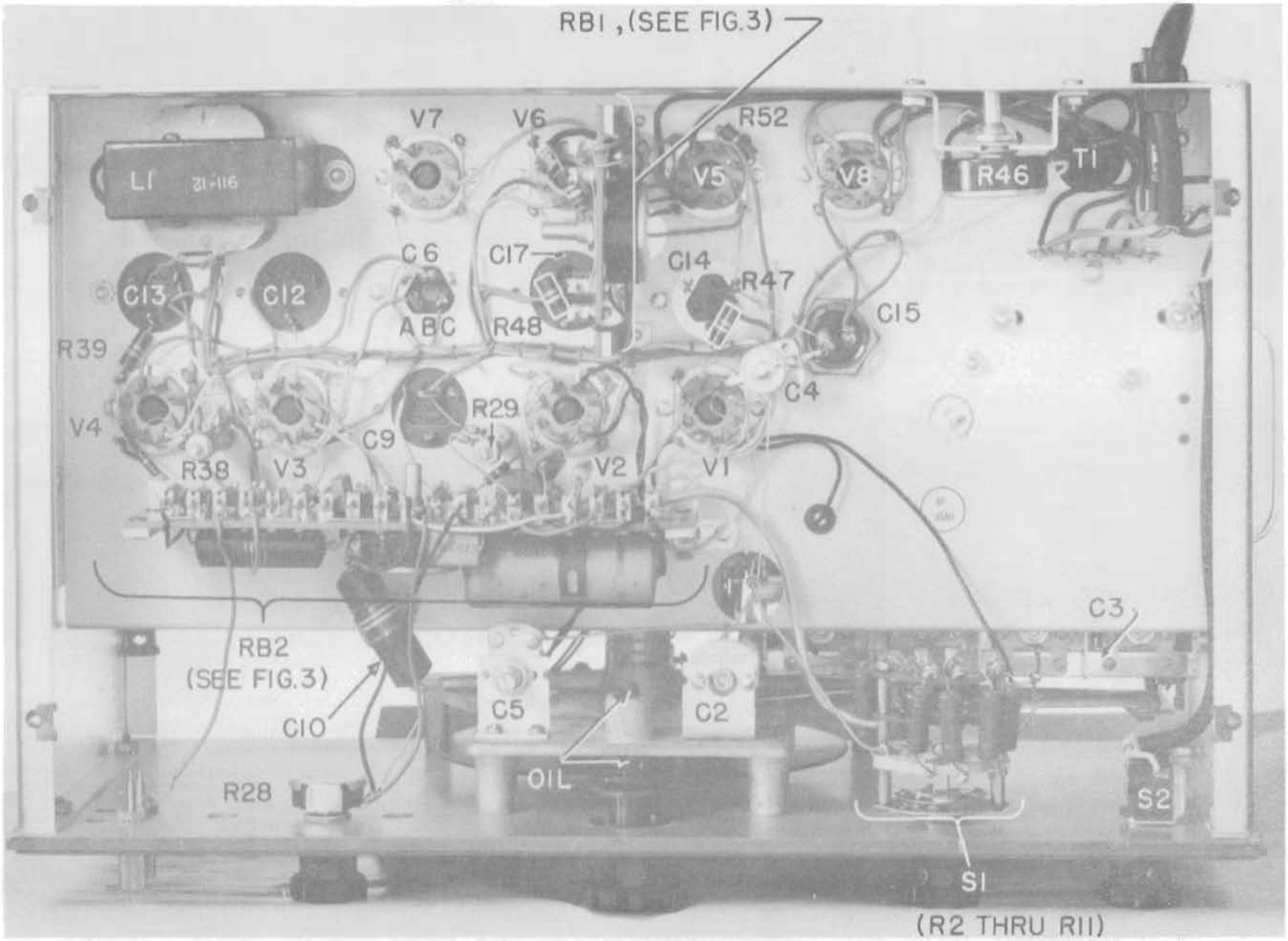
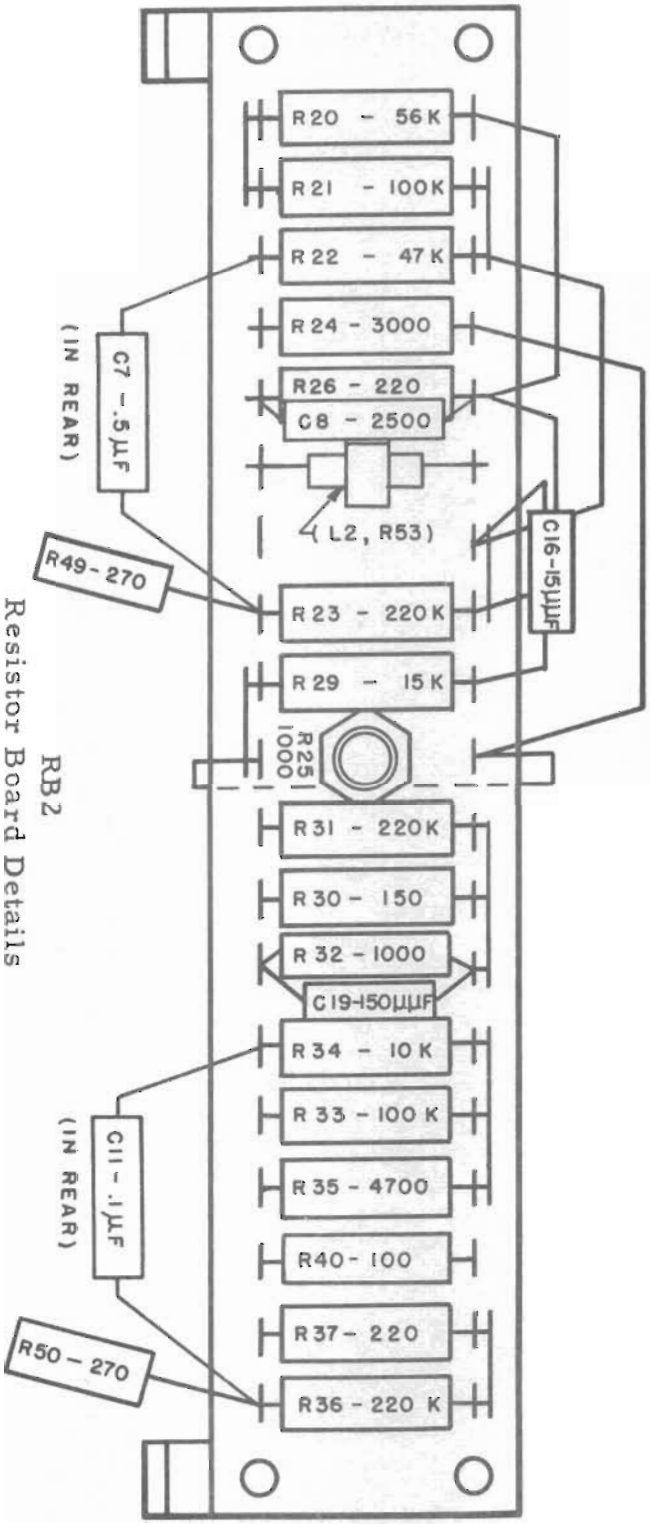
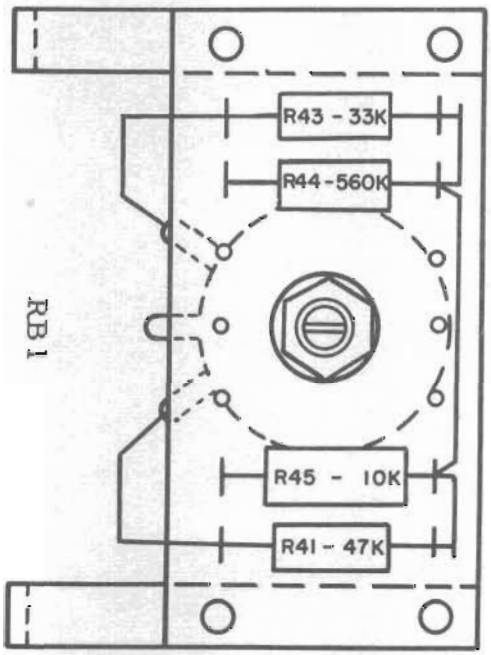


