

**INSTRUCTION AND OPERATING MANUAL**

**MODEL 206A**

**LOW DISTORTION  
AUDIO SIGNAL GENERATOR**

**Serial 875 and Above**



**HEWLETT-PACKARD COMPANY**

395 Page Mill Road • Palo Alto, California, U.S.A.

## General Description

The Model 206A Low Distortion Audio Signal Generator provides a precise source of continuously variable audio-frequency voltage suitable for use in making accurate gain or frequency response measurements of high-quality audio circuits. Any desired frequency within a range of 20 to 20,000 cycles/second is made available by an extremely low-distortion resistance-capacity oscillator within the instrument. A voltmeter, calibrated both in volts and dbm, is provided to measure the output of the oscillator output amplifier. Following the voltmeter is an attenuator which permits the output level to be reduced in .1 db steps to a maximum of 111 db. A line-matching transformer and associated switch permits the signal generator output to be coupled to a balanced line of 50, 150, or 600 ohms. An unbalanced 600 ohm output which bypasses the line-matching transformer also is provided.

The Model 206A is suitable for FM transmitter maintenance, studio amplifier and console testing, as a low-distortion signal source for bridge measurements, as a transmission-measuring set, and for any application requiring a low-distortion, accurately-known audio test signal.

### CAUTION

VOLTAGES WHICH ARE DANGEROUS TO LIFE ARE PRESENT WITHIN THIS INSTRUMENT.

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# TABLE OF CONTENTS

## MODEL 206A

### LOW DISTORTION AUDIO SIGNAL GENERATOR

	<u>Page No.</u>
Specifications . . . . .	1
Operating Instructions	
Controls and Terminals . . . . .	2
Operation . . . . .	3
Circuit Description . . . . .	8
Maintenance	
Cover Removal . . . . .	10
Replacements	
Tubes . . . . .	11
Lamp R13 . . . . .	11
Variable Resistors . . . . .	12
Capacitor Drive . . . . .	12
Adjustments	
Regulated Power Supply Voltage Level . . . . .	12
Oscillator Output . . . . .	13
Selective Amplifier Gain . . . . .	13
Hum Balance . . . . .	13
Calibration of Voltmeter . . . . .	13
Output at 600G . . . . .	14
Centering Selective Amplifier Output Level . . . . .	14
Lubrication . . . . .	15
Trouble Shooting . . . . .	16
Table of Replaceable Parts . . . . .	20

# INSTRUCTIONS

## MODEL 206A

### LOW DISTORTION AUDIO SIGNAL GENERATOR

#### Specifications

##### Frequency Rating --

Frequency Range - 20 to 20,000 cycles/sec.

Frequency Dial Calibration - 20 to 200.

Ranges -

XI 20 to 200 cycles/sec

XI0 200 to 2,000 cycles/sec.

XI00 2,000 to 20,000 cycles/sec.

Response - Better than .2 db at all levels, 30 to 15,000 cycles/sec.

Stability - Better than 2% accuracy under normal temperature conditions.

##### Power Output Rating --

Power Output - 31.6 milliwatts (+15 db above 1 mw) into 50, 150, or 600 ohm approximately 10 volts open circuit.

Distortion - Less than .1% at frequencies above 50 cycles/sec., less than .25% at frequencies from 20 to 50 cycles/sec.

Hum and Noise Level - At least 70 db below the output signal, or more than 100 db below zero level, whichever is the larger.

Output Impedance - 50, 150, or 600 ohms, balanced or unbalanced.

Selector switch provided.

Center - tap connection available for balanced-to-ground operation.

##### Output Meter --

Calibrated to read directly in volts (0 to 4.5 volts) across 600 ohms and in dbm (-5 to +15 dbm) (reference: 1 mw into 600 ohms)

Output Attenuator -- A three-section attenuator provides a range of:

111 db in .1 db steps

110 db in 1 db steps

100 db in 10 db steps

##### Power Supply Rating --

Voltage - 115/230 volts  $\pm 10\%$

Frequency - 50/1,000 cycles

Wattage - 130 watts

## Overall Dimensions --

Cabinet Model - 20-3/4" wide x 12-1/2" high x 14-1/2" deep  
Rack Model - 19" wide x 10-1/2" high x 13" deep  
Depth behind panel - 12-3/4"

## Weight --

Cabinet Model - approximately 60 pounds  
Rack model - approximately 49 pounds

## Operating Instructions

### Inspection --

This instrument was thoroughly tested and inspected before being shipped from the factory. After the instrument is unpacked, it should be carefully checked for any damage received in transit. If any shipping damage is found, follow the procedure outlined in the "Claim for Damage in Shipment" section on the last page of this instruction book.

### Controls and Terminals --

The controls and terminals are mounted on the control panel, which is shown in Fig. 1.

**FUSE** - The fuseholder, located on the control panel, contains a 1.6-ampere cartridge fuse. The fuse is in the power-supply input circuit and protects the whole instrument. The fuse may be replaced by turning the fuseholder cap and inserting a new fuse. Replacement fuses must be of the "Slo-Blo" type as specified in the Table of Replaceable Parts.

Note: When the instrument power transformer is connected for 230-volt operation, use an .8-ampere "Slo-Blo" cartridge fuse.

**POWER** - This rotary switch controls the power supplied to the instrument from the power line. When the power switch is turned on, the tuning dial window is illuminated.

**IMPEDANCE** - The setting of this four-position rotary switch indicates the impedance at the output binding posts. In three positions (50, 150, and 600) the switch connects windings of the impedance-matching transformer to the OUTPUT binding posts for balanced 50-ohm, 150-ohm, or 600-ohm operation. In the fourth position, 600G, the switch bypasses the impedance-matching transformer and arranges the output circuit for 600-ohm unbalanced operation.

**CT, OUTPUT, G** - Two of these four binding posts are the output terminals for the signal generator. All of the Model 206A binding posts will accept either a banana plug or wire. The terminals are so arranged that any double banana plug with 3/4 inch spacing may be used to connect to any pair of adjacent terminals.



Fig. 1. Model 206A Low Distortion Audio Signal Generator

An additional set of binding posts, identical in type and arrangement with those on the control panel, is provided at the rear of the instrument. This set of four terminals is connected in parallel with the binding posts on the control panel.

CT - This binding post is the impedance-matching transformer center-tap terminal.

OUTPUT - These binding posts are the output terminals for the Model 206A Signal Generator.

G - This binding post is connected to the chassis. By patching to terminal G, any of the binding posts may be connected to the chassis.

RANGE - This rotary switch controls the magnitude of the resistance in the frequency-determining circuits. The position of the RANGE switch indicates the multiplying factor for the tuning dial indication.

FREQUENCY - This knob is the fine control for adjusting the capacity in the frequency-determining circuits of the Model 206A.

The coarse control for the frequency-determining capacity adjustment is directly connected to the tuning dial and capacitor drive mechanism. The coarse control is the knob immediately below the tuning dial.

The tuning dial is calibrated in cycles per second for the lowest range, and its indication multiplied by the factor indicated by the RANGE switch will give the actual output frequency of the oscillator.

AMPLITUDE - This knob varies the setting of the variable resistor which controls the level of the input to the output amplifier. The voltage level of the amplifier output is indicated by the meter on the control panel.

0-1 DB, 0-10 DB, 0-100 DB - These three dials are the controls for the three-section attenuator, which is inserted in the output path between the output meter and the line-matching transformer. The attenuation in db inserted in the circuit is equal to the sum of the three control knob settings, and the reading of the output meter minus the inserted attenuation is the level of the signal at the generator OUTPUT binding posts. The attenuator provides a means for reducing the output voltage, in .1 db steps, to a maximum of 111 db below the level indicated by the meter.

#### Operation --

The procedure for operating the Model 206A Low Distortion Audio Signal Generator is as follows.

1. General: Plug the power cable into the male connector at the rear of the chassis. Connect the power cable to a power line of specified voltage and frequency.

If a 230 volt supply is used:

- a. The primary of transformer T1 should be connected for 230 volt operation, as indicated on the schematic diagram.
- b. The fuse inserted in the fuseholder on the control panel should be an .8 amp "Slo-Blo" type fuse.

**NOTE:** To ground the chassis, the green wire at the female-connector end of the power cable should be connected to the chassis and the green wire at the other end of the cable should be connected to the power outlet box or other ground. The connection to the chassis may be made at one of the screws which fasten the male-connector mounting to the chassis.

Turn the **POWER** switch to ON and allow a few minutes warm-up period. The frequency calibration will be within its 2% limits after only a brief warm-up, but a 20 to 30 minute warm-up is necessary if greatest accuracy is desired.

2. Selecting Frequency: The desired output frequencies are obtained by the combined use of the **FREQUENCY** controls and the **RANGE** switch. The frequencies from 20 cps to 20,000 cps are covered in three ranges as follows:

X1	Range: 20 cps to 200 cps
X10	Range: 200 cps to 2,000 cps
X100	Range: 2,000 cps to 20,000 cps

The **FREQUENCY** tuning dial is calibrated in cycles per second for the lowest or X1 range. The higher ranges multiply the calibration of the tuning dial by the indicated factors of 10 or 100. For example, to select a frequency of 400 cps, set the tuning dial to 40 and the **RANGE** switch to X10. A frequency of 10,000 cps is selected by setting the tuning dial to 100 and the **RANGE** switch to X100.

3. Connecting the Load: Connect the load to the **OUTPUT** binding posts. If the impedance of the load is 50, 150, or 600 ohms, the instrument can be set (see par. 5 below) to match the load impedance.

4. Setting the Output Voltage Level: To keep hum at a satisfactory level below that of the output voltage, the output from the amplifier should be maintained at a relatively high level and then reduced by means of the attenuator to the level desired for test purposes.

In following the procedure for setting the output voltage level, it is important to understand the position of the meter in the output circuit and also the calibration of the meter. The meter is across the output of the output amplifier, ahead of the attenuator, but is so calibrated that when the attenuator is set for zero attenuation and the instrument is working into a matched resistive load, the level of the signal at the **OUTPUT** binding posts may be read on the meter in dbm. To convert the dbm reading to volts, quick-reference graphs have been provided



Fig. 2. Model 206A Control Panel Dial Settings for Generator  
Output of .23 Volts Across 600 Ohms

at the back of this manual. (When working into a matched 600-ohm load with the attenuator at zero attenuation, the voltage at the OUTPUT binding posts may be read directly on the meter.)

The following procedure should be used for setting the output voltage level:

a. Set the level of the output amplifier. Use the output meter reading as an indication of the amplifier output, and adjust the level by means of the AMPLITUDE control (on the control panel). Unless the noise level in the output signal is non-critical, the output amplifier always should be adjusted for a meter indication of +15 dbm.

b. Determine the level in dbm for the output voltage desired. The quick-reference graphs referred to above are arranged to show the relationship between db referred to 1 milliwatt into a matched load and the voltage across a corresponding matched load. To determine the level in dbm for an output voltage of .23 volts into 600 ohms, for example, refer to the graph and find the level in dbm for .23 volts into 600 ohms. The level will be found to be -10.5 dbm.

c. Compute the amount of attenuation required to bring the output down to the desired level. With the output from the amplifier at +15 dbm, attenuation of 25.5 db will be required to bring the output to -10.5 dbm at the OUTPUT binding posts (+15 dbm minus 25.5 db equals -10.5 dbm).

d. Set the attenuator for the loss required. The loss inserted by the attenuator is the sum of the settings of the dials. Using as an example the condition described above where a loss of 25.5 db is required, all three dials will be set for loss (20 db + 5 db + .5 db equals 25.5 db). Control panel dial positions for setting the generator output for .23 volts across 600 ohms are indicated in Fig. 2.

NOTE: A method for determining the voltage across a non-matching load is described below in paragraph 5. Setting Output Impedance.

