

INSTRUCTIONS

AUDIO OSCILLATOR

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

Instructions

200 SERIES RESISTANCE-TUNED OSCILLATORS

The 200 series Resistance-tuned Oscillators includes the Model 200A with a frequency range of 35 cps to 35,000 cps and 1 watt output, the Model 200B with a frequency range of 20 cps to 20,000 cps and 1 watt output, the Model 200C with a frequency range of 20 cps to 200 KC and 100 milliwatts output, and the Model 200D with a frequency range of 7 cps to 70 KC and 100 milliwatts output. These units consist of an oscillator section and a power amplifier section with the necessary voltage supplies.

DESCRIPTION

1-1 General: The oscillator section is a two stage resistance-coupled amplifier over which both positive and negative feedback are applied. The positive feedback network is a frequency selective, resistance condenser combination which is used to control the frequency of oscillation. Negative feedback is used to stabilize the operation of the circuit. The amount of negative feedback is determined by a resistance network, one element of which is non-linear. This element controls the amount of feedback in accordance with the amplitude of oscillation and consequently maintains the proper operating point in the system.

1-2 Output Amplifier Models 200A and 200B: The Models 200A and 200B have a two stage power amplifier with a transformer-coupled output following the oscillator section. Feedback is used in the power amplifier to eliminate distortion and to provide good frequency response. This amplifier is designed to deliver 1 watt of audio power into a 500 ohm resistance load over the major portion of the frequency range. Special output impedances are supplied on order and in this case the output impedance is marked on the panel of the instrument.

The internal impedance of the output system is approximately 50 ohms so the output voltage is not critical with load resistance. A load resistance of 600 ohms may be used with only small loss in available power. A load resistance less than 500 ohms, however, will cause an abnormal drop in output voltage at frequencies above 10,000 cps.

1-3 Output Amplifier Models 200C and 200D: The Models 200C and 200D have a two stage resistance-coupled output amplifier. Feedback is used in this amplifier to eliminate distortion and to provide a good frequency response over the wide frequency range. This amplifier is designed to deliver 100 milliwatts into a 1000 ohm resistance load over the major portion of the frequency range. The internal impedance of this amplifier is approximately 50 ohms at 400 cps and therefore the output is not critical with load. Load resistances less than 1000 ohms will tend to increase the distortion at full output but otherwise will not affect the operation.

OPERATING INSTRUCTIONS

2-1 Initial Adjustments: This oscillator has been carefully tested and adjusted before leaving the factory and no further adjustments should be necessary. Before turning on the power the unit should be checked to make sure the tubes are secure in their sockets and the Mazda lamp is screwed in tightly. Ordinarily a warm-up period is not required. However, when the unit is first put into operation or when it has been standing idle for a long time the oscillator should be

allowed to run for ten or fifteen minutes before it is used.

2-2 Frequency: The main dial located in the center of the panel is calibrated directly in cycles per second for the lowest frequency range. The reading of this dial is multiplied by the factor indicated on the range switch at the left side of the panel.

2-3 Output: The output voltage is controlled by the amplitude control at the right side of the panel. This control is ahead of the output amplifier. When very small audio voltages are required it is good practice to use an attenuator between the oscillator and the equipment being driven. This will help keep the hum level far enough below the audio signal.

The oscillator has been adjusted to deliver more than rated power into the load. Because of this adjustment the output wave may show some distortion when the amplitude control is open. This condition is normal and when low distortion is required the oscillator should be operated at rated output or slightly below.

2-4 Power Supply: The oscillator is designed to operate on 115 volts, 50-60 cps.

MAINTENANCE

3-1 General: For proper operation both the frequency calibration and the distortion level in the output should be periodically checked. Also the unit should be thoroughly cleaned and a drop of light oil should be applied to the bearing on the main dial shaft.