Fig. 2. Model 200H Bottom View Bottom Plate Removed



RB2



RB1

Resistor Board Details

Fig. 3

PRODUCTION CHANGES

Serial 613 and above

Replaceable Parts List --

Add L2:
RF Coil: 1 mh, HP Stock #2H-27A, Mfr. HP

Coil L2 is wound on resistor R53 (560K, 1 watt, composition) and connected in parallel with R53.

TABLE OF REPLACEABLE PARTS

Circuit Ref.	Description	-hp- Stock No.	Mfr. * & Mfrs. Designation
C1	This circuit reference not assigned		
C2	Capacitor: variable, air, 100 μμf	12-11	AA, A-103L
C3	Capacitor: variable, air, 4 sections, 530 μμf/sec. Also included in tuning capacitor and drive assembly. Stock #2H-100	12-5	HP
C4	Capacitor: variable, ceramic, 7-45 μμf, 500 vdcw	13-1	L, TS2A
C5	Capacitor: variable, air, 25 μμf	12-10	AA, O-25L
C6 ABC	Capacitor: fixed, electrolytic, 10, 10, 10 μf, 450 vdcw	18-31	A AEF
C7	Capacitor: fixed, paper, .5 μf, 600 vdcw	16-5	A Type 684
C8	Capacitor: fixed, paper, 2500 μμf, 600 vdcw	16-33	A Type 684
C9	Capacitor: fixed, electrolytic, .40 μf, 450 vdcw	18-40	X FPS 146
C10	Capacitor: fixed, paper, .1 μf, 600 vdcw	16-1	A Type P688
C11	Capacitor: fixed, paper, .1 μf, 600 vdcw	16-1	A Type P688
C12	Capacitor: fixed, elctrolytic, 20 μf, 450 vdcw	18-20	X FPS-144
C13	Capacitor: fixed, elctrolytic, .40 μf, 450 vdcw	18-40	X FPS 146
C14	Capacitor: fixed, electrolytic, .40 μf, 450 vdcw	18-40	X FPS 146
C15	Capacitor: fixed, oil filled paper, 4 μf, 600 vdcw	17-10	P
C16	Capacitor: fixed, mica, 15 μf, 500 vdcw Electrical value adjusted at factory	14-15	V Type OXM

*See "List of Manufacturers Code Letters For Replaceable Parts Table."

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TABLE OF REPLACEABLE PARTS

Circuit Ref.	Description	-hp- Stock No.	Mfr. * & Mfrs. Designation
C17	Capacitor: fixed, electrolytic, .40 µf, 450 vdcw	18-40	X FPS 146
C18	Capacitor: fixed, paper, .05 µf, 600 vdcw	16-15	A Type P688
R1	This circuit reference not assigned		
R2-R11	Part of Range Switch Assembly		
R12-R18	These circuit references not assigned		
R19	Lamp: 10 watt, 250V	211-29	N
R20	Resistor: fixed, composition, 56,000 ohms, ±10%, 1 W	24-56K	B GB 5631
R21	Resistor: fixed, composition, 100,000 ohms, ±10%, 2 W	25-100K	B HP 1041
R22	Resistor: fixed, composition, 47,000 ohms, ±10%, 1 W	24-47K	B GB 4731
R23	Resistor: fixed, composition, 220,000 ohms, ±10%, 1 W	24-220K	B GB 2241
R24	Resistor: fixed, wirewound, 3000 ohms, ±10%, 1 W	26-3000	R Type BW
R25	Resistor: variable, wirewound, 1000 ohms, linear taper	210-5	G Type 43
R26	Resistor: fixed, composition, 220 ohms, ±10%, 1 W	24-220	B GB 2211
R27	Resistor: fixed, wirewound, 5000 ohms, ±10%, 10 W	26-8	S Type 1-3/4E
R28	Resistor: variable, 5000 ohms	210-15	G
R29	Resistor: fixed, composition, 15,000 ohms, ±10%, 1 W	24-15K	B GB 1531
R30	Resistor: fixed, composition, 150 ohms, ±10%, 1 W	24-150	B GB 1511

*See "List of Manufacturers Code Letters For Replaceable Parts Table."