5. Setting Output Impedance: The output impedance of the generator is determined by the setting of the IMPEDANCE switch. For balanced 50-, 150-, or 600-ohm operation, set the IMPEDANCE switch to 50, 150, or 600. For balanced-to-ground operation, patch binding post CT to binding post G, and check that the chassis has been connected to ground (see NOTE in step 1 above).

For 50- or 150-ohm unbalanced operation, set the IMPEDANCE switch to the 50 or 150 position, and connect the lower OUTPUT binding post to ground at terminal G.

For 600-ohm unbalanced operation, set the IMPEDANCE switch to 600G. At the 600G position, the IMPEDANCE switch connects the lower OUTPUT binding post to the G binding post. (In the 600G position, the matching transformer is bypassed, and an advantage in distortion and frequency-response characteristics is obtained.)

The calibration of the voltmeter and attenuator is correct only when the instrument is working into a matched resistive load. The VOLTS calibration of the meter is correct only when working into a 600 ohm load; the DBM calibration is correct when working into a 50, 150, or 600 ohm load provided the IMPEDANCE switch is in the position which matches the output impedance to the load.

If it is desired to work the generator into resistive loads other than 50, 150, or 600 ohms, the following method may be used to compute the voltage across the external load.

a. With the RANGE switch and FREQUENCY controls set for the desired output frequency, set the IMPEDANCE switch for the impedance nearest that of the load into which the generator will be working.

b. Choose the output level in dbm and add 15 (the reading of the output meter) to it. Set the attenuator dials for the sum.

c. Refer to the voltage graph, and obtain the voltage across the generator output impedance at the chosen output level. (The generator output impedance is the setting of the IMPEDANCE switch; the output level is +15 dbm minus the setting of the attenuator dials.) For example, if the IMPEDANCE switch is set for 150 and the output level is -10 dbm (attenuator dials set for 25 db), the graph shows the voltage across the generator output impedance to be .125 volt.

d. Multiply by two the voltage across the generator output impedance to obtain the open circuit voltage.

e. The voltage across the external resistive load may now be calculated, using the following formula:

$$E_L = \frac{E_{oc}}{R_L + R_o} R_L$$

Where  $E_L$  is the voltage across the external resistive load  
 $E_{oc}$  is the open circuit voltage  
 $R_L$  is the external resistive load  
 $R_o$  is the output impedance of the generator

For example, assume the output meter indicates +15 dbm, the attenuator dials are set for 25 db, the external resistive load is 250 ohms, and the generator IMPEDANCE switch is set at 150.

A. To obtain the open circuit voltage of the generator:

1. The reading of the output meter minus the attenuator setting gives an output level of -10 dbm (+15 dbm minus 25 db).

2. The voltage at -10 dbm across the generator output impedance (150 ohms) is .125 volts. Twice .125 volt is .25 volt, the open circuit voltage.

B. Applying the formula:

$$E_L = \frac{.25}{250 + 150} \times 250, \text{ or } .156 \text{ volt}$$

#### CAUTION

When using low output levels of -40 dbm or below (attenuator set for 55 db or more), do not use the 600G position of the IMPEDANCE switch if the accuracy of calibration of the output attenuator is important. If it is desired to have a 600-ohm single-ended output at a low level, use the 600 position of the IMPEDANCE switch, and connect the lower OUTPUT binding post to ground via the G binding post.

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## Circuit Description

The circuit of the Model 206A is shown schematically in a diagram at the back of this manual and in block-diagram form in Fig. 3.

The instrument includes an oscillator, a selective amplifier, and a regulated power supply. In the generator output path there is a rectifier-type voltmeter, a three-section attenuator, and an impedance-matching transformer.

The oscillator is variable, and may be tuned for the production of any signal voltage in the 20 to 20,000 cps range. The output from the oscillator passes to the selective amplifier, the tuning section of which is tracked with that of the oscillator. Similar components are used in the frequency-determining networks of the two circuits, and setting the FREQUENCY controls and RANGE switch for a particular frequency tunes both circuits. The selective-amplifier circuitry reduces to a fraction of a percent the harmonic voltages present in the wave generated by the oscillator. The low-distortion output from the selective amplifier is passed to the output amplifier, the input of which may be adjusted by means of the AMPLITUDE control. The level of the signal voltage from the output amplifier is indicated by the voltmeter. An attenuator, which may be set for up to 111 db in attenuation, provides a facility for reducing the output voltage as low as approximately 12 microvolts across 600 ohms. The signal voltage may be coupled to the output terminals via an impedance-matching transformer, or passed directly to a single-ended termination which presents an impedance of 600 ohms. The transformer is arranged to present an impedance of 50, 150, or 600 ohms, depending upon the position of the IMPEDANCE switch.

The facilities of the Model 206A and design of the circuit provide a stable low-distortion audio-frequency voltage which is adjustable as to frequency, voltage level, and output impedance. A built-in regulated power supply furnishes voltages for the vacuum tube circuits.

Oscillator: The Model 206A oscillator circuit includes pentodes V1 and V2 arranged as a two-stage amplifier with both positive and negative feedback loops. The frequency-selective network is in the positive feedback loop. The network is a resistance-capacity combination which is tuned to the desired frequency by operation of the FREQUENCY controls and RANGE switch. Negative feedback is applied via variable resistor R18 and resistor R17 to the cathode of V1. Distortion in the oscillator output is minimized by the negative feedback.

The resistance network which determines the amount of negative feedback includes lamp R13, which has nonlinear resistance characteristics. The resistance lamp R13 varies in such manner as to compensate for variations in output amplitude, thus holding constant the amplitude of oscillations, and ensuring a constant and stable output over a wide frequency range. The lamp used in the Model 206A has sufficient thermal inertia to ensure the desired resistance characteristics even at low frequencies.

The output from the oscillator is passed to the selective amplifier.

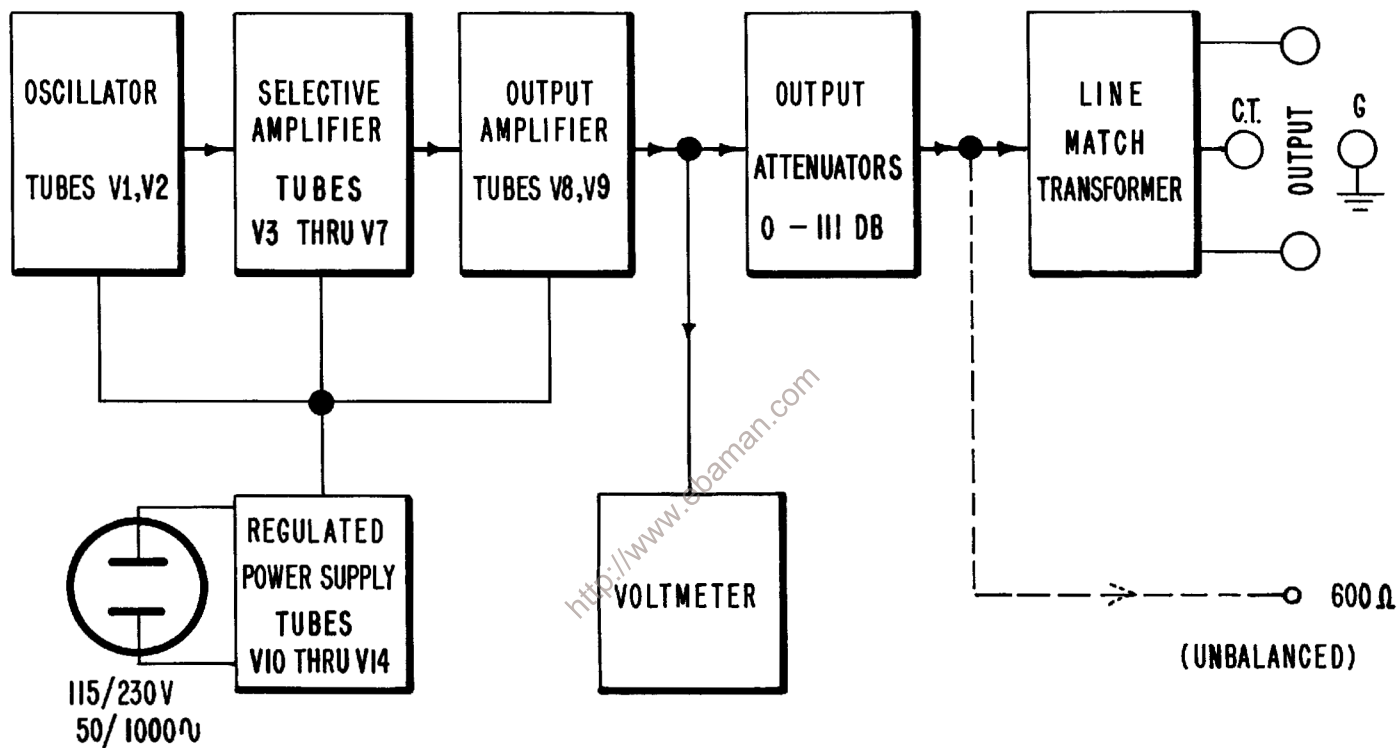


Fig. 3. Model 206A Block Diagram

**Selective Amplifier:** The selective amplifier includes tubes V3 to V7. The circuit is so arranged that any incoming frequencies other than the fundamental are filtered, amplified, and returned as a negative feedback to the first stage (V3). A practical reduction of 10 db or more in distortion is obtained by this arrangement.

Tubes V3 and V4 are conventional voltage amplifiers, while V5 is a cathode-follower with a Wien bridge in its cathode circuit. The Wien bridge is tuned to a null at the fundamental frequency so that the fundamental is eliminated from the voltage present in the last two stages of the amplifier. Any harmonics that may be present are not eliminated, however, and are amplified by tube V6 which is connected across the bridge.

Pentode V6 is a conventional voltage amplifier which feeds tube V7. Pentode V7 is a cathode follower, the output of which is returned to the cathode of V3. The circuit of V7 is in phase with the cathode circuit of V3, providing overall negative feedback at all frequencies except that to which the bridge is balanced. Since the output from the selective amplifier is taken from the top (rather than the arms) of the bridge, the amplifier as a whole exhibits a selective characteristic with respect to the fundamental frequency.

The frequency to which the selective amplifier is tuned is determined by the R and C values in the Wien bridge. The variable capacitors used in the bridge are so arranged that they track with the variable capacitors in the oscillator circuit, and the resistance network in the bridge also is arranged to track with that of the oscillator circuit. Thus adjustment of the frequency-determining network in the oscillator section also adjusts the RC network in the selective-amplifier circuit. Tracking is set at the factory for the life of the instrument.

The output from the cathode follower V5 is coupled by capacitor C12 to the output amplifier.

**Output Amplifier:** The output amplifier includes tubes V8 and V9. The signal incoming from the selective amplifier is passed to the grid of V8 via variable resistor R57, the setting of which is adjusted by the AMPLITUDE control on the control panel. Thus, by adjusting the input to the output amplifier, the AMPLITUDE control becomes, in effect, the gain control for the instrument.

Pentode V8 operates as a driver for high-mu pentode V9, the power output tube. Pentode V9 is connected as a triode to allow the tube to work into very low impedance loads without generating appreciable distortion. Negative feedback from V9, applied via capacitor C19 and resistor R67 to the cathode of V8, is used to minimize distortion.

The output of V9 is passed, via a rectifier-type voltmeter, an attenuator, and an impedance-matching transformer to the OUTPUT binding posts.

**Voltmeter:** The voltmeter circuit includes variable resistor R69, a germanium diode full-wave rectifier, and a one-milliamperere meter connected across the rectifier bridge. Resistor R69 is provided for adjustment of the meter calibration. The meter is arranged to indicate the output voltage directly in volts across 600 ohms and in dbm, with 0 dbm equal to 1 milliwatt into 600 ohms.