3-2 Calibration: To adjust the tracking of the main frequency selecting dial, a standard source of frequency must be used for comparison. Set dial to 200 and range switch to X10. Note output of oscillator at 20 on dial (200 cps.) then set to 200 on dial. Adjust oscillator frequency to 2000 cps. by means of C1 (see diagram of chassis arrangement) at the same time adjust the voltage output to be equal to that obtained at 20 on the dial by the compensating condenser (C6—Model 200A, B; C8—Model 200C, D). This requires some maneuvering as the settings are interdependent. Check output at 20 again to make sure it has not changed. If it has changed, readjust output and frequency at 200 to match.

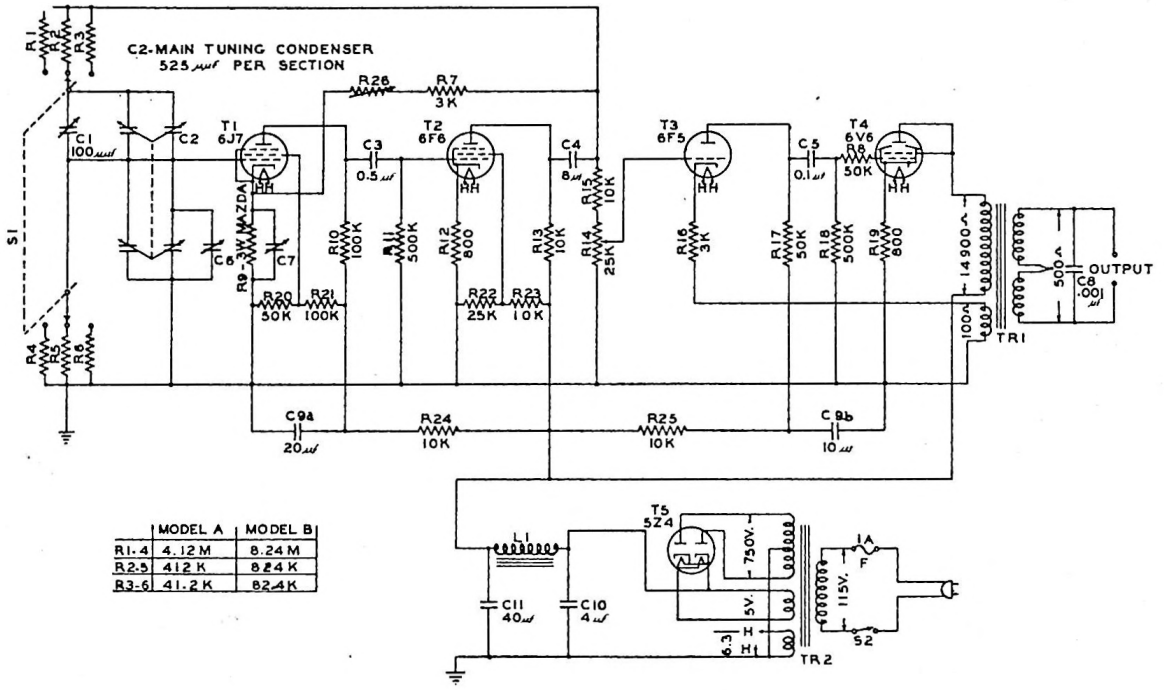
The Models 200A and 200D differ only in their main dial settings for oscillator output and frequency adjustment. These are 35 (350 cps.) and 350 (3500 cps.) for the 200A; the 200D settings are 7 (70 cps.) and 70 (700 cps.).

These adjustments are all made from the bottom because the final calibration is correct only when the dust cover is in place. If the instrument still does not track properly, the resistors have probably changed value. Return oscillator to the factory for range switch replacement and recalibration.

3-3 Distortion: The total harmonic distortion will be less than one-half of 1 percent when the instrument is operating properly. If tubes are changed the distortion should be measured if possible, because a poor tube will increase the distortion without otherwise affecting the operation of the instrument. Instability of the output voltage is sometimes caused by a defective tube in the oscillator section T1 or T2 or by a defective coupling condenser which places a positive voltage on the grid of T2.

