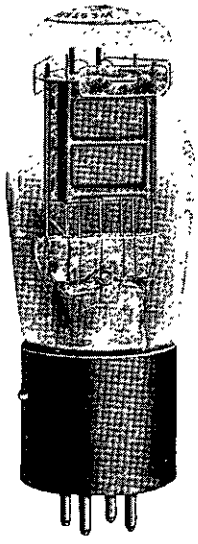
BELL SYSTEM PRACTICES
Transmission Engineering and Data
Vacuum Tube Data

SECTION AB46.052
Issue 2
A T & T Co Standard

Western Electric

102F Vacuum Tube
(Dome)



Classifications—Filamentary, voltage amplifier triode

This tube is a redesign of the 102F tube. It includes an improved filament, a new mechanical design using transverse mica supports and is mounted in a dome type bulb. The electrical characteristics are practically identical with the previous 102F tube which it supersedes.

Applications—Voltage amplifier for voice-frequency telephone repeaters and carrier-frequency telegraph equipment.

Detector or modulator.

Dimensions and Connections—The outline diagrams of the tube and base, giving the dimensions and the arrangement of the electrode connections to the base terminals are shown in Figures 1 and 2.

Base and Mounting—This vacuum tube employs a medium, four-pin bayonet type base having special contact metal at the ends of the pins. It is suitable for use in a Western Electric 100L, 100R, or similar type socket, preferably provided with contact-metal contacts.

The tube may be mounted in either a vertical or horizontal position. If mounted in a horizontal position the plane of the filament, which is indicated in Figure 2, should be vertical. To assure adequate ventilation the tubes should be mounted with not less than 2⅝ inches between centers when two or more tubes are used.

Average Direct Interelectrode Capacitances

Grid to plate	5.1 $\mu\mu f$
Grid to filament	4.0 $\mu\mu f$
Plate to filament	2.3 $\mu\mu f$

These values are for a based tube without socket.

Filament Rating

Filament current	0.50 ampere, d.c.
Nominal filament voltage	2.1 volts

The filament of this tube is designed to operate on a current basis and should be operated at as near the rated current as practicable.

The filament resistance of this tube increases slightly during the first 2000 hours of operation. The voltage given above is the nominal value after the resistance has stabilized.

Characteristics—Typical curves showing plate current as a function of grid voltage for several values of plate voltage are shown in Figure 3. The grid and plate voltages are measured from the negative end of the filament. Corresponding amplification factor, plate resistance and transconductance characteristics are given in Figures 4, 5 and 6 respectively. Plate current as a function of plate voltage for several values of grid voltage is shown in Figure 7.

Operating Conditions and Output—Permissible operating plate and grid voltages are included within the area, ABCD in Figure 3. A number of recommended and maximum operating conditions and the corresponding values of amplification factor, plate resistance, transconductance and performance data are given in the table below. Recommended conditions or others of no greater severity should be selected in preference to maximum conditions wherever possible. The life of the tube at maximum operating conditions may be shorter than at less severe conditions.

The performance data shown include the fundamental output voltage in peak volts and the second and third harmonic levels in db below the fundamental for values of load resistance equal to the plate resistance and for load resistances of 100,000 and 300,000 ohms. The peak value of the sinusoidal input voltage E_{gm}, which gives the indicated output E_{pm}, and harmonic levels F_{2m} and F_{3m}, in each case is numerically equal to the grid bias. For a smaller input voltage E_g, the approximate levels may be computed from the following relations:

$$E_p = E_{pm} \frac{E_g}{E_{gm}}$$

$$F_2 = F_{2m} + 20 \log_{10} \frac{E_{gm}}{E_g}$$

$$F_3 = F_{3m} + 40 \log_{10} \frac{E_{gm}}{E_g}$$

Microphonic Noise

For a plate voltage of 130 volts, a grid bias of −1.5 volts and a load resistance of 100,000 ohms, the mean microphonic output level of this tube, measured in a laboratory reference test set is 33 db below 1 volt. The range of levels of individual tubes extends from 25 to 41 db below 1 volt. Since microphonic noise output depends on the type and intensity of the mechanical disturbance which produces it, the values given here are useful chiefly for comparison with the levels of other types of tubes which have been tested in the same way.