Attenuator: The attenuator has three sections, each of which is controlled by its own dial. One section is of an L-type configuration, with ten steps of .1 db each. The other two sections are bridged-T configurations, one of ten 1 db steps and the other of ten 10 db steps. The three attenuators provide from .1 db to 111 db attenuation of the output voltage.

Impedance-Matching Transformer: Connections to impedance-matching transformer T2 are established by the IMPEDANCE switch, S2. In the 50, 150, and 600 positions of the switch: (1) the output voltage is passed to the primary winding of transformer T2 and (2) the secondary of T2 is connected to the OUTPUT binding posts.

The secondary winding of the impedance-matching transformer is balanced, and has three sets of taps so arranged that proper termination is provided for 50, 150, or 600 ohm balanced operation. A center tap is provided for use when balanced-to-ground operation is desired. For unbalanced 50 or 150 ohm operation, one side of the line circuit may be connected to ground by connecting one of the OUTPUT binding posts to the G binding post. (For unbalanced 600 ohm operation for output levels higher than -40 dbm, the IMPEDANCE switch may be set to the 600G position, in which setting transformer T2 is bypassed and the switch connects one side of the line circuit to ground.)

Transformer T2 is constructed with a high permeability core to provide uniform frequency response especially at low levels and low frequencies. However, where it is desired to eliminate even the possibility of slight distortion or frequency-response errors that might be caused by the transformer, and an unbalanced circuit can be used, the transformer may be bypassed by use of the 600G position of the IMPEDANCE switch.

Power Supply: The power supply includes a conventional full-wave rectifier using a dual diode tube with a two-section pi filter for removing the AC components of the rectified wave. The voltage output of the circuit is regulated by a degenerative type voltage regulator, consisting of tubes V11 to V14.

The power supply is designed to operate from a 115/230 volt, 50/1,000 cycle supply, and draws approximately 130 watts.

### Maintenance

#### Cover Removal --

##### Rack Model:

1. To remove the dust cover, loosen and remove the four screws which fasten the cover to the back of the instrument and slide the cover toward the rear of the instrument.
2. To remove the bottom plate, turn the instrument on its back, loosen and remove the four screws which fasten the plate to the bottom of the instrument, and lift off the plate.

### Metal Cabinet:

1. At the back of the instrument, remove the four screws which fasten the rear cover to the chassis. Remove the rear cover.
2. Turn the instrument on its back. Remove the two large Allen setscrews on the bottom, next to the control panel. Lift the cabinet off the instrument.

### Replacements --

Tubes: Any tube in the Model 206A may be replaced with a tube having corresponding RETMA standard characteristics. All tubes are accessible when the dust cover or cabinet is removed. Location of tubes is shown in Fig. 4.

Whenever a tube in the oscillator, selective amplifier, or output amplifier circuit is replaced, harmonic distortion in the output voltage should be measured with a distortion analyzer such as a Hewlett-Packard Model 330B, 330C, or 330D. A replacement tube having any serious departure from its average type characteristics can cause an increase in harmonic distortion in the output voltage. Distortion should measure less than .1% at frequencies above 50 cps, and less than .25% at frequencies from 20 to 50 cps.

Replacement of any tube in the voltage regulator (tubes V11 to V14) may cause a change in the level of the regulated voltage. Whenever a tube in the regulator circuit is changed, therefore, the level of the regulated voltage should be measured, and adjusted as necessary, as described below under Adjustments. When any tube in the regulator circuit is replaced, a check also should be made to make certain that the regulated voltage remains essentially constant when the line voltage is varied from 105 to 125 volts (or from 210 to 250 volts, on 230 volt operation). Since failure to regulate over this range usually is a function of tubes, regulator tubes should be replaced as necessary to obtain satisfactory regulation.

If tube V3, V4, V5, V6, or V7 is replaced, the gain of the selective amplifier should be checked, as described below under Adjustments.

Lamp R13: Lamp R13 has an extremely long life, theoretically almost infinite, and should not have to be replaced. Since the lamp controls the amount of negative feedback in the oscillator circuit, if for any reason the lamp should fail, the voltage generated at the output of tube V2 should be measured after the replacement lamp has been installed.

Measurement and adjustment of the oscillator output are described below under Adjustments. If the adjustment does not bring the oscillator output voltage within the specified limits, the replacement lamp should be rejected and another lamp installed. The test procedure should then be repeated.

Variable Resistors: Should any of the variable resistors require replacement, connections should be made as shown in Fig. 8.

If resistor R18 is replaced, the oscillator output voltage should be measured and adjusted as described below under Adjustments.

If resistor R79 in the filament supply is replaced, readjust the hum balance as described below under Adjustments.

If resistor R69 in the voltmeter circuit is replaced, the procedure for calibrating the voltmeter, described below under Adjustments, should be performed.

If resistor R81 in the voltage regulator circuit is replaced check the level of the regulated voltage and adjust R81 as necessary, as described below under Adjustments.

If resistor R96 is replaced readjust the gain of the selective amplifier, as described below under Adjustments.

If resistor R74 is replaced, check the 600G output as described below under Adjustments.

If resistor R39 or R93 should ever require replacement, the generator should be returned to the factory for readjustment, or, if qualified personnel is available, the procedure for centering the selective amplifier output level for the three ranges, described below under Adjustments, may be performed.

Capacitor Drive: The special wire cable arrangement used for rotating the two tuning capacitors in the Model 206A has a life far beyond the life of the equipment. However, should any drive failure ever occur, the instrument should be returned to the factory for repair. Under no circumstances should adjustment of the drive be attempted, because the calibration of the instrument will be destroyed.

#### Adjustments --

Adjustment of Regulated Power Supply Voltage Level: The level of the regulated output voltage may be measured either at the cathode of tube V11 or V12.

1. Turn the POWER switch to ON, and allow a few minutes for warm-up.
2. Connect a voltmeter to pin 8 of V11 or V12. The voltage between the cathode and ground should measure 240 volts  $\pm$  5 volts.
3. Adjust resistor R81 (located as shown in Fig. 5) as necessary to bring the voltage within the proper range.

### Adjustment of Oscillator Output:

1. Connect a high-impedance vacuum tube voltmeter, such as a Hewlett-Packard Model 400A, B, or C to the center tap of variable resistor R18 (Fig. 5). With the Model 206A generating 1,000 cycles, the voltage from the center tap of R18 to ground should measure 2.8 volts  $\pm$  .1 volt.

2. If the voltage is not within the required range, variable resistor R18 should be adjusted.

Adjustment of Selective Amplifier Gain: With oscillator output voltage at the proper level (see Adjustment of Oscillator Output, above), if the output of the instrument falls below rated level or the output waveform shows clipping, the gain of the selective amplifier may need readjustment. Proceed as follows:

1. With the generator set to deliver 1,000 cycles, connect a vacuum tube voltmeter at pin 4 of tube V3, and measure the input to the selective amplifier. (A Hewlett-Packard Model 400A, 400B, or 400C vacuum tube voltmeter is suitable for making the measurement.)

2. Connect the voltmeter to pin 8 of tube V5, and measure the amplifier output. The gain through the amplifier should be approximately 24 db ( $\pm$  5 db).

3. If amplifier gain is too low or too high, adjust variable resistor R96 (Fig. 5) to obtain approximately a 24 db gain.

NOTE: If with a gain of 24 db the waveform at the OUTPUT terminals shows clipping, lower the gain of the amplifier until clipping stops.

Adjustment of Hum Balance: Variable resistor R79 (Fig. 5) provides an adjustment for minimizing the beat between the oscillator and the power supply frequency. Either of two methods may be used for the adjustment.

1. If a distortion analyzer such as a Hewlett-Packard Model 330B or 330C is available, adjust resistor R79 for minimum distortion in the output waveform with the instrument generating 5 to 20 cycles above or below the power line frequency.

2. If a distortion analyzer is not available, output amplitude variation (60 cycle beat) may be observed on a sensitive voltmeter (such as a Hewlett-Packard 400A, 400B, or 400C), and resistor R79 adjusted for minimum variation in output amplitude with the instrument tuned to a frequency near that of the power line. For example, where the power line frequency is 60 cycles, the Model 206A should be tuned with the FREQUENCY dial for maximum beat (approximately 58 cycles), and then resistor R79 should be adjusted for minimum beat.

### Calibration of Voltmeter:

Calibration of the control panel voltmeter is set at the factory, and unless one of the crystal diodes in the rectifier circuit requires replacement or the voltmeter should be smashed, it is unlikely that the voltmeter will require recalibration during the life of the Model 206A. To recalibrate the voltmeter, a comparison meter standardized for 4 volts at 100 cycles is required.

1. Set the IMPEDANCE switch at 600. Connect the standardized voltmeter and a 600-ohm load to the OUTPUT terminals.

2. Set the Model 206A for an output of 100 cycles.

3. Turn the AMPLITUDE control to zero (maximum counterclockwise position). Check that the three attenuator dials are set at 0. Set the control panel voltmeter pointer to zero with the zero adjust screw (located at a midpoint on the face of the meter, below the window).

4. Adjust the AMPLITUDE control to obtain an indication of exactly 4 volts on the external voltmeter. If the internal voltmeter does not indicate exactly 4 volts also, adjust resistor R69 to obtain exactly a 4 volt indication on the internal meter.

Adjustment of Output at 600G: This equalization adjustment has been set at the factory, and it is improbable that it will require readjustment. Should line-matching transformer T2 ever be replaced, however, equalization of the 600 and 600G outputs may be obtained by the following procedure.

1. Connect a vacuum tube voltmeter, such as a Hewlett-Packard Model 400A, 400B, or 400C, and a 600-ohm load to the OUTPUT terminals.

2. Set the Model 206A for an output of 1,000 cycles. Set the IMPEDANCE switch at 600.

3. Adjust the AMPLITUDE control to obtain an indication of 4 volts on the external voltmeter.

4. Switch the IMPEDANCE control to 600G, and adjust resistor R74 (located as shown in Fig. 5) until a 4 volt indication is obtained on the external voltmeter. Repeat until there is no change between the output levels of the 600 and 600G positions.

#### Adjustment for Centering Selective Amplifier Output Level:

CAUTION: THIS ADJUSTMENT HAS BEEN SET AT THE FACTORY AND, UNLESS THE RANGE SWITCH OR ONE OF THE TUNING CAPACITORS HAS BEEN REPLACED, THE ADJUSTMENT SHOULD NEVER UNDER ANY CIRCUMSTANCES BE CHANGED. IF REPLACEMENT OF THE RANGE SWITCH OR TUNING CAPACITOR EVER SHOULD BE NECESSARY, IT IS RECOMMENDED THAT THE INSTRUMENT BE RETURNED TO THE FACTORY FOR THE REPLACEMENT AND NECESSARY RE-ADJUSTMENTS.

Variable resistor R39 for the X1 range, variable capacitor C4 for the X10 range, and variable resistor R93 for the X100 range are used for centering the output level. First a reference is set on the X10 range with the FREQUENCY dial at 20. By means of capacitor C4 the other end of the X10 range is adjusted against the reference. Then resistors R39 and R93 are adjusted as necessary to center the change of output level versus frequency around the reference set on the X10 range. The following procedure may be used.

1. Set the RANGE switch at X10 and the FREQUENCY dial at 20, to obtain a frequency of 200 cycles. Set the IMPEDANCE switch at 600 and connect a 600-ohm load across the OUTPUT terminals. Adjust the AMPLITUDE control to obtain an indication of 4 volts on the control panel voltmeter.

2. Set the FREQUENCY dial at 200 on the X10 range, to obtain a frequency of 2,000 cycles. Adjust capacitor C4 as necessary to again obtain a 4 volt indication on the voltmeter.

3. Using the level set at 20 on the X10 range as a reference, adjust R39 and R93 on the X1 and X100 ranges respectively to center the change of output level versus frequency around the reference, within approximately  $\pm 1$  db.