On the following pages the circuit diagrams are shown for reference.

WIRING DIAGRAM MODELS 200-A-B

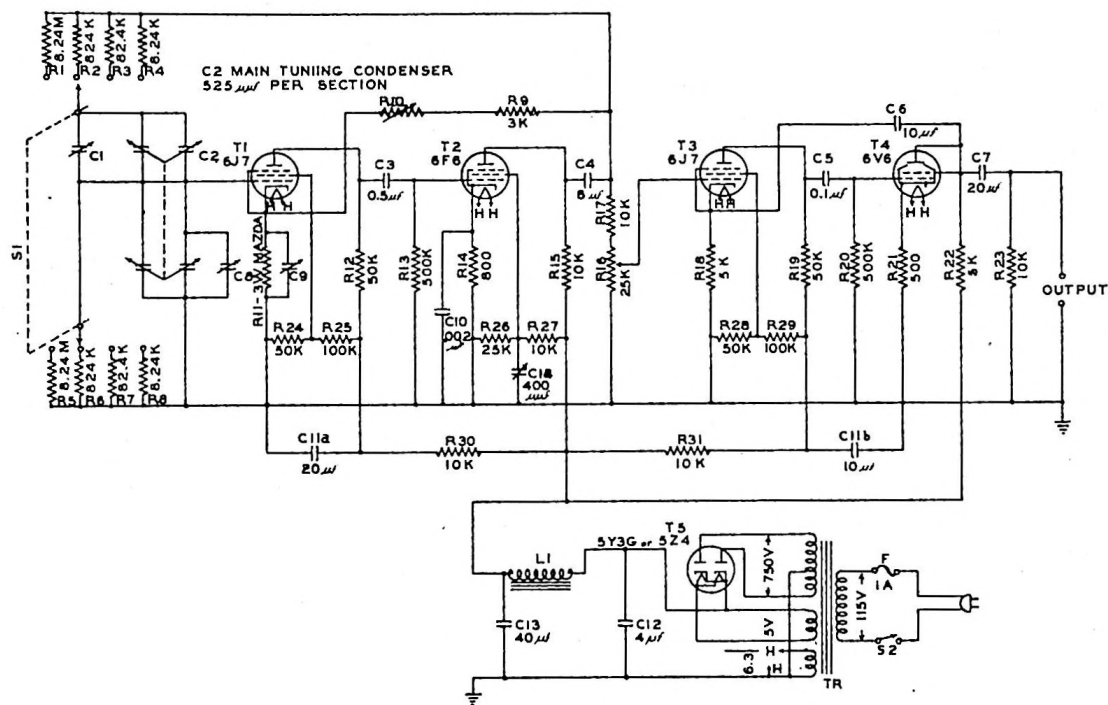


	MODEL A	MODEL B
R1-4	4.12 M	8.24 M
R2-5	412 K	824 K
R3-6	41.2 K	82.4 K

CIRCUIT CONSTANTS Models 200-A and 200-B

- | | |
|--|--|
| <p>R1, R2, R3 Frequency determining resistors</p> <p>R4, R5, R6 Frequency determining resistors</p> <p>R7 3000 ohms</p> <p>R8 50,000 ohms</p> <p>R9 Amplitude control resistor</p> <p>R10 100,000 ohms</p> <p>R11 500,000 ohms</p> <p>R12 800 ohms</p> <p>R13 10,000 ohms</p> <p>R14 25,000 ohms potentiometer</p> <p>R15 10,000 ohms</p> <p>R16 3000 ohms</p> <p>R17 50,000 ohms</p> <p>R18 500,000 ohms</p> <p>R19 800 ohms</p> <p>R20 50,000 ohms</p> <p>R21 100,000 ohms</p> <p>R22 25,000 ohms</p> <p>R23 10,000 ohms</p> <p>R24 