TABLE

Plate Voltage Volts	Grid Bias Volts	Plate Current Milliamperes	Amplification Factor	Plate Resistance Ohms	Transconductance Micromhos	Load Resistance Ohms	Output Voltage Peak Volts	Second Harmonic db	Third Harmonic db
130	−2.0	0.60	30.9	58,000	530	58,000	28	23	39
						100,000	37	28	45
						300,000	49	39	55
130	−1.5	0.85	31.0	50,000	620	50,000	22	30	48
						100,000	30	37	55
						300,000	38	49	65
130	−1.0	1.15	31.0	44,000	700	44,000	14	36	55
						100,000	20	44	60
						300,000	25	56	65
160	−3.0	0.55	30.9	60,000	520	60,000	42	19	33
						100,000	53	23	38
						300,000	71	35	50
160	−2.0	1.15	31.0	45,000	690	45,000	29	30	48
						100,000	39	37	55
						300,000	49	50	65
*160	−1.0	1.85	31.0	39,000	800	39,000	15	41	60
						100,000	21	51	65
						300,000	25	60	65
*190	−3.0	1.15	30.9	45,000	690	45,000	45	26	40
						100,000	62	35	50
						300,000	75	46	60
*190	−2.0	1.85	31.0	39,000	800	39,000	30	35	55
						100,000	41	44	60
						300,000	50	55	65

*Maximum operating conditions.