Recalibration: If the Model 206A ever should need recalibration, write to the manufacturer for information or return the instrument to the factory for recalibration. A reasonable charge will be made for this service.

Lubrication --

Tuning Capacitor Drive Assembly - The tuning capacitor drive assembly should be lubricated once a month if the instrument is in constant use, or every six months if the instrument has only occasional use. Before lubrication, all dust and dirt that have collected on the tuning mechanism should be removed. Lubricate the following:

1. Vernier drive shaft bearing, one drop.
2. Idler pulley (below the pilot lamp socket), one drop.
3. Spring loaded take-up pulley (on the back of the FREQUENCY dial tuning control (coarse) shaft), one drop next to casting.

The most satisfactory oil for this purpose is Lubriplate #3, manufactured by the Fiske Brothers Refining Co., Newark, New Jersey.

## Trouble Shooting --

The following information is designed to be of assistance in trouble shooting a defective instrument:

<u>Symptoms</u>	<u>Possible Cause</u>	<u>Test Procedure</u>	<u>Remedies</u>
Instrument NOT operating, pilot light NOT on.	Line fuse blown due to defective fuse, power line surge, or overload in power supply section of the instrument.	Replace fuse, if this fuse blows remove V10, and again replace the fuse. If this fuse blows it is an indication of: 1. Short circuit in wiring associated with power transformer, T1. 2. Short circuit in filament wiring. 3. Defective power transformer.  If the fuse does not blow when V10 is removed, it indicates: 1. Defective rectifier V10. 2. Short in direct current wiring. 3. -16- ive filter capacitor.	1. Locate and clear short circuit. 2. Locate and clear short circuit. 3. Replace power transformer.  1. Replace V10. 2. Locate and clear short circuit. 3. Locate and replace defective capacitor.
Instrument NOT operating, pilot light ON.	Oscillator section not operating.	Measure oscillator voltage between center tap of R18 and ground; it should be 27-29 volts at 1000 $\omega$ . If the oscillator voltage is present but of incorrect value refer to Replacement of Lamp R13; if oscillator voltage not present check the following: 1. Oscillator tubes, V1 and V2, and Lamp R13. 2. The DC voltages in the oscillator section should agree with those indicated on the schematic diagram within $\pm 10\%$ . 3. A short circuit in tuning capacitor or associated trimmers.	1. Replace V1, V2, or Lamp R13. 2. Replace component causing incorrect DC voltage. 3. Clear short circuit. If foreign material is causing short remove carefully; if plates have been

damaged and are touching, carefully straighten.

4. RANGE switch (S1) contacts may be dirty and not making good contact, or if trouble is on one band only it may be due to an open resistor.
4. Clean RANGE switch (S1) contacts or replace RANGE switch assembly if any resistor is defective. Recommended that instrument be returned to factory for such replacement; a reasonable charge will be made for this service.

Oscillator voltage correct, amplifier sections NOT operating properly.

Check DC voltages in amplifier sections (V3 through V9); they should agree with voltages indicated on schematic diagram within  $\pm 10\%$ .

Replace defective component.

Instrument operating, high amount of distortion present in output.

Incorrect DC voltages.

Measure power supply voltages and regulator output voltage.

Correct difficulty in power supply or regulator. See Adjustments.

Distortion in oscillator section.

1. Check oscillator output voltage: between center tap of R18 and ground should measure 27-29 volts.
2. Check distortion at oscillator output: should be -50 db or better.

1. Reset oscillator output voltage (see Adjustments).
2. Replace V1, V2, or Lamp R13.

Incorrect gain through selective amplifier section.

1. Remove V6. At 1 kc there should be 28-30 db gain from grid of V3 to cathode of V5.
2. With V6 in circuit, at 1 kc gain from grid of V3 to cathode of V5 should drop to approximately 24 db (see Adjustment of Selective Amplifier Gain in Adjustments).
3. Check DC voltages in selective amplifier section.

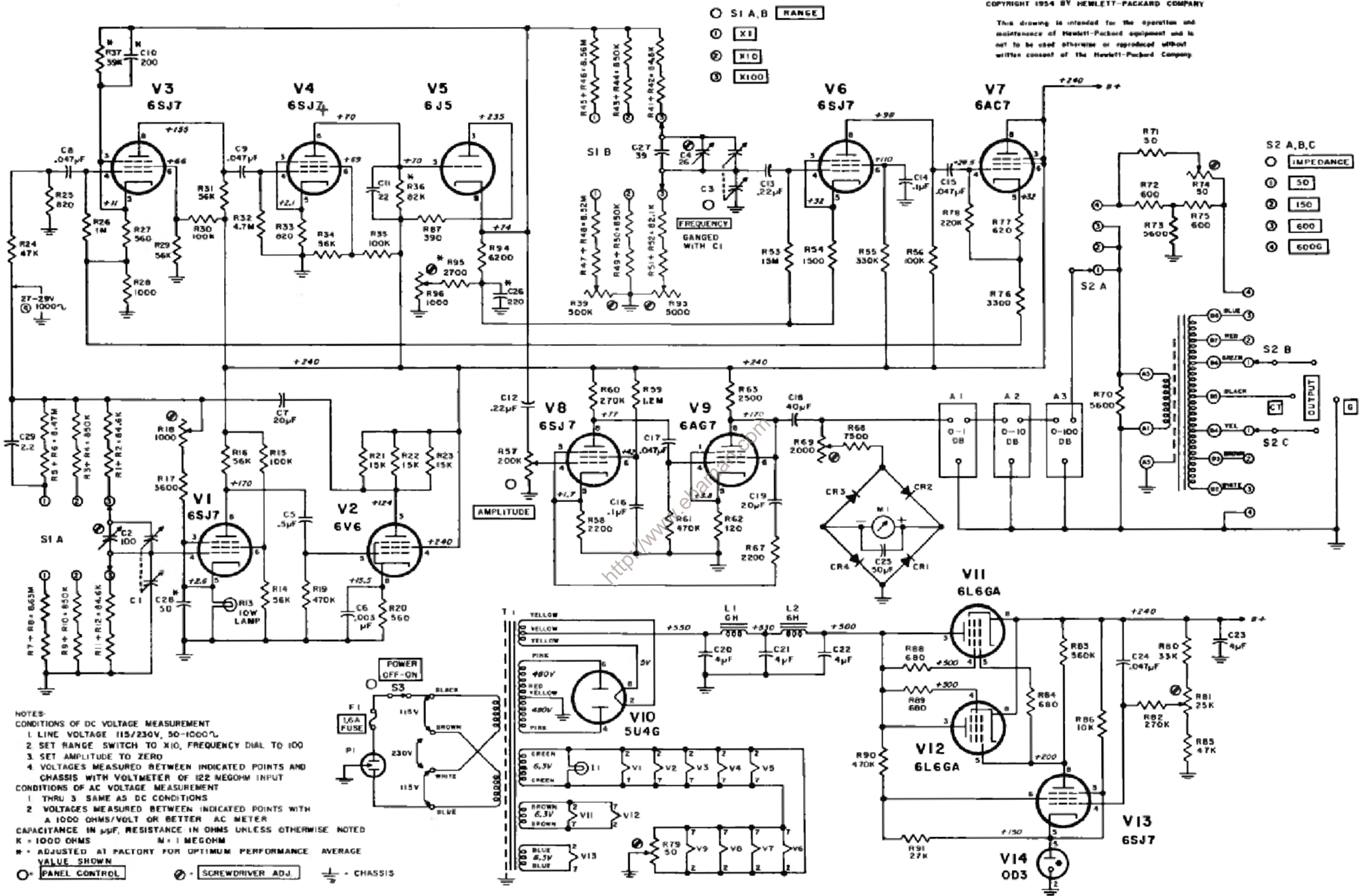
1. Replace V3, V4, and/or V5.
2. a. Replace V6 and/or V7.  
b. Blow dust out of tuning capacitor C3.
3. Replace defective part and reset gain.

Trouble Shooting -- (Continued)

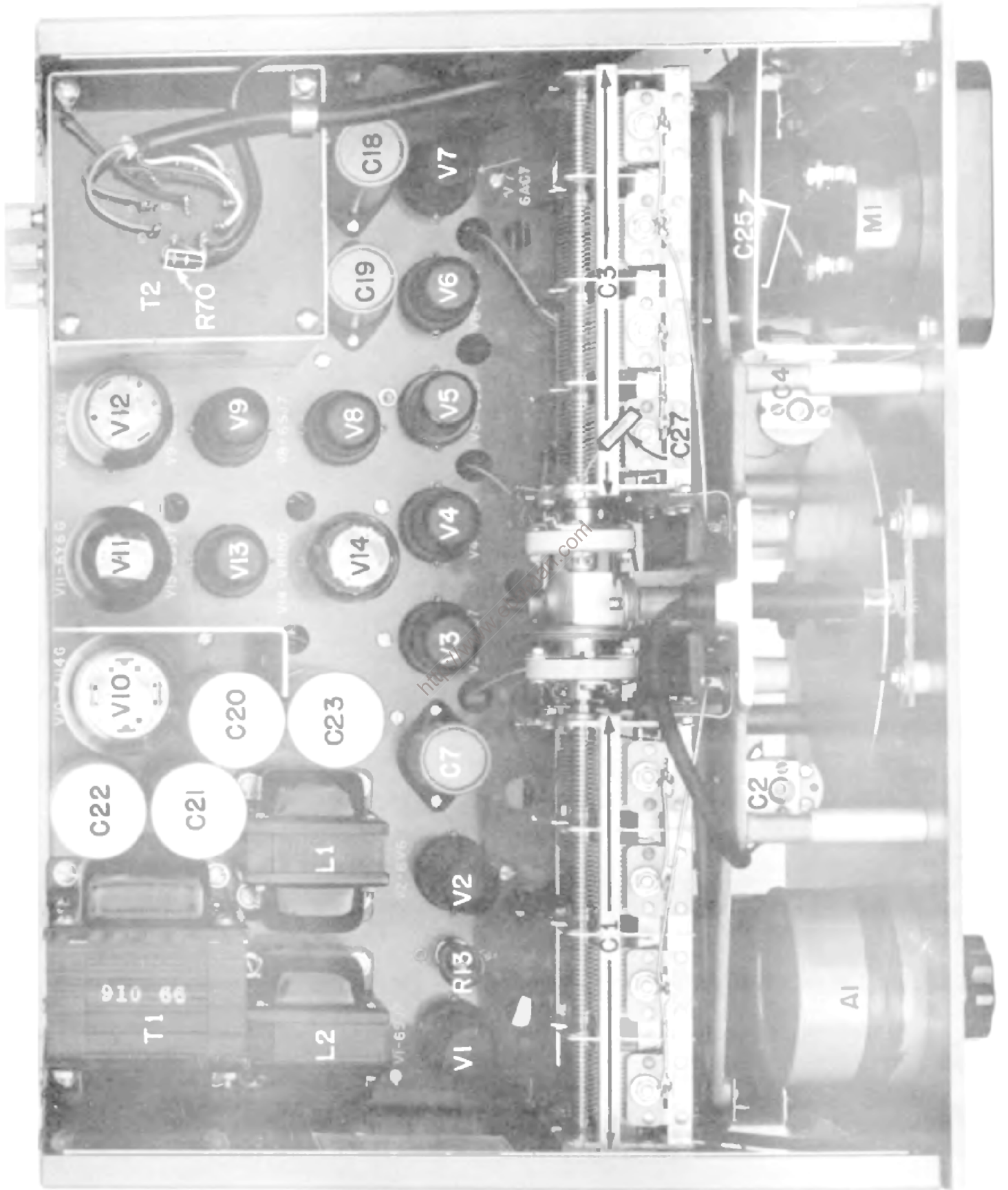
<u>Symptoms</u>	<u>Possible Cause</u>	<u>Test Procedure</u>	<u>Remedies</u>
Instrument operating, high amount of distortion present in output. (Con't.)	Distortion in intermediate or output amplifiers.	Replace each tube (V3 to V9) individually and recheck distortion.	Replace defective tube.
Instrument operating, high distortion and/or high output voltage on one range only.	Defective resistor in selective amplifier tuned bridge.	For range in trouble, measure resistors in amplifier section of RANGE switch, and R39 or R93.	Replace defective resistor. (Ordinarily replacement of a Wilkor with a Wilkor of the same marked value will be satisfactory. If not, replace RANGE switch assembly. See CAUTION preceding Adjustment for Centering Selective Amplifier Output Level.)
Noise and instability of output waveform.	AMPLITUDE control (R57) dirty or worn.	Check resistance between center tap of R57 and ground for smooth variation with rotation of AMPLITUDE control. (Disconnect instrument from power line when making resistance measurements.)	Replace R57.
	C10, C11, or C26 leaky.	Substitute capacitor of same value known to be good.	Replace defective capacitor.
	Short or dust in tuning capacitor C3.	Check visually.	Remove short, and/or blow dust out of tuning capacitor C3.
Calibration off on all ranges.	Tuning capacitor C1 damaged or slipping.	Check visually.	1. Reset position of tuner, and tighten Allen setscrews on tuner drive.