10,000 ohms</p> <p>R25 10,000 ohms</p> <p>R26 0-800 ohms</p> | <p>C1 100 ufd. adjusted at factory</p> <p>C2 Main tuning condenser</p> <p>C3 0.5 ufd. paper</p> <p>C4 8 ufd. paper</p> <p>C5 0.1 ufd. paper</p> <p>C6 200A—50 ufd. adjusted at factory
200B—25 ufd. adjusted at factory</p> <p>C7 0.00025 ufd. mica adjusted at factory</p> <p>C8 0.001 ufd. paper</p> <p>C9a 20 ufd. electrolytic</p> <p>C9b 10 ufd. electrolytic</p> <p>C10 4 ufd. paper</p> <p>C11 40 ufd. electrolytic</p> <p>T1 6J7 metal</p> <p>T2 6F6 metal</p> <p>T3 6F5 metal</p> <p>T4 6V6 metal</p> <p>T5 5Z4 metal</p> <p>Tr1 Output transformer</p> <p>Tr2 Power transformer</p> <p>L1 Filter choke</p> |
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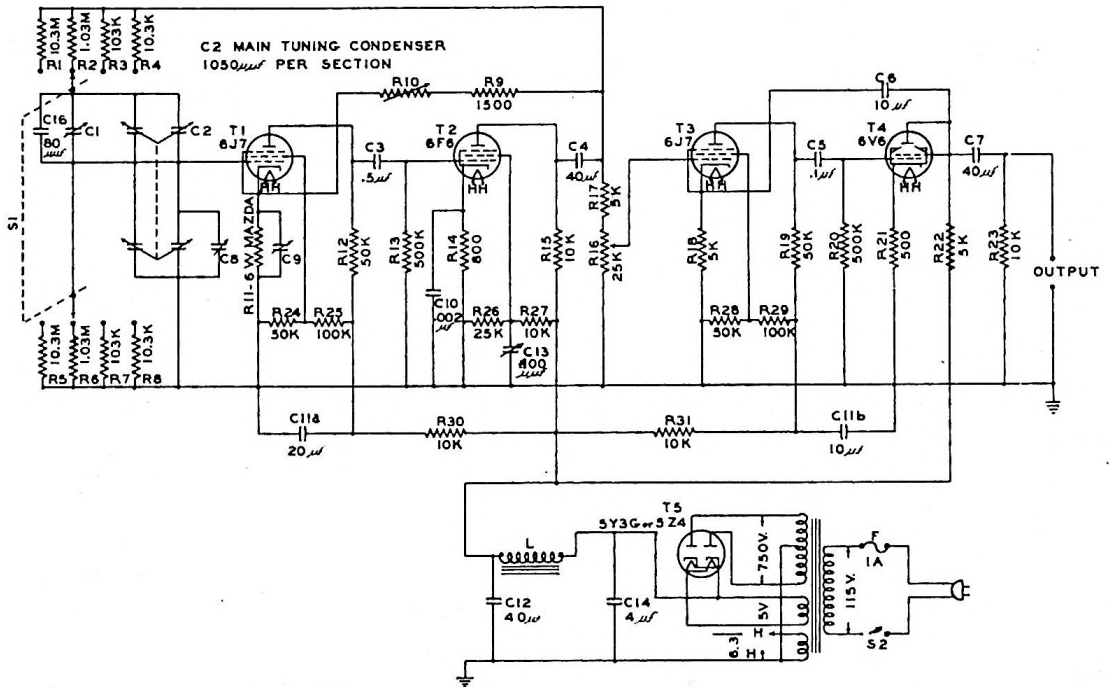
WIRING DIAGRAM MODEL 200-C