TABLE OF REPLACEABLE PARTS

Circuit Ref.	Description	-hp- Stock No.	Mfr. * & Mfrs. Designation
R31	Resistor: fixed, composition, 220,000 ohms, ±10%, 1W	24-220K	B GB 2241
R32	Resistor: fixed, composition, 1000 ohms, ±10%, 1W	24-1000	B GB 1021
R33	Resistor: fixed, composition, 100,000 ohms, ±10%, 1W	24-100K	B GB1041
R34	Resistor: fixed, composition, 10,000 ohms, ±10%, 1W	24-10K	B GB 1031
R35	Resistor: fixed, composition, 4700 ohms, ±10%, 1W	24-4700	B GB 4721
R36	Resistor: fixed, composition, 220,000 ohms, ±10%, 1W	24-220K	B GB 2241
R37	Resistor: fixed, composition, 220 ohms, ±10%, 1W	24-220	B GB 2211
R38	Resistor: fixed, wirewound, 5000 ohms, ±10%, 10W	26-8	S Type 1-3/4E
R39	Resistor: fixed, composition, 10,000 ohms, ±10%, 1W	24-10K	B GB 1031
R40	Resistor: fixed, composition, 100 ohms, ±10%, 1W	24-100	B GB 1011
R41	Resistor: fixed, composition, 47,000 ohms, ±10%, 1W	24-47K	B GB 4731
R42	Resistor: variable, composition, 25,000 ohms, linear taper	210-11	G
R43	Resistor: fixed, composition, 33,000 ohms, ±10%, 1W	24-33K	B GB 3331
R44	Resistor: fixed, composition, 560,000 ohms, ±10%, 1W	24-560K	B GB 5641
R45	Resistor: fixed, composition, 10,000 ohms, ±10%, 2W	25-10K	B HB 1031

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*See "List of Manufacturers Code Letters For Replaceable Parts Table."

TABLE OF REPLACEABLE PARTS

Circuit Ref.	Description	-hp- Stock No.	Mfr. * & Mfrs. Designation
R46	Resistor: variable, wirewound, 50 ohms	210-2	G-1079
R47	Resistor: fixed, composition, 100,000 ohms, ±10%, 1W	24-100K	B GB 1041
R48	Resistor: fixed, composition, 100,000 ohms, ±10%, 1W	24-100K	B GB 1041
R49	Resistor: fixed, composition, 270 ohms, ±10%, 1/2W	23-270	B EB 2711
R50	Resistor: fixed, composition, 27 ohms, ±10%, 1/2W	23-27	B EB 2711
R51	Resistor: fixed, composition, 270,000 ohms, ±10%, 1W	24-270K	B EB 2741
R52	Resistor: fixed, composition, 680 ohms, ±10%, 1W	24-680	B GB 6811
	Binding Post:	312-3	HP
	Dial Indicator:	I-100N	HP
	Escutcheon:	G-99A	HP
F1	Fuse: 1A, 3AG type Fuseholder:	211-18 312-8	E, MDL-1 T, #342001
	Knob: 1-5/8" diam. Knob: 1-1/2" diam. Knob: 2" diam.	37-12 37-11 37-13	HP HP HP
I1	Lamp: Lampholder: for 6 W lamp Lampholder: for #211-47 lamp	211-47 38-89 38-139	O, Mazda Leecraft #659-1 Frank Morse Co. Type 5000
	Panel Plate: engraved	I-43	HP
P1	Power Cable:	812-56	HP
L1	Reactor: 6 H @ 125 MA, 240 ohms	911-12	HP

*See "List of Manufacturers Code Letters For Replaceable Parts Table."