Calibration off on one range.	Wilkor resistor on RANGE switch changed value.	For defective range, measure resistors on RANGE switch.	<p>2. Replace tuning capacitor C1. (See CAUTION preceding Adjustment for Centering Selective Amplifier Output Level.)</p> <p>Ordinarily replacement with Wilkor of same marked value will be satisfactory; if not replace RANGE switch assembly. (See CAUTION preceding Adjustment for Centering Selective Amplifier Output Level.)</p>
Voltage at OUTPUT terminals below rated level.	Oscillator output voltage low.	<p>Measure voltage from center tap of R18 to ground; should be 27-29 volts (see Adjustment of Oscillator Output).</p> <ol style="list-style-type: none"> <li>1. Check V1 and V2.</li> <li>2. Adjust R18.</li> <li>3. Check lamp R13</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace any defective tube.</li> <li>3. Replace lamp (see Replacement of Lamp R13)</li> </ol>
Waveform at OUTPUT terminals shows clipping.	Selective amplifier gain too low.	See Adjustment of Selective Amplifier Gain.	Adjust R96.
	Selective amplifier gain too high.	See Adjustment of Selective Amplifier Gain.	Adjust R96.

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**SCHEMATIC DIAGRAM OF MODEL 206A  
 AUDIO SIGNAL GENERATOR  
 SERIAL 950 & ABOVE**





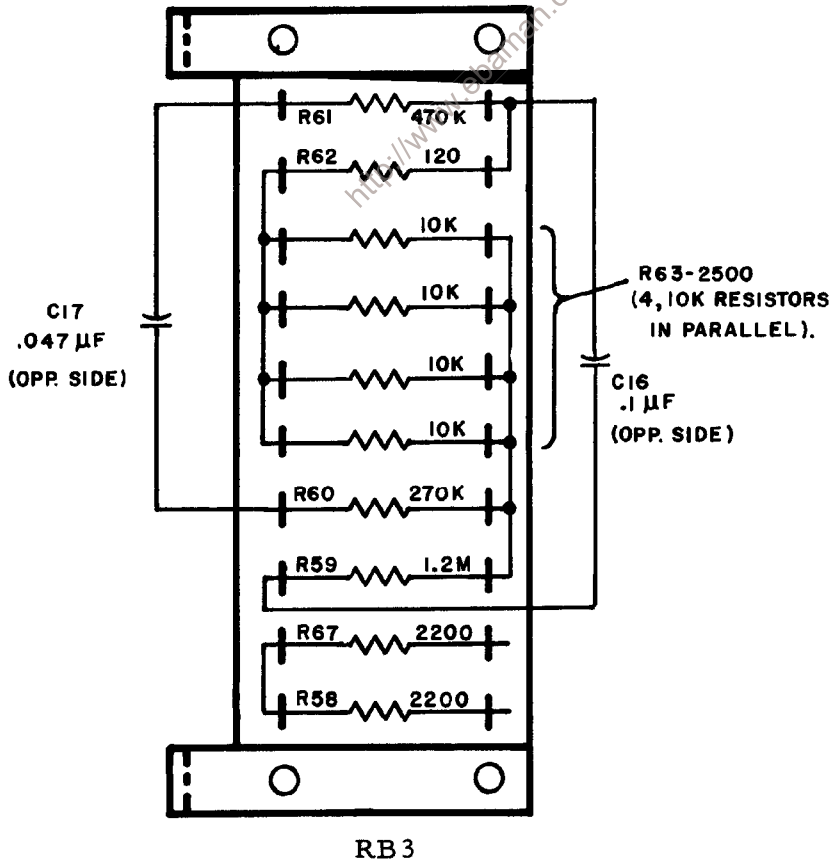
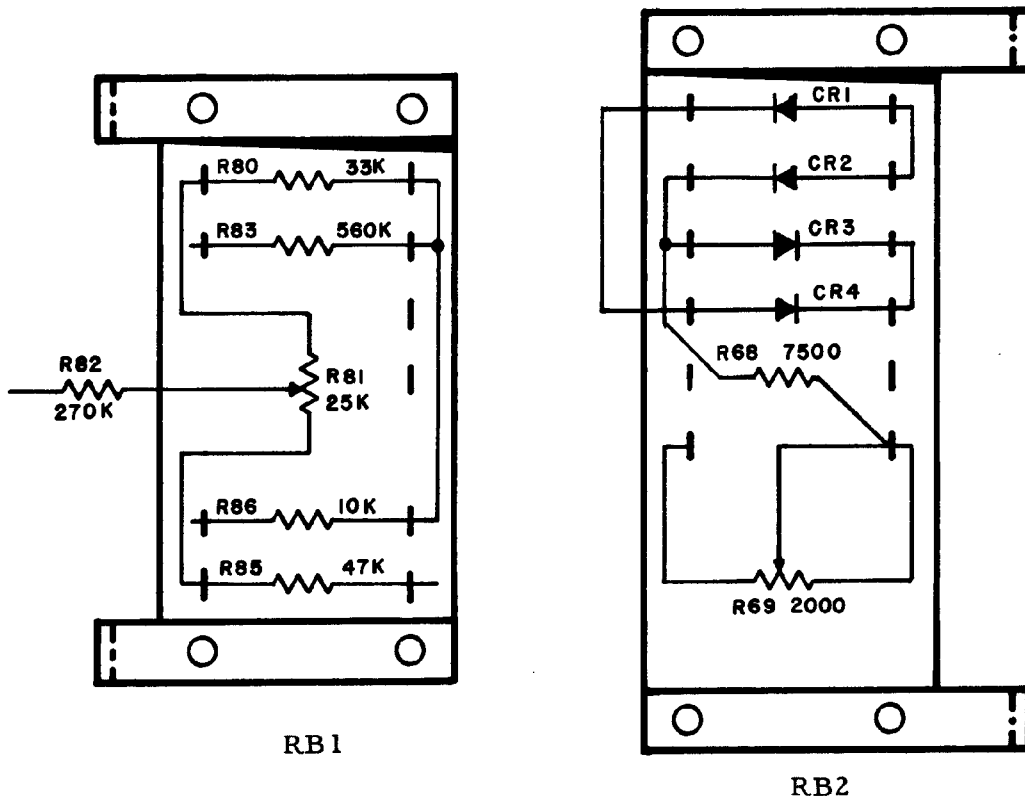
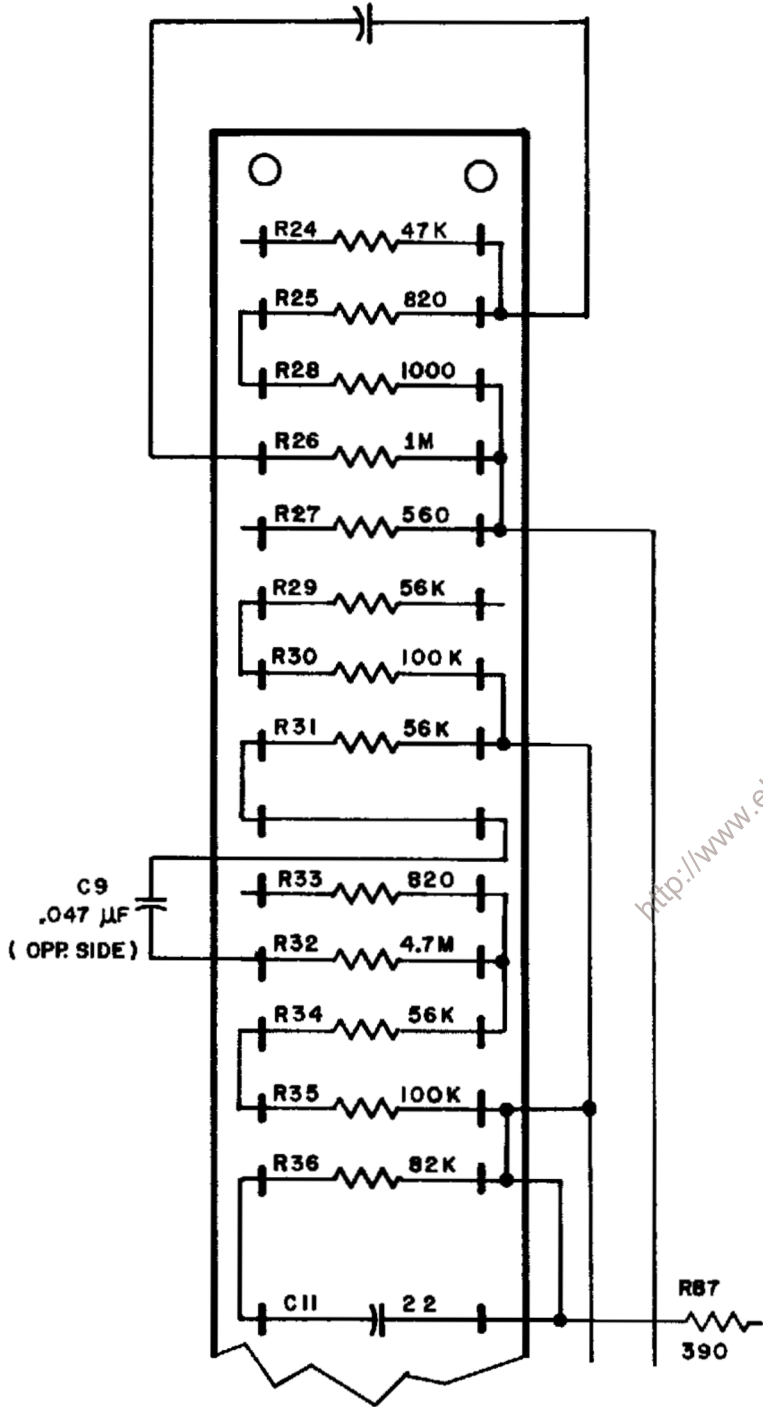
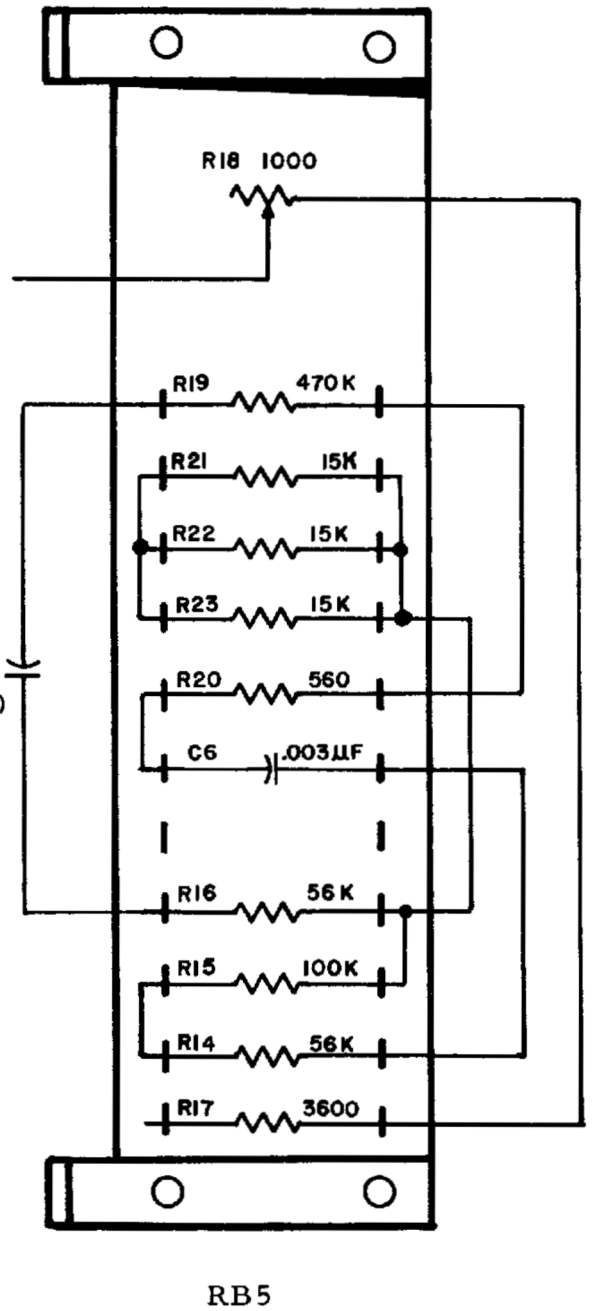


