PRELIMINARY OPERATING INSTRUCTIONS FOR TYPE 608-A OSCILLATOR

Form 520-A

GENERAL RADIO COMPANY
CAMBRIDGE A, MASSACHUSETTS

PRELIMINARY
OPERATING INSTRUCTIONS
FOR
TYPE 608-A OSCILLATOR

PART I
DESCRIPTION

The Type 608-A Oscillator operates on the inverse feedback principle which permits a relatively high power output to be obtained with unusually low harmonic distortion. An output with a total harmonic content of less than 0.1% is available from this oscillator at 27 different audio frequencies, ranging from 20 cycles per second to 15 kilocycles.

Other frequencies within this range or slightly outside of this range may be obtained from the oscillator by merely connecting three external resistances of the proper values.

The instrument is entirely a-c operated and is arranged for either relay-rack or table mounting. Push-button switches provide a novel and convenient means of adjusting the frequency and output impedance. Figure 1 is a schematic block diagram.

PART II
INSTALLATION

Mounting

The oscillator is supplied with walnut ends mounted on the metal cabinet, thus making the instrument suitable for use on a table or bench. If it is desired to mount the oscillator on a relay rack, these ends should be removed.

If the instrument is not mounted on a grounded relay rack, the oscillator itself should be grounded. A terminal (G) is provided for this purpose on the panel.

Power Supply

The instrument is adjusted in the laboratory for operation on a 115-volt, 60-cycle line, but it may be used satisfactorily on any line voltage between 110 and 120 volts and any line frequency between 25 and 60 cycles.

The oscillator can also be arranged to operate on a line having a voltage between 220 and 240 volts, by making a change in the connections to the power transformer. As supplied for 110- to 120-volt operation, terminals 1 and 3 are strapped together and connected to one side of the line, and terminals 2 and 4 are strapped together and connected to the other side of the line. To modify the instrument for 220- to 240-volt operation, remove the straps between terminals 1 and 3 and between terminals 2 and 4, connect the line to terminals 1 and 4, and strap terminals 2 and 3 together. These connections are shown in Figure 2. The total power consumption is approximately 60 watts.

Tubes

CAUTION: Do not turn on the instrument unless all tubes are in the sockets. Damage to the instrument may result if this precaution is not observed.

The tubes required are one 6F5G, one 6Y6G, one 6X5G, and one 6E5. The instrument is shipped with the 6E5 in place. The other tubes should be inserted in the sockets in accordance with the markings thereon.

PART III
OPERATION

The instrument can be turned on by pressing any one of the frequency buttons at the top of the panel. The harmonic control should be turned fully on. One of the frequency multiplier buttons and one of the output impedance buttons should also be depressed for correct operation.

CAUTION: Do not turn on the instrument unless all tubes are in their sockets.

When the circuit starts to oscillate, this is evidenced by a closing of the beam in the electron-ray tube.

Adjustment for Minimum Harmonics

Under ordinary conditions of operation, the harmonic content will probably be satisfactory with the harmonic control turned fully on. For such applications as distortion measurements and some bridge measurements, where minimum harmonic content is desirable, the distortion can be lowered by reducing the setting of the harmonic control. Turning this control back so that output voltage is reduced by approximately 10 percent provides a waveform sufficiently pure for most distortion measurements. A further reduction in the setting of the harmonic control until the instrument just oscillates reduces the harmonic content to less than 0.1% for most conditions of operation.

Because a transformer is used in the 500-ohm output circuit, the harmonics at frequencies below 50 cycles will be somewhat greater for any given setting of the harmonic control when using the 500-ohm output circuit. A further reduction in the harmonic control or, if this stops the oscillation, a reduction in the setting of the output control, to reduce the voltage applied to the output transformer at these low frequencies will result in an output practically as pure as at higher frequencies.

Frequency Characteristics

When measuring the frequency characteristics of audio-frequency apparatus, extremely low harmonic content is seldom necessary in the oscillator. Under these conditions it is

generally desirable to operate the Type 608-A Oscillator with a slightly higher setting of the harmonic control than would be used when measuring harmonic distortion. The slightly increased regeneration caused by the higher setting of the harmonic control will provide practically constant output voltage, regardless of frequency, so that the output control need not be adjusted when the oscillator is shifted from one frequency to the next.