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TABLE OF REPLACEABLE PARTS

Circuit Ref.	Description	-hp- Stock No.	Mfr. * & Mfrs. Designation
S1, R2-R11	Range Switch Assembly:	2H-19W	HP
S2	Rotary Switch: SPST	310-1	D, #81715
C3	Tuning Capacitor and Drive Assembly:	2H-100	HP
T1	Power Transformer:	910-55	HP
V1	Tube: 6SJ7	212-6SJ7	ZZ
V2	Tube: 6AG7	212-6AG7	ZZ
V3	Tube: 6AC7	212-6AC7	ZZ
V4	Tube: 6AG7	212-6AG7	ZZ
V5	Tube: 6L6G	212-6L6G	ZZ
V6	Tube: 6SQ7-GT	212-6SQ7-GT	ZZ
V7	Tube: VR150	212-VR150	ZZ
V8	Tube: 5Y3GT	212-5Y3GT	ZZ

*See "List of Manufacturers Code Letters For Replaceable Parts Table."

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LIST OF MANUFACTURERS CODE LETTERS FOR REPLACEABLE PARTS TABLE

Code Letter	Manufacturer
A	Aerovox Corp.
B	Allen-Bradley Co.
C	Amperite Co.
D	Arrow, Hart and Hegeman
E	Bussman Manufacturing Co.
F	Carborundum Co.
G	Centralab
H	Cinch Manufacturing Co.
I	Clarostat Manufacturing Co.
J	Cornell Dubilier Electric Co.
K	Electrical Reactance Co.
L	Erie Resistor Corp.
M	Federal Telephone and Radio Corp.
N	General Electric Co.
O	General Electric Supply Corp.
P	Girard-Hopkins
HP	Hewlett-Packard
Q	Industrial Products Co.
R	International Resistance Co.
S	Lectrohm, Inc.
T	Littelfuse, Inc.
U	Maguire Industries, Inc.
V	Micamold Radio Corp.
W	Oak Mfg. Co.
X	P.R. Mallory Co., Inc.
Y	Radio Corp. of America
Z	Sangamo Electric Co.
AA	Sarkes Tarzian
BB	Signal Indicator Co.
CC	Sprague Electric Co.
DD	Stackpole Carbon Co.
EE	Sylvania Electric Products, Inc.
FF	Western Electric Co.
GG	Wilkor Products, Inc.
HH	Amphenol
II	Dial Light Co. of America
JJ	Leecraft Manufacturing Co.
ZZ	Any tube having RMA standard characteristics

CLAIM FOR DAMAGE IN SHIPMENT

The instrument should be tested as soon as it is received. If it fails to operate properly, or is damaged in any way, a claim should be filed with the carrier. A full report of the damage should be obtained by the claim agent, and this report should be forwarded to us. We will then advise you of the disposition to be made of the equipment and arrange for repair or replacement. Include model number, type number and serial number when referring to this instrument for any reason.

WARRANTY

Hewlett-Packard Company warrants each instrument manufactured by them to be free from defects in material and workmanship. Our liability under this warranty is limited to servicing or adjusting any instrument returned to the factory for that purpose and to replace any defective parts thereof (except tubes, fuses and batteries). This warranty is effective for one year after delivery to the original purchaser when the instrument is returned, transportation charges prepaid by the original purchaser, and which upon our examination is disclosed to our satisfaction to be defective. If 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.

If any fault develops, the following steps should be taken:

1. Notify us, giving full details of the difficulty, and include the model number, type number and serial number. On receipt of this information, we will give you service instruction or shipping data.

2. On receipt of shipping instruction, forward the instrument prepaid, and repairs will be made at the factory. If requested, an estimate of the charges will be made before the work begins provided the instrument is not covered by the warranty.

SHIPPING

All shipments of Hewlett-Packard instruments should be made via Railway Express. The instruments should be packed in a wooden box and surrounded by two to three inches of excelsior or similar shock-absorbing material.

DO NOT HESITATE TO CALL ON US

HEWLETT-PACKARD COMPANY
Laboratory Instruments for Speed and Accuracy
395 PAGE MILL ROAD PALO ALTO, CALIFORNIA