Fig. 6. Model 206A Resistor Board Detail

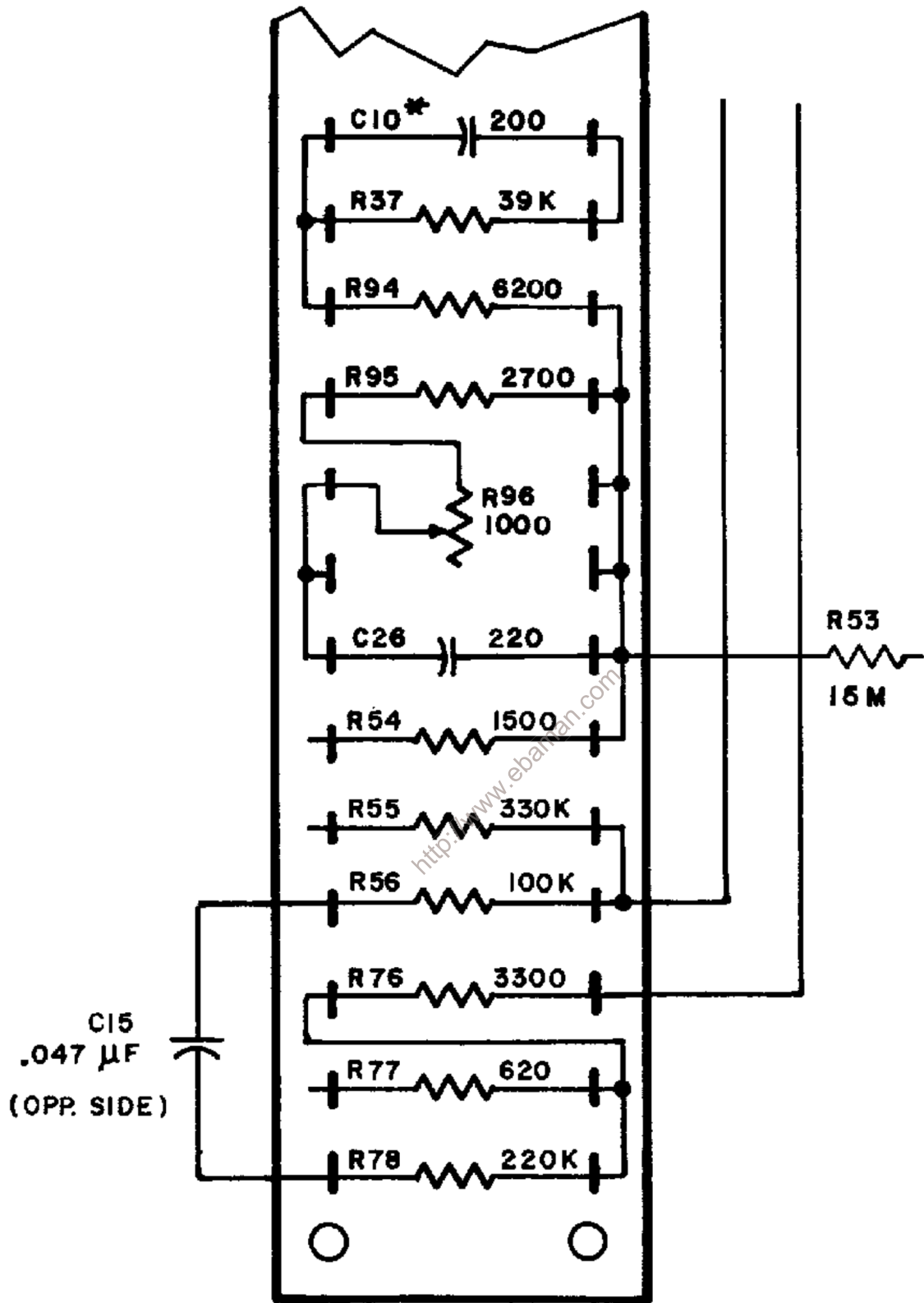
C8 .047  $\mu$ F (OPP. SIDE)



C5 .5UF (OPP. SIDE)



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RB4

Fig. 7. Model 206A Resistor Board Detail

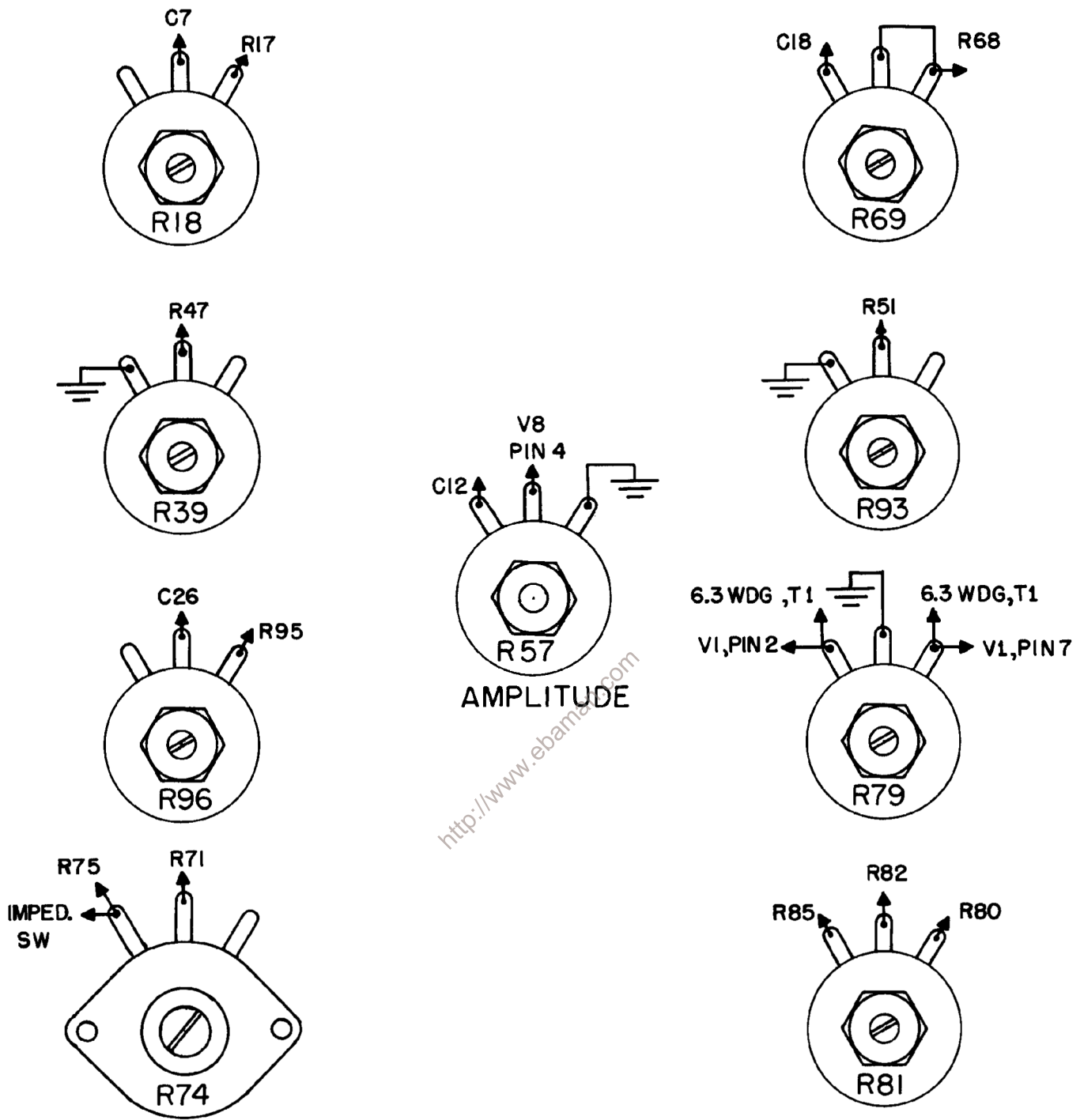


Fig. 8. Model 206A Detail of Variable Resistors

**TABLE OF REPLACEABLE PARTS**

Circuit Ref.	Description	-hp- Stock No.	Mfr. * & Mfrs. Designation
<p align="center"><u>Parts Substitutions</u>                      It is necessary in some instances to substitute parts in this instrument. These substitutions do not impair the performance of the instrument. Either the substitute part or the part specified in the Replaceable Parts Table may be used for replacement purposes.</p>			
C1	Capacitor: variable, air, four sections, each 535 $\mu\text{mf}$	12-5	HP
C2	Capacitor: variable, air, 7.5 $\mu\text{mf}$ to 102.7 $\mu\text{mf}$	12-11	HP
C3	Capacitor: variable, air, four sections, each 535 $\mu\text{mf}$	12-7	HP
C4	Capacitor: variable, air, 3.6 $\mu\text{mf}$ to 26 $\mu\text{mf}$	12-9	HP
C5	Capacitor: fixed, paper, .5 $\mu\text{f}$ , $\pm 10\%$ , 400 vdcw	16-58	Z 300405
C6	Capacitor: fixed, paper, .003 $\mu\text{f}$ , $\pm 10\%$ , 600 vdcw	16-23	A 688
C7	Capacitor: fixed, electrolytic, 20 $\mu\text{f}$ , 450 vdcw	18-20	X FPS-144
C8	Capacitor: fixed, paper, .047 $\mu\text{f}$ , $\pm 10\%$ , 600 vdcw	16-15	CC 73P47396
C9	Capacitor: fixed, paper, .047 $\mu\text{f}$ , $\pm 10\%$ , 600 vdcw	16-15	CC 73P47396
C10	Capacitor: fixed, mica, 200 $\mu\text{mf}$ , 500 vdcw	14-200	V OXM
C11	Capacitor: fixed, mica, 22 $\mu\text{mf}$ , $\pm 10\%$ , 500 vdcw	14-61	V RCM20B220K
C12	Capacitor: fixed, paper, .22 $\mu\text{f}$ , $\pm 10\%$ , 400 vdcw	16-48	CC 67P22494
C13	Capacitor: fixed, paper, .22 $\mu\text{f}$ , $\pm 10\%$ , 400 vdcw	16-48	CC 67P22494
C14	Capacitor: fixed, paper, .1 $\mu\text{f}$ , $\pm 10\%$ , 600 vdcw	16-1	CC 73P10496
C15	Capacitor: fixed, paper, .047 $\mu\text{f}$ , $\pm 10\%$ , 600 vdcw	16-15	CC 73P47396