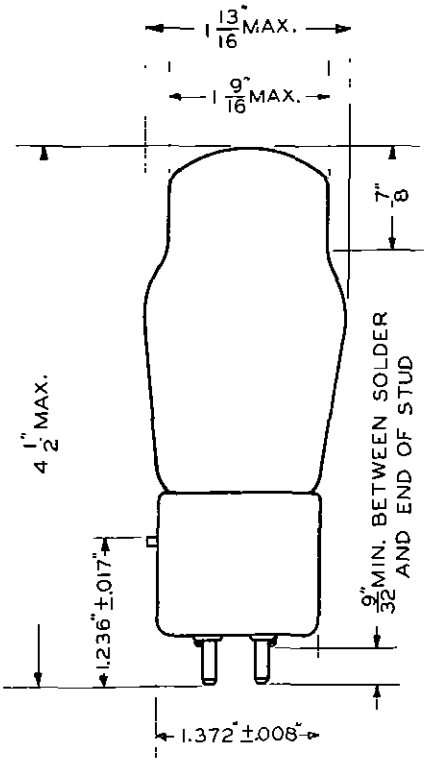


FIG 1

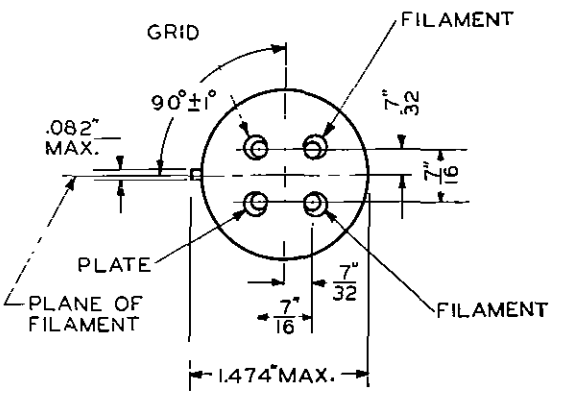


FIG. 2

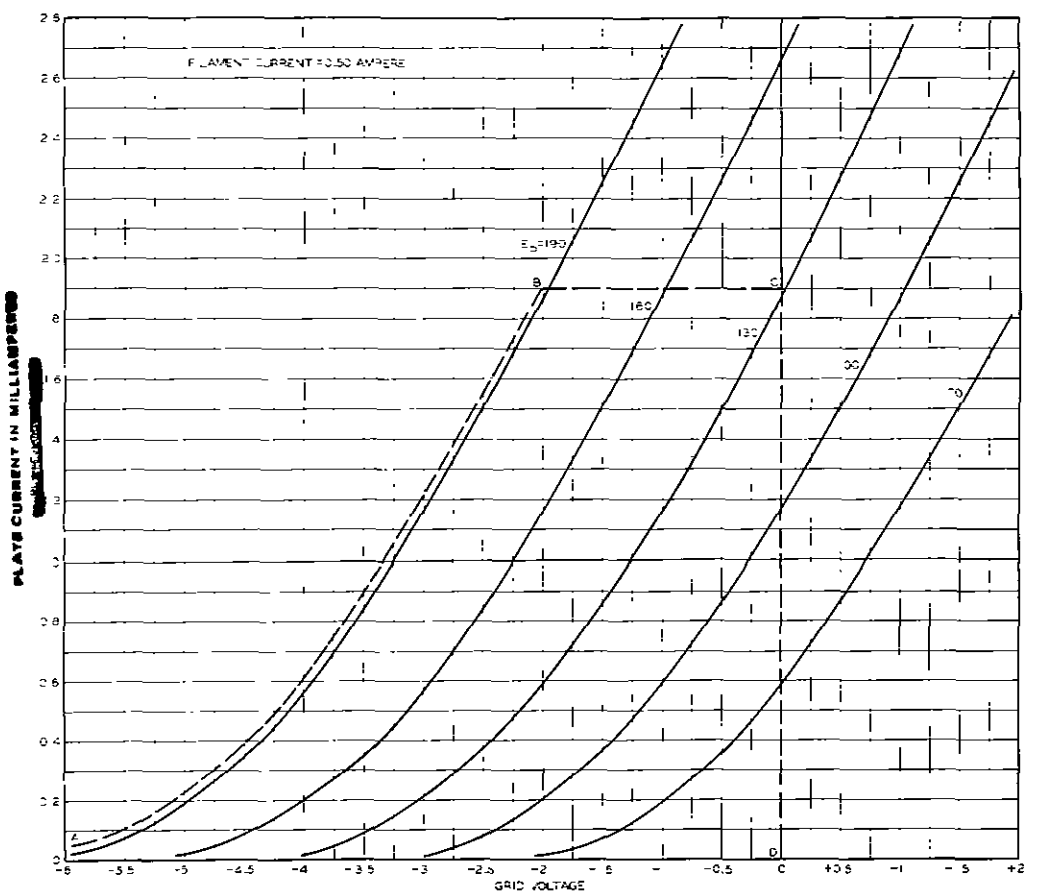