Line Voltage

The instrument is adjusted in the laboratory for operation on a 115-volt line and will provide satisfactory operation without excessive harmonic content on such a line when the harmonic control is turned fully on. If, however, the line voltage is higher or lower than 115 volts, the harmonic content may increase to an undesirable value or, at the other extreme, the oscillator may stop working. Either of these conditions may be corrected by means of the three trimmer resistors mounted in back of the harmonic control.

The three trimmer adjustments correspond to the three buttons on the frequency multiplier switch. The correct adjustment for each trimmer is that value at which the circuit oscillates satisfactorily with no load when any one of the frequency buttons is depressed. Failure to oscillate on any one of the buttons indicates insufficient regeneration. Oscillation so hard as to produce bad waveform indicates excessive regeneration. Adjustment of the trimmers should always be made with the harmonic control turned to a maximum.

In cases where the line voltage fluctuates frequently, the trimmers should be adjusted for satisfactory operation at the lowest line voltage which will be encountered. When the voltage is higher, satisfactory purity of waveform can always be obtained by reducing the setting of the harmonic control.

If the line voltage is continuously too high or too low, these resistors should be readjusted slightly so that satisfactory oscillation is obtained over the entire range of frequencies when the harmonic control is turned fully on. When the harmonic control is adjusted for minimum harmonic content, this adjustment must be changed each time the frequency or load impedance is changed, if best results are to be obtained.

Output Impedance

Maximum output is obtained on the 5000-ohm output circuit, but because of the volume control the impedance of this circuit will vary between approximately 2000 and 8500 ohms, depending upon the setting of the control. Also, a change in load impedance will affect the operating characteristics of the oscillator slightly, so that for minimum harmonic content the harmonic control should be readjusted each time the load impedance is changed.

The 500- to 600-ohm output circuits, however are provide with a resistance pad which, although it lowers the output power, does decrease the mutual effect of the oscillator and load circuit On the 500- to 600-ohm output circuit the output impedance of the oscillator is between 450 and 650 ohms, regardless of the setting of the output control, and a change in load resistance has only a minor, and in most cases negligible, effect upon the performance of the oscillator.

PART IV
OPERATION AT OTHER FREQUENCIES

For operation at other frequencies, three resistances will be required. Wire-wound or metallized types, or decade boxes can be used. It is desirable, however, that for best results resistances match correctly within a fraction of a percent and that the distributed capacitances across them be kept as low as possible. In cases where the resistors have a higher capacitance to ground from one terminal, then the other, the high-capacitance-to-ground terminal should be connected to the lower jack.

The correct values for the resistors are shown in the chart in Figure 3. The values shown are for resistors "A" and "B". Resistance "C" should equal one-half of resistance "A". If the resistors all vary from the theoretical value by the same percentage in the same direction, the only effect will be to shift the frequency slightly, but, if they vary in different directions, it may be difficult to obtain satisfactory oscillation or low harmonic content.