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

**TABLE OF REPLACEABLE PARTS**

Circuit Ref.	Description	-hp- Stock No.	Mfr. * & Mfrs. Designation
C16	Capacitor: fixed, paper, .1 $\mu$ f, $\pm 10\%$ , 600 vdcw	16-1	CC 73P10496
C17	Capacitor: fixed, paper, .047 $\mu$ f, $\pm 10\%$ , 600 vdcw	16-15	CC 73P47396
C18	Capacitor: fixed, electrolytic, 40 $\mu$ f, 450 vdcw	18-40	X FPS-146
C19	Capacitor: fixed, electrolytic, 20 $\mu$ f, 450 vdcw	18-20	X FPS-144
C20	Capacitor: fixed, paper, 4 $\mu$ f, $\pm 10\%$ , 600 vdcw	17-10	Z Type 4106-4
C21	Capacitor: fixed, paper, 4 $\mu$ f, $\pm 10\%$ , 600 vdcw	17-10	Z Type 4106-4
C22	Capacitor: fixed, paper, 4 $\mu$ f, $\pm 10\%$ , 600 vdcw	17-10	Z Type 4106-4
C23	Capacitor: fixed, paper, 4 $\mu$ f, $\pm 10\%$ , 600 vdcw	17-10	Z Type 4106-4
C24	Capacitor: fixed, paper, .047 $\mu$ f, 600 vdcw	16-15	CC 73P47396
C25	Capacitor: fixed, electrolytic, 50 $\mu$ f, 50 vdcw	18-50	X TC-39
C26	Capacitor: fixed, mica, 220 $\mu$ f, $\pm 10\%$ , 500 vdcw	14-66	V RCM20B221K
C27	Capacitor: fixed, ceramic, 39 $\mu$ f, $\pm 5\%$ , 500 vdcw	15-4	A CI-2
C28	Capacitor: fixed, mica, 50 $\mu$ f, $\pm 10\%$ , 500 vdcw Electrical value adjusted at factory	14-50	V Type OXM
R1 to R12	Part of Range Switch Assembly; See S1	Part of 26A-19W	
R13	Lamp: 10 W, 250 V	211-29	O 10S6/10 250V
R14	Resistor: fixed, composition, 56,000 ohms, $\pm 10\%$ , 1W,	24-56K	B GB 5631
R15	Resistor: fixed composition, 100,000 ohms, $\pm 10\%$ , 2 W,	25-100K	B HB 1041

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

TABLE OF REPLACEABLE PARTS

Circuit Ref.	Description	-hp- Stock No.	Mfr. * & Mfrs. Designation
R16	Resistor: fixed, composition, 56,000 ohms, $\pm 10\%$ , 1 W	24-56K	B GB 5631
R17	Resistor: fixed, wirewound, 3,600 ohms, $\pm 5\%$ , 1 W	26-4	R Type BW
R18	Resistor: variable, wirewound, 1,000 ohms, $\pm 10\%$ , 2 W Linear Taper	210-5	HP
R19	Resistor: fixed, composition, 470,000 ohms, $\pm 10\%$ , 1 W	24-470K	B GB 4741
R20	Resistor: fixed, composition, 560 ohms, $\pm 10\%$ , 1 W	24-560	B GB 5641
R21	Resistor: fixed, composition, 15,000 ohms, $\pm 10\%$ , 2 W	25-15K	B HB 1531
R22	Resistor: fixed, composition, 15,000 ohms, $\pm 10\%$ , 2 W	25-15K	B HB 1531
R23	Resistor: fixed, composition, 15,000 ohms, $\pm 10\%$ , 2 W	25-15K	B HB 1531
R24	Resistor: fixed, composition, 47,000 ohms, $\pm 10\%$ , 1 W	24-47K	B GB 4731
R25	Resistor: fixed, composition, 820 ohms, $\pm 10\%$ , 1 W	24-820	B GB 8211
R26	Resistor: fixed, composition, 1 megohm, $\pm 10\%$ , 1 W	24-1M	B GB 1051
R27	Resistor: fixed, composition, 560 ohms, $\pm 10\%$ , 1 W	24-560	B GB 5641
R28	Resistor: fixed, composition, 1,000 ohms, $\pm 10\%$ , 1 W	24-1000	B GB 1021
R29	Resistor: fixed, composition, 56,000 ohms, $\pm 10\%$ , 1 W	24-56K	B GB 5631
R30	Resistor: fixed, composition, 100,000 ohms, $\pm 10\%$ , 1 W	24-100K	B GB 1041
R31	Resistor: fixed, composition, 56,000 ohms, $\pm 10\%$ , 1 W	24-56K	B GB 5631
R32	Resistor: fixed, composition, 4.7 megohms, $\pm 10\%$ , 1/2 W	23-4.7M	B EB 4751

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

TABLE OF REPLACEABLE PARTS

Circuit Ref.	Description	-hp- Stock No.	Mfr. * & Mfrs. Designation
R33	Resistor: fixed, composition, 820 ohms, $\pm 10\%$ , 1 W	24-820	B GB 8211
R34	Resistor: fixed, composition, 56,000 ohms, $\pm 10\%$ , 1 W	24-56K	B GB 5631
R35	Resistor: fixed, composition, 100,000 ohms, $\pm 10\%$ , 1 W	24-100K	B GB 1041
R36	Resistor: fixed, composition, 82,000 ohms, $\pm 5\%$ , 1 W Electrical value adjusted at factory	24-82K-5	B GB 8235
R37	Resistor: fixed, composition, 39,000 ohms, $\pm 10\%$ , 1 W Electrical value adjusted at factory	24-39K	B GB 3931
R38	This circuit reference not assigned		
R39	Resistor: variable, composition, 500,000 ohms, linear taper	210-20	HP
R40	This circuit reference not assigned		
R41 to R52	Part of Range Switch Assembly; see S1	Part of 26A-19W	
R53	Resistor: fixed, composition, 15 megohms, $\pm 10\%$ , 1/2 W	23-15M	B EB 1561
R54	Resistor: fixed, composition, 1,500 ohms, $\pm 10\%$ , 1 W	24-1500	B GB 1521
R55	Resistor: fixed, composition, 330,000 ohms, $\pm 10\%$ , 1/2 W	23-330K	B EB 3341
R56	Resistor: fixed, composition, 100,000 ohms, $\pm 10\%$ , 1 W	24-100K	B GB 1041
R57	Resistor: variable, composition, 200,000 ohms, $\pm 10\%$ , 1 W,	210-13	HP
R58	Resistor: fixed, composition, 2,200 ohms, $\pm 10\%$ , 1 W	24-2200	B GB 2221
R59	Resistor: fixed, composition, 1.2 megohms, $\pm 10\%$ , 1 W	24-1.2M	B GB 1251
R60	Resistor: fixed, composition, 270,000 ohms, $\pm 10\%$ , 1 W	24-270K	B GB 4741

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

TABLE OF REPLACEABLE PARTS

Circuit Ref.	Description	-hp- Stock No.	Mfr. * & Mfrs. Designation
R61	Resistor: fixed, composition, 470,000 ohms, $\pm 10\%$ , 1 W	24-470K	B GB 4741
R62	Resistor: fixed, composition, 120 ohms, $\pm 10\%$ , 1 W	24-120	B GB 1211
R63	Resistor: 2,500 ohms, Four of following connected in parallel: fixed, composition, 10,000 ohms, $\pm 10\%$ , 2 W	25-10K	B HB 1031
R64, R65, R66	These circuit references not assigned		
R67	Resistor: fixed, composition, 2,200 ohms, $\pm 10\%$ , 1 W	24-2200	B GB 2221
R68	Resistor: fixed, composition, 7,500 ohms, $\pm 1\%$ , 1 W	31-7500	Electra: Type DC-1
R69	Resistor: variable, composition, 2,000 ohms, $\pm 20\%$ , 1/4 W, linear taper	210-14	HP
R70	Resistor: fixed, composition, 5600 ohms, $\pm 10\%$ , 1 W	24-5600	B GB 5621
R71	Resistor: fixed, wirewound, 50 ohms, Part of S2	Part of 26A-19A	
R72	Resistor: fixed, wirewound, 600 ohms, Part of S2	Part of 26A-19A	
R73	Resistor: fixed, wirewound, 5600 ohms, Part of S2	Part of 26A-19A	
R74	Resistor: variable, wirewound, 50 ohms, linear taper, Part of S2	210-27	HP
R75	Resistor: 600 ohms, Part of S2	Part of 26A-19A	
R76	Resistor: fixed, composition, 3,300 ohms, $\pm 10\%$ , 1 W	24-3300	B GB 3321
R77	Resistor: fixed, composition, 620 ohms, $\pm 5\%$ , 1 W	24-620-5	B GB 6215
R78	Resistor: fixed, composition, 220,000 ohms, $\pm 10\%$ , 1 W	24-220K	B GB 2241

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

TABLE OF REPLACEABLE PARTS

Circuit Ref.	Description	-hp- Stock No.	Mfr. * & Mfrs. Designation
R79	Resistor: variable, wirewound, 50 ohms, $\pm 10\%$ , 3 W, linear taper	210-2	HP
R80	Resistor: fixed, composition, 33,000 ohms, $\pm 10\%$ , 1 W	24-33K	B GB 3331
R81	Resistor: variable, composition, 25,000 ohms, $\pm 20\%$ , 1 W, linear taper	210-11	HP
R82	Resistor: fixed, composition, 270,000 ohms, $\pm 10\%$ , 1 W	24-270K	B GB 4741
R83	Resistor: fixed, composition, 560,000 ohms, $\pm 10\%$ , 1 W	24-560K	B GB 5641
R84	Resistor: fixed, composition, 680 ohms, $\pm 10\%$ , 1/2 W	23-680	B EB 6811
R85	Resistor: fixed, composition, 47,000 ohms, $\pm 10\%$ , 1 W	24-47K	B GB 4731
R86	Resistor: fixed, composition, 10,000 ohms, $\pm 10\%$ , 2 W	25-10K	B HB 1031
R87	Resistor: fixed, composition, 390 ohms, $\pm 10\%$ , 1 W	24-390	B GB 3911
R88	Resistor: fixed, composition, 680 ohms, $\pm 10\%$ , 1 W	24-680	B GB 6811
R89	Resistor: fixed, composition, 680 ohms, $\pm 10\%$ , 1 W	24-680	B GB 6811
R90	Resistor: fixed, composition, 470,000 ohms, $\pm 10\%$ , 1 W	24-470K	B GB 4741
R91	Resistor: fixed, composition, 27,000 ohms, $\pm 10\%$ , 1 W	24-27K	B GB 2731
R92	This circuit reference not assigned		
R93	Resistor: variable, composition, 5000 ohms, linear taper	210-15	HP
R94	Resistor: fixed, composition, 6,200 ohms, $\pm 5\%$ , 1 W	24-6200-5	HP GB 6225
R95	Resistor: fixed, composition, 2,700 ohms, $\pm 10\%$ , 1 W Electrical value adjusted at factory	24-2700	B GB 2721