FIG. 3

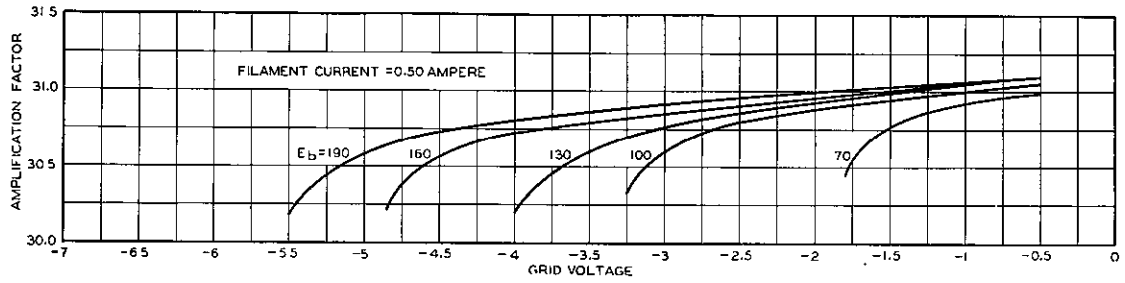


FIG. 4

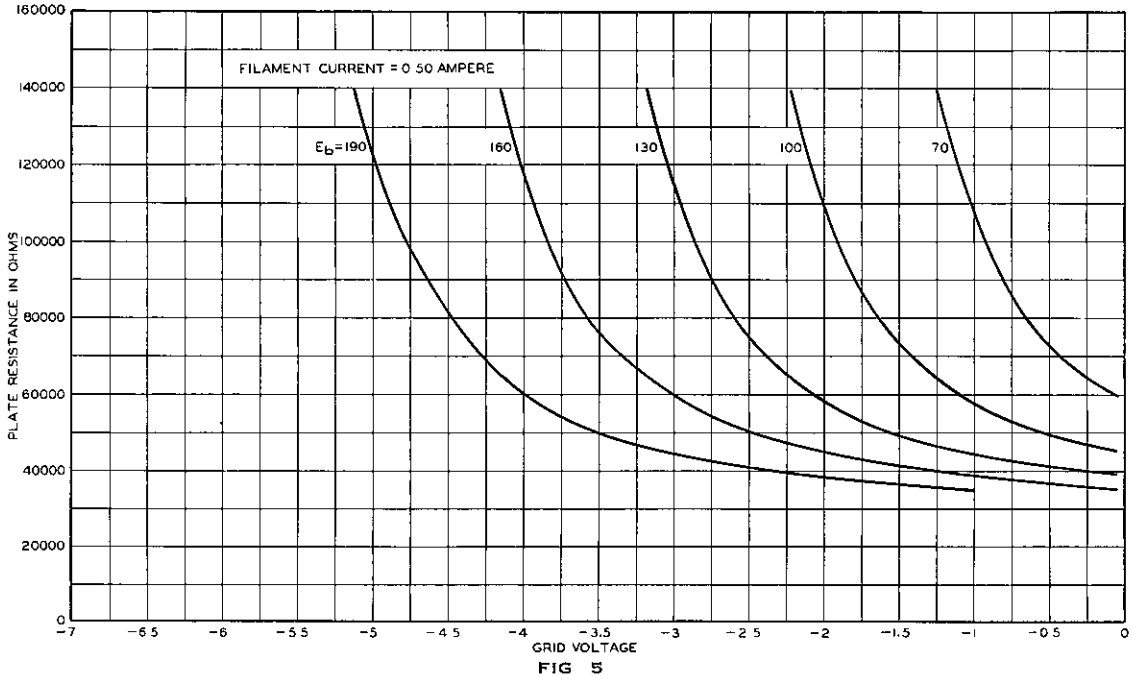


FIG 5