CIRCUIT CONSTANTS Model 200-C

R1, R2, R3, R4	Frequency determining resistors	R31	10,000 ohms
R5, R6, R7, R8	Frequency determining resistors	C1	100 ufd. adjusted at factory
R9	3000 ohms	C2	Main tuning condenser
R10	0-800 ohms	C3	0.5 ufd.
R11	Amplitude control resistor	C4	8 ufd.
R12	50,000 ohms	C5	0.1 ufd.
R13	500,000 ohms	C6	10 ufd.
R14	800 ohms	C7	20 ufd.
R15	10,000 ohms	C8	25 ufd. adjusted at factory
R16	25,000 ohms potentiometer	C9	100 ufd. adjusted at factory
R17	10,000 ohms	C10	.002 ufd.
R18	5000 ohms	C11a	20 ufd.
R19	50,000 ohms	C11b	10 ufd.
R20	500,000 ohms	C12	4 ufd.
R21	500 ohms	C13	40 ufd.
R22	5000 ohms	C14	400 ufd.
R23	10,000 ohms	T1	6J7 metal
R24	50,000 ohms	T2	6F6 metal
R25	100,000 ohms	T3	6J7 metal or glass
R26	25,000 ohms	T4	6V6 metal or glass
R27	10,000 ohms	T5	5Z4 metal or 5Y3G
R28	50,000 ohms	Tr1	Power transformer
R29	100,000 ohms	L1	Filter choke
R30	10,000 ohms		

WIRING DIAGRAM MODEL 200-D

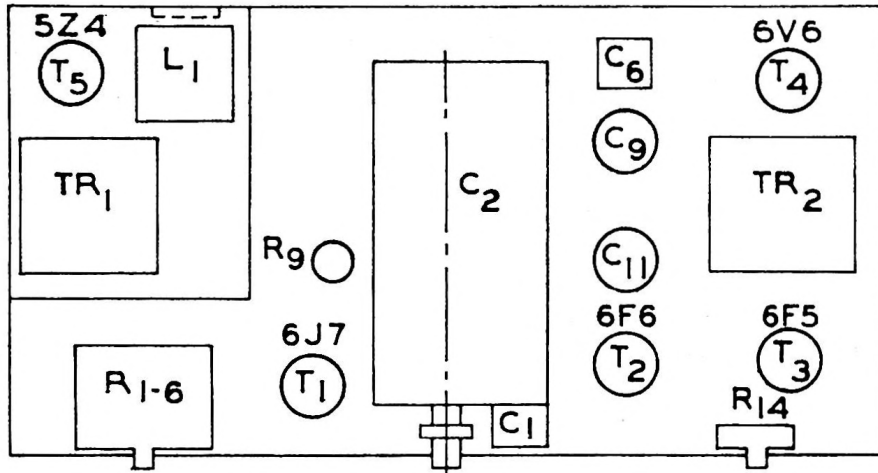


CIRCUIT CONSTANTS Model 200-D

R1, R2, R3, R4	Frequency determining resistors	R31	10,000 ohms
R5, R6, R7, R8	Frequency determining resistors	C1	100 ufd. adjusted at factory
R9	1500 ohms	C2	Main tuning condenser
R10	0-400 ohms	C3	0.5 ufd.
R11	Amplitude control resistor	C4	40 ufd.
R12	50,000 ohms	C5	0.1 ufd.
R13	500,000 ohms	C6	10 ufd.
R14	800 ohms	C7	40 ufd.
R15	10,000 ohms	C8	100 ufd. adjusted at factory
R16	25,000 ohms potentiometer	C9	100 ufd. adjusted at factory
R17	5000 ohms	C10	.002 ufd.
R18	5000 ohms	C11a	20 ufd.
R19	50,000 ohms	C11b	10 ufd.
R20	500,000 ohms	C12	40 ufd.
R21	500 ohms	C13	400 ufd. adjusted at factory
R22	5000 ohms	C14	4 ufd.
R23	10,000 ohms	C16	80 ufd.
R24	50,000 ohms	T1	6J7 metal
R25	100,000 ohms	T2	6F6 metal
R26	25,000 ohms	T3	6J7 metal or glass
R27	10,000 ohms	T4	6V6 metal or glass
R28	50,000 ohms	T5	5Z4 metal or 5Y3G
R29	100,000 ohms	Tr1	Power transformer
R30	10,000 ohms	L1	Filter choke