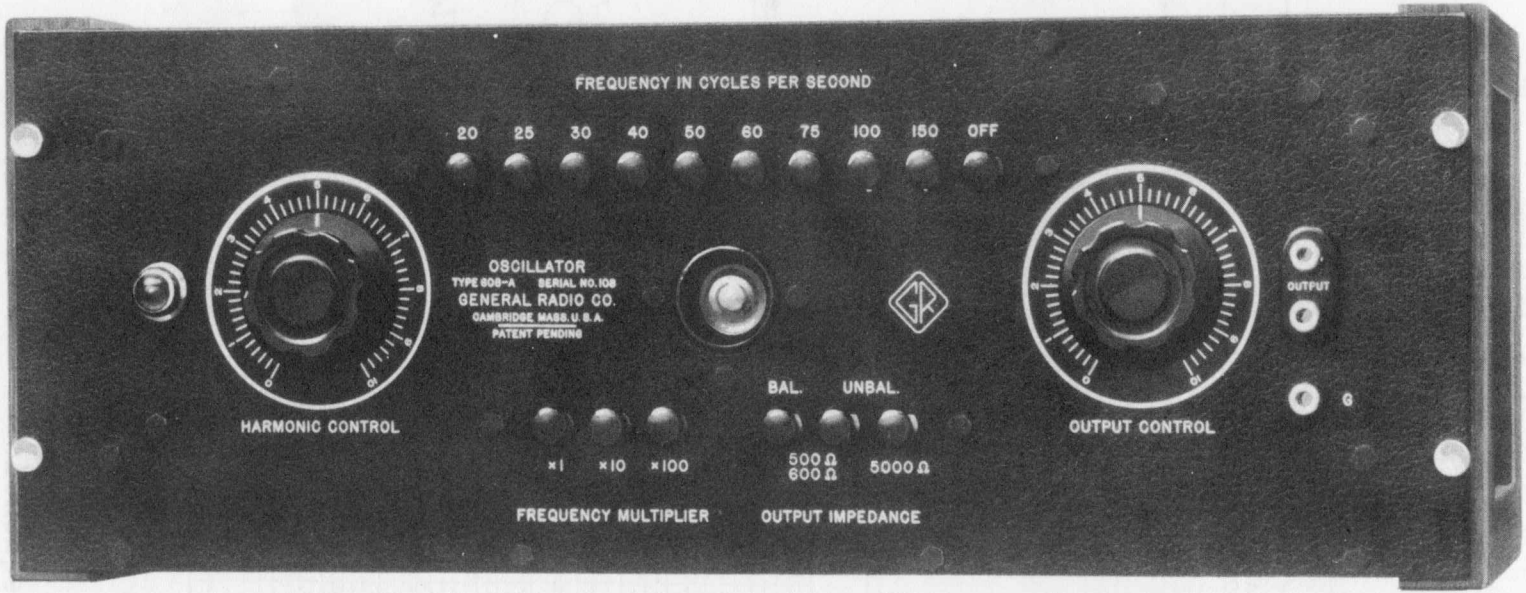

FIGURE 1. Panel view of Type 608-A Oscillator

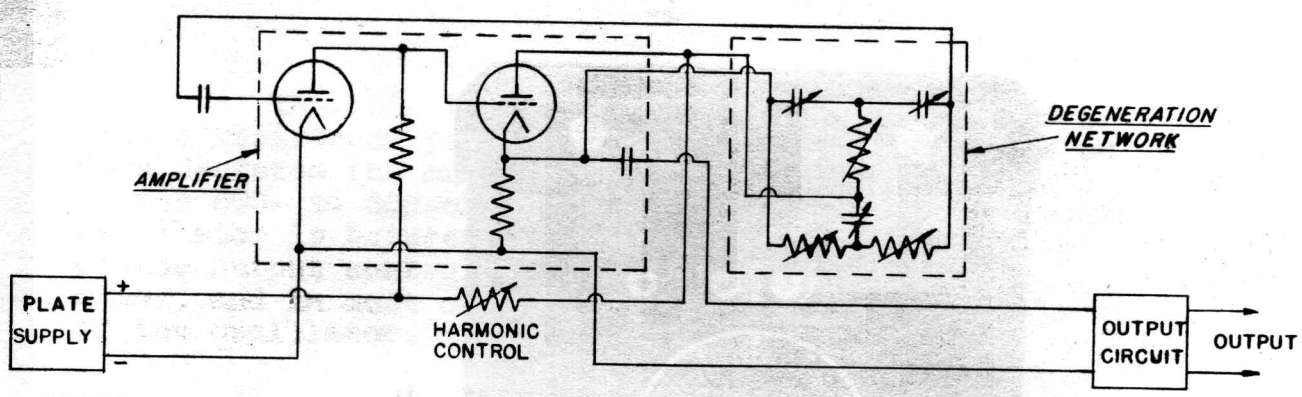

FIGURE 2. Functional schematic diagram of Type 608-A Oscillator

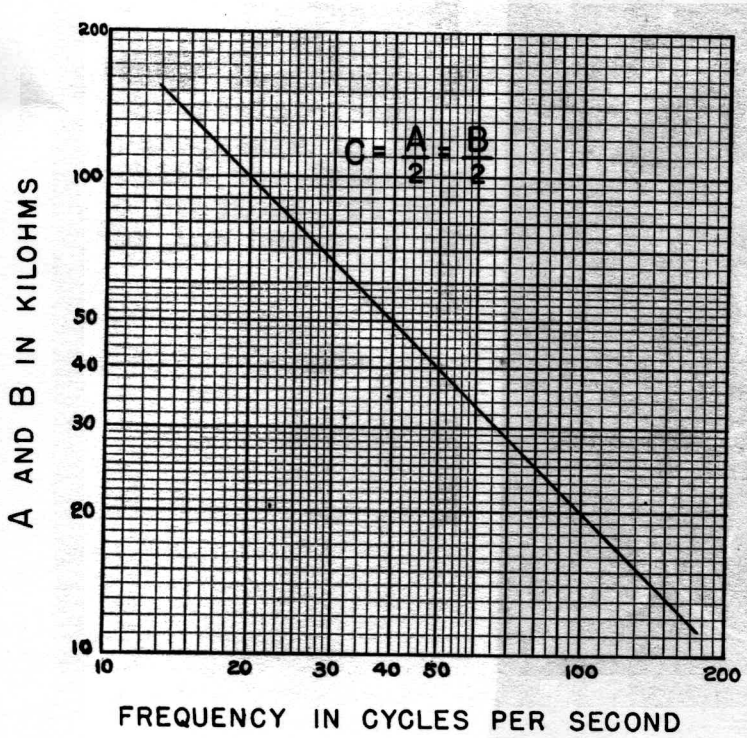

FIGURE 3. Resistor values for obtaining other frequencies

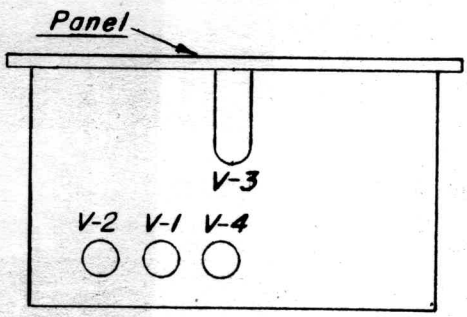

FIGURE 4. Location of tubes

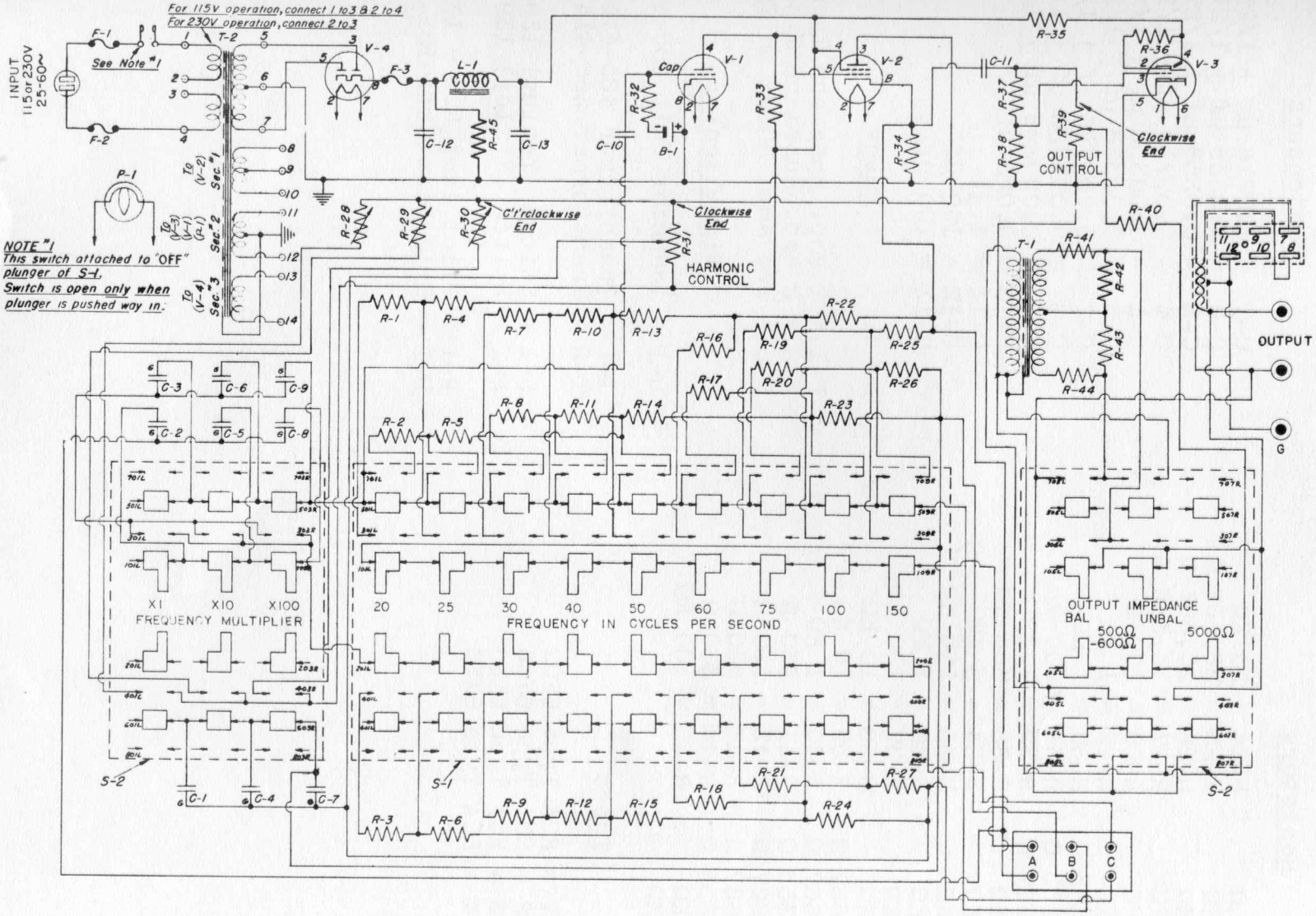

FIGURE 5. Complete wiring diagram of Type 608-A Oscillator

PARTS LIST

Resistors

R-1 = 40 KΩ
R-2 = 40 KΩ
R-3 = 20 KΩ
R-4 = 80 KΩ
R-5 = 80 KΩ
R-6 = 40 KΩ
R-7 = 33,333 Ω
R-8 = 33,333 Ω
R-9 = 16,667 Ω
R-10 = 20 KΩ