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

TABLE OF REPLACEABLE PARTS

Circuit Ref.	Description	-hp- Stock No.	Mfr. * & Mfrs. Designation
R96	Resistor, variable, composition, 1,000 ohms, linear taper	210-51	HP
A1, A2, A3	Attenuator, set of three, including 0-100 db, 0-10 db, 0-1 db	26A-34	HP
	Binding Post:	149-4	HP
	Binding Post Nut:	149-5	HP
CR1, CR2, CR3, CR4	Crystal:	212-C-11C	
	Dial Drive Mechanical Cable	816-3	
F1	Fuse: 1.6A, 3 AG type	211-15	
	Fuseholder:	140-18	T, #342001
	Indicator Lamp Assembly:	312-10	BB, #807BS
	Knob: 1-5/8" diam. (Frequency control coarse)	37-12	
	Knob: 1-1/2" diam. (POWER, RANGE, IMPEDANCE, AMPLITUDE controls)	37-11	HP
	Knob: 2" diam. (FREQUENCY control, fine; DB controls)	37-13	HP
I1	Lamp:	211-47	O, Mazda #47
	Lampholder:	145-11	
	Lamp Insulator	G-33C	HP
M1	Meter: 0-4.5 V into 600 $\Omega$ , -5/+15 DBM	112-18	
P1	Plug: motor base type	125-25	
	Power Cable:	812-68	HP
L1, L2	Reactor: 6 H @ 125 MA, 240 ohms	911-4	HP
S1	Rotary Switch Assem: RANGE Switch, includes switch and frequency-determining resistors for oscillator (R1 through R12) and selective amplifier (R41 through R52) circuits	26A-19W	
S2	Rotary Switch Assem: IMPEDANCE switch, includes resistors R71 through R75	26A-19A	

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

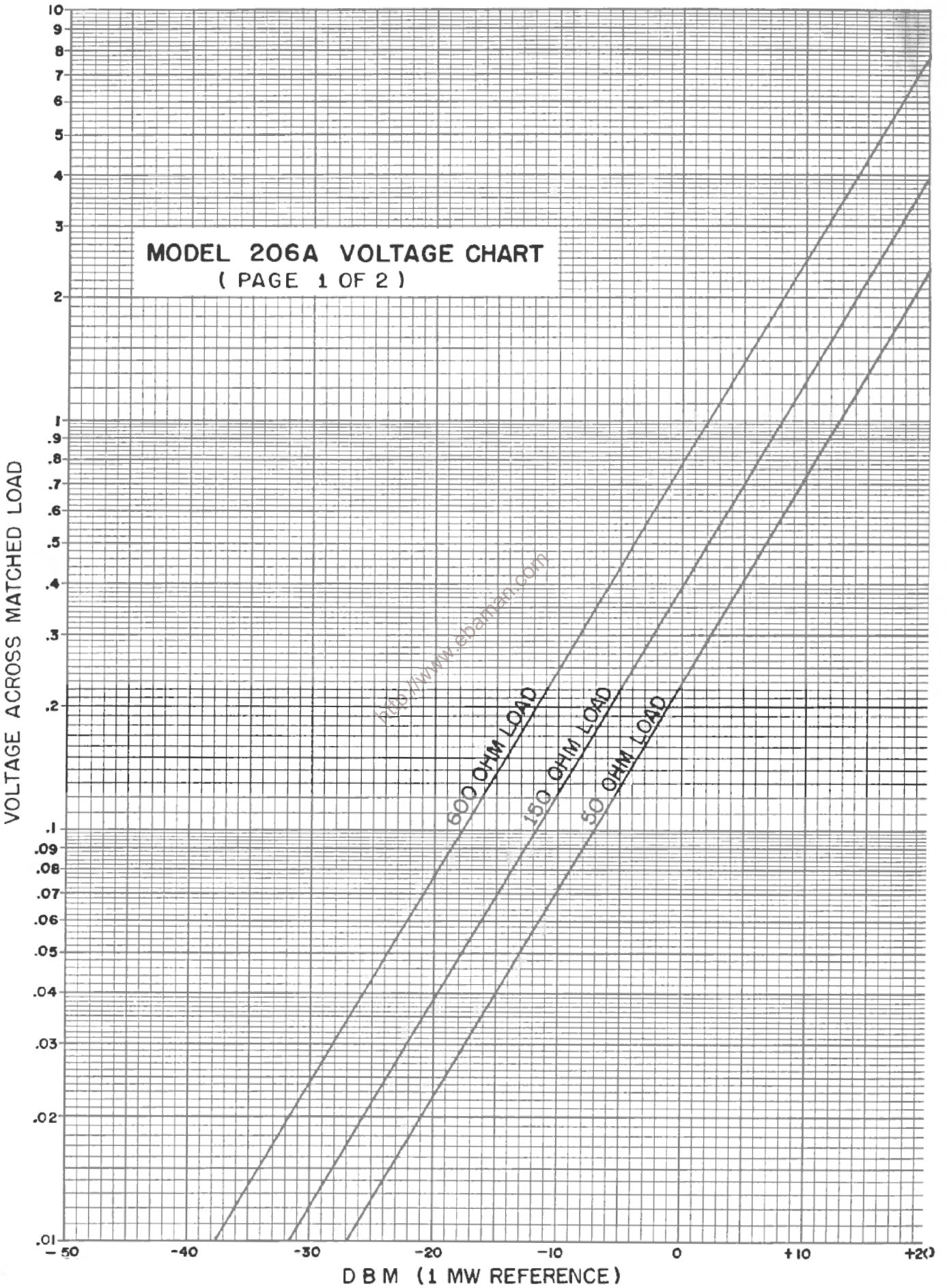
TABLE OF REPLACEABLE PARTS

Circuit Ref.	Description	-hp- Stock No.	Mfr. * & Mfrs. Designation
S3	Rotary Switch; SPST: POWER	310-1	
T1	Power Transformer:	910-66	
T2	Imped. Match. Transformer: audio	912-9	
V1	Tube: 6SJ7	212-6SJ7	ZZ
V2	Tube: 6V6	212-6V6	ZZ
V3	Tube: 6SJ7	212-6SJ7	ZZ
V4	Tube: 6SJ7	212-6SJ7	ZZ
V5	Tube: 6J5	212-6J5	ZZ
V6	Tube: 6SJ7	212-6SJ7	ZZ
V7	Tube: 6AC7	212-6AC7	ZZ
V8	Tube: 6SJ7	212-6SJ7	ZZ
V9	Tube: 6AG7	212-6AG7	ZZ
V10	Tube: 5U4G	212-5U4G	ZZ
V11	Tube: 6Y6G	212-6Y6G	ZZ
V12	Tube: 6Y6G	212-6Y6G	ZZ
V13	Tube: 6SJ7	212-6SJ7	ZZ
V14	Tube: VR150	212-VR150	ZZ

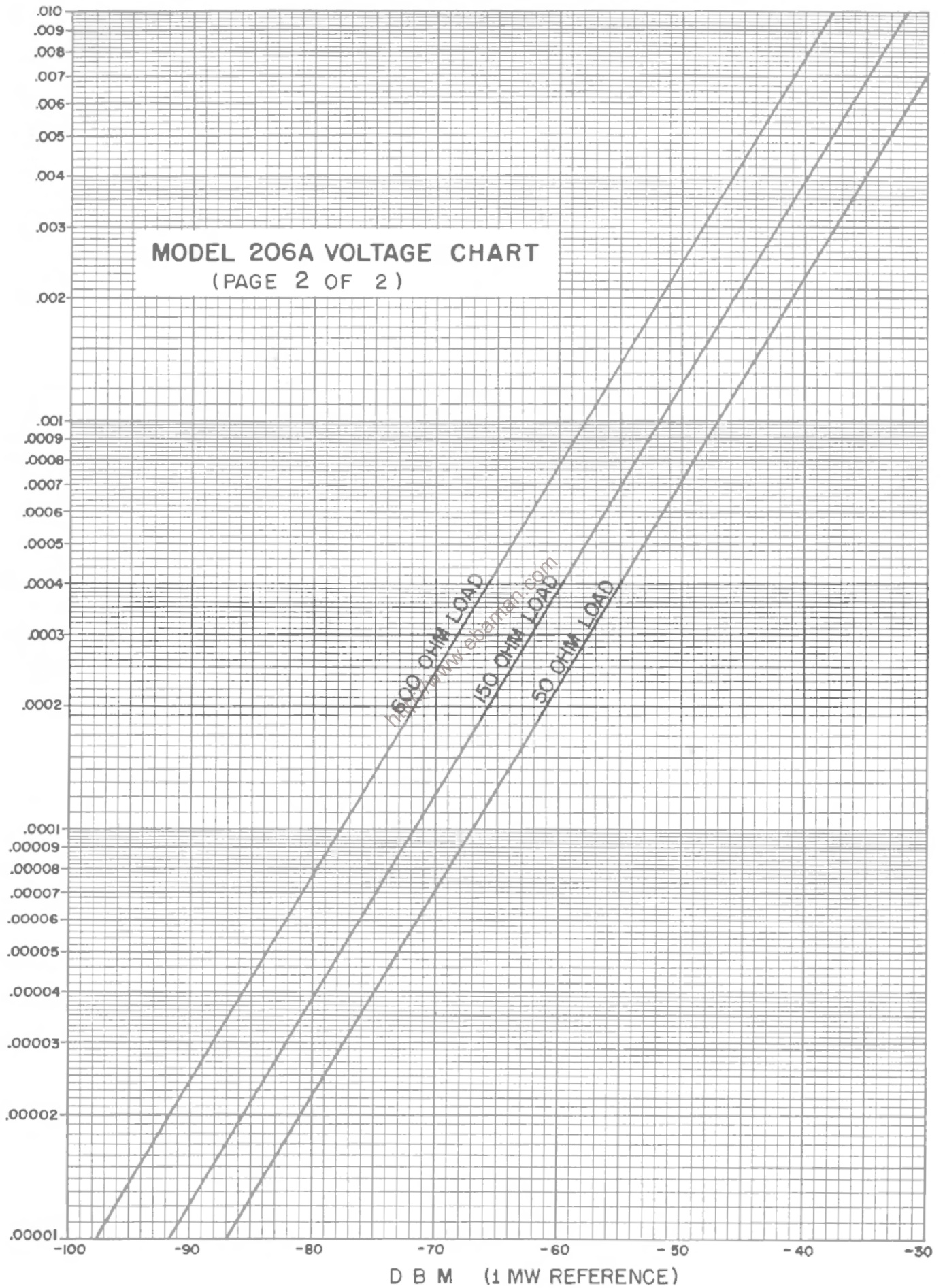
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\*See "List of Manufacturers Code Letters For Replaceable Parts Table."

MODEL 206A VOLTAGE CHART  
( PAGE 1 OF 2 )



MODEL 206A VOLTAGE CHART  
(PAGE 2 OF 2)



D B M (1 MW REFERENCE)

LIST OF MANUFACTURERS CODE LETTERS  
FOR REPLACEABLE PARTS TABLE

<u>Code Letter</u>	<u>Manufacturer</u>
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.
HP	Hewlett-Packard
I	Clarostat Manufacturing Co.
J	Cornell Dubilier Electric Co.
K	Hi-Q Division of Aerovox Corp.
L	Erie Resistor Corp.
M	Federal Telephone and Radio Corp.
N	General Electric Co.
O	General Electric Supply Corp.
P	Girard-Hopkins
R	International Resistance Co.
S	Lectrohm, Inc.
T	Littelfuse, Inc.
V	Micamold Radio Corp.
X	P.R. Mallory Co., Inc.
Z	Sangamo Electric Co.
AA	Sarkes Tarzian
CC	Sprague Electric Co.
DD	Stackpole Carbon Co.
EE	Sylvania Electric Products, Inc.
FF	Western Electric Co.
HH	Amphenol
II	Dial Light Co. of America
KK	Switchcraft, Inc.
LL	Gremer Mfg. Co.
MM	Carad Corp.
ZZ	Any tube having RETMA 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