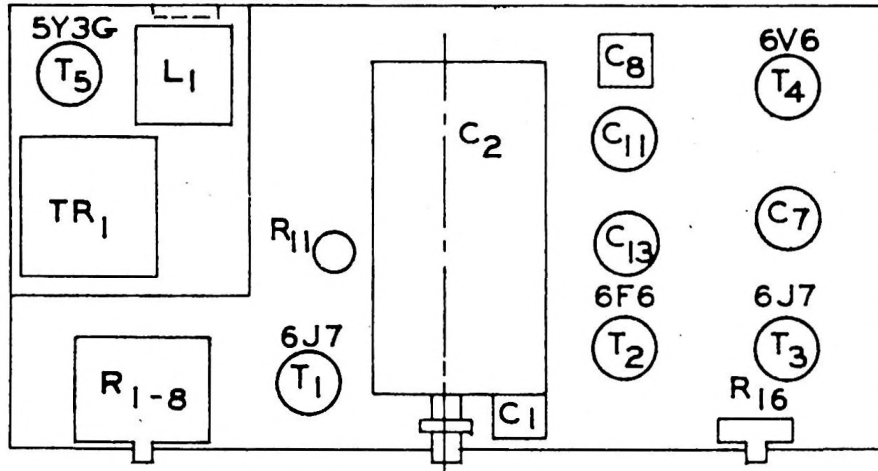
TOP OF CHASSIS ARRANGEMENT

Note: Fuse mounted beneath chassis



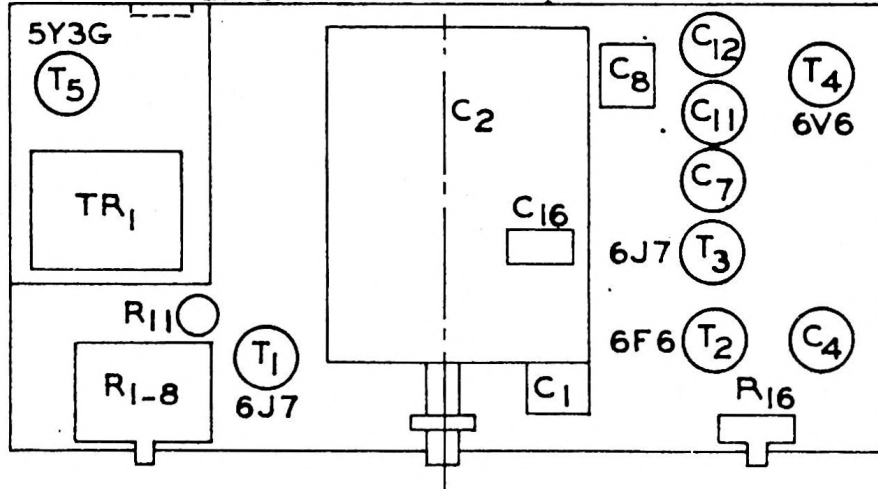
Models 200-A, 200-B

Note: Fuse mounted beneath chassis



Model 200C

Note: Fuse mounted beneath chassis



Model 200-D

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

Our instruments are guaranteed to be free from defects in material and workmanship for one year from date of purchase. Our liability under this warranty is limited to repairs and adjustment or replacement of defective parts (except tube, fuses and batteries) or instruments when the fault is a direct result of defective materials or workmanship in the manufacture of the apparatus. This warranty covers service for the first year without charge except for transportation to the factory.

If, during subsequent service, any fault develops in the equipment, the following steps should be taken:

1. Notify us, giving full particulars of the difficulty, and include the serial number of the instrument in question. On receipt of this information, we will give you service information or shipping instructions.

2. On receipt of shipping instructions, forward the apparatus to us prepaid, and we will make repairs and adjustments immediately at the factory.

If the fault has been caused by misuse or abnormal conditions of operation as disclosed by our examination, repairs will be billed at cost. In this case, an estimate of the cost will be submitted before the work is started.

DO NOT HESITATE TO CALL ON US


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