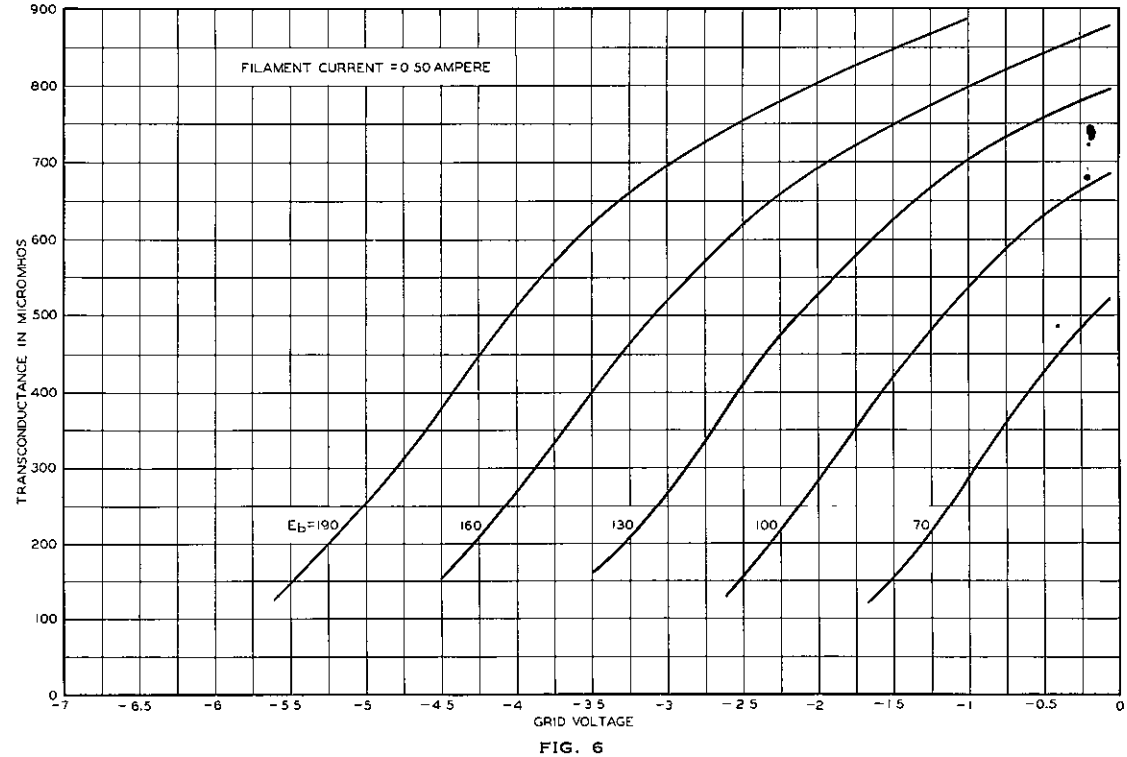


FIG. 6

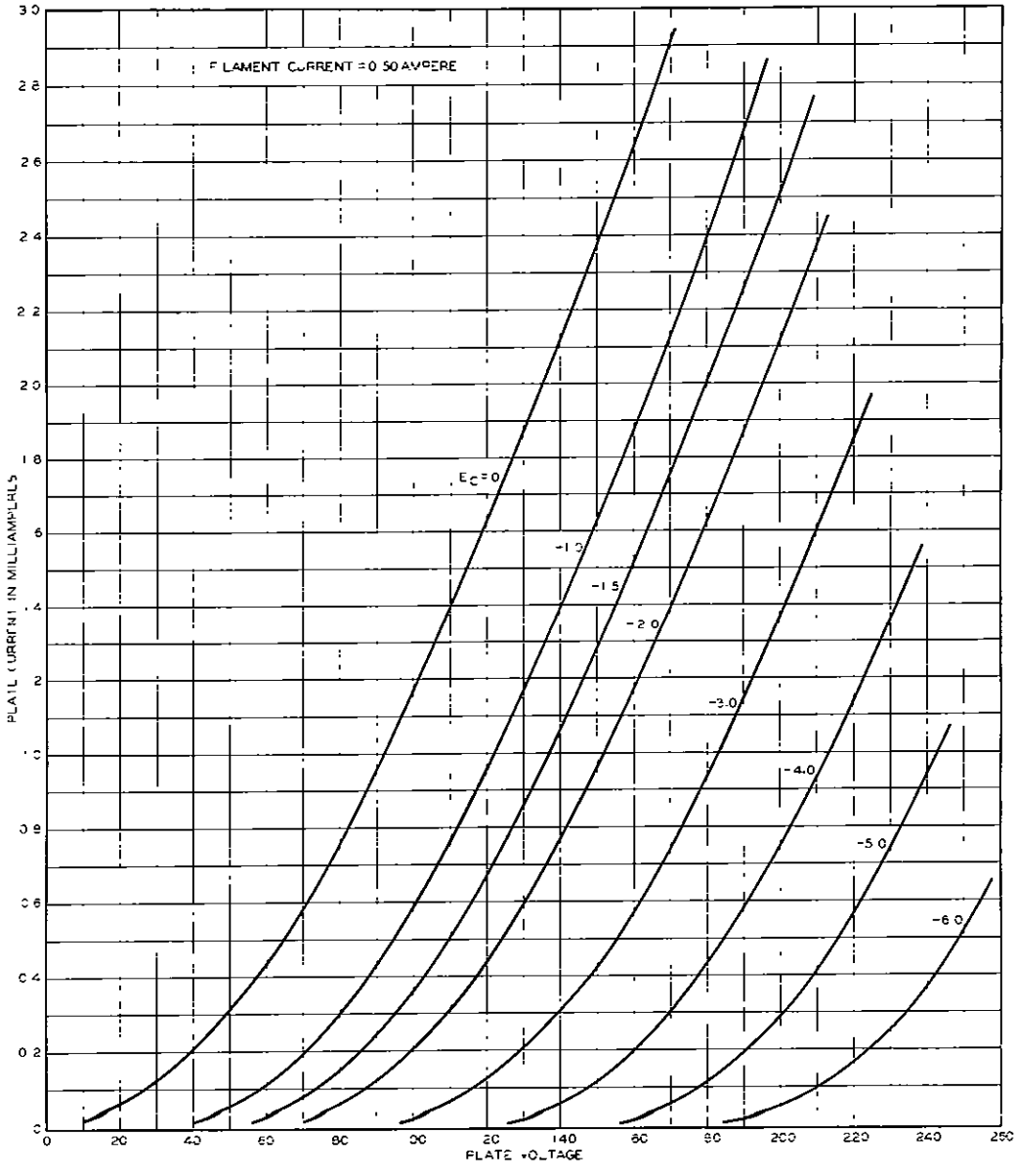


FIG. 7

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