R-11 = 20 KΩ
R-12 = 10 KΩ
R-13 = 40 KΩ
R-14 = 40 KΩ
R-15 = 20 KΩ
R-16 = 26,667 Ω
R-17 = 26,667 Ω
R-18 = 13,333 Ω
R-19 = 26,667 Ω
R-20 = 26,667 Ω
R-21 = 13,333 Ω
R-22 = 40 KΩ
R-23 = 40 KΩ
R-24 = 20 KΩ
R-25 = 26,667 Ω
R-26 = 26,667 Ω
R-27 = 13,333 Ω
R-28 = 200 Ω
R-29 = 1 KΩ
R-30 = 1 KΩ
R-31 = 200 Ω
R-32 = 1 MΩ
R-33 = 350 KΩ
R-34 = 6 KΩ
R-35 = 150 KΩ
R-36 = 1 MΩ
R-37 = 100 KΩ
R-38 = 10 KΩ
R-39 = 10 KΩ
R-40 = 1 KΩ
R-41 = 330 Ω
R-42 = 550 Ω
R-43 = 550 Ω
R-44 = 330 Ω
R-45 = 100 KΩ

Tubes

V-1 = RCA Type 6F5G
V-2 = RCA Type 6Y6G
V-3 = RCA Type 6E5
V-4 = RCA Type 6X5G

Condensers

C-1 = 0.0716 μf ± 1/2%
C-2 = 0.0358 μf ± 1/2%
C-3 = 0.0358 μf ± 1/2%
C-4 = 0.00716 μf ± 1/2%
C-5 = 0.00358 μf ± 1/2%
C-6 = 0.00358 μf ± 1/2%
C-7 = 0.000796 μf ± 1/2%
C-8 = 0.000398 μf ± 1/2%
C-9 = 0.000398 μf ± 1/2%
C-10 = 0.025 μf
C-11 = 4 μf
C-12 = 100 μf
C-13 = 100 μf

Fuses

F-1 = 2 amp. Bussmann Type 7AG
F-2 = 2 amp. Bussmann Type 7AG
F-3 = 1/4 amp. Bussmann Type 7

Miscellaneous

L-1 = Inductor Unit 485-413

T-1 = Transformer 485-414
T-2 = Transformer 365-414

S-1 = Switch (Yaxley) 139-1256
S-2 = Switch (Yaxley) 139-1257

P-1 = Pilot lamp 6.3 v 139-939
B-1 = Grid Bias Cell 139-1304


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