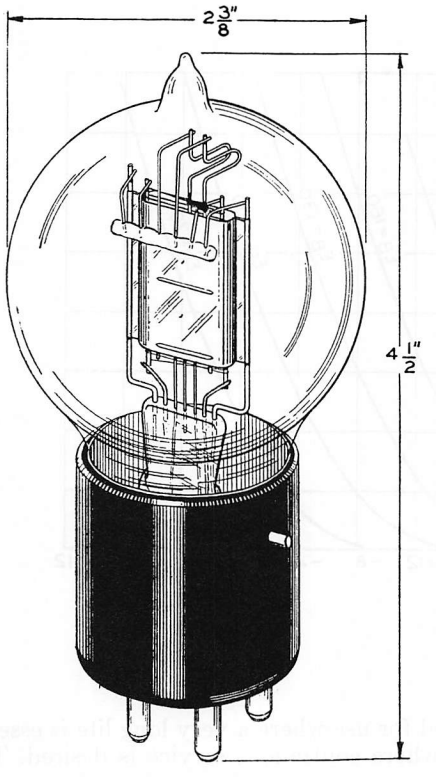
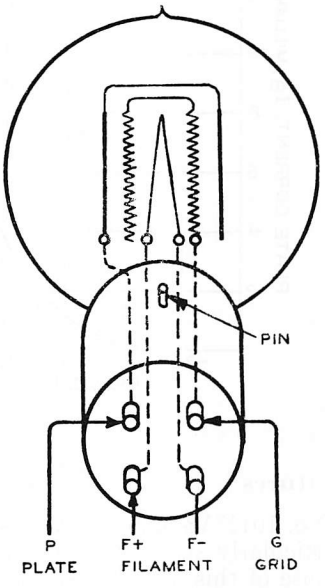
101F Vacuum Tube





Classification

The No. 101F Vacuum Tube is a three-element filamentary type tube for use where small amounts of output power are required.

Base and Socket

The No. 101F Vacuum Tube employs a four-prong bayonet pin type base suitable for use in a Western Electric No. 100L (front panel mounting), No. 100R (rear panel mounting), or similar type socket.

Rating and Characteristic Data

Filament Current				.50 Ampere
Filament Voltage				4.1 Volts
Plate Voltage	130	130	160	190 Max.
Grid Voltage	—8	—8	—12	—16
Average Plate Current—Milliamperes	6.0	6.0	6.7	7.5
Average Amplification Factor	6.5	6.5	6.5	6.5
Average Plate Resistance—Ohms	5900	5900	5600	5400
*Average Power Output—Milliwatts	60	55	135	240
Second Harmonic—% of Fundamental	5	2	3	4
Third Harmonic—% of Fundamental	0.5	0.2	0.3	0.5
Load Resistance—Ohms	5900	11800	11200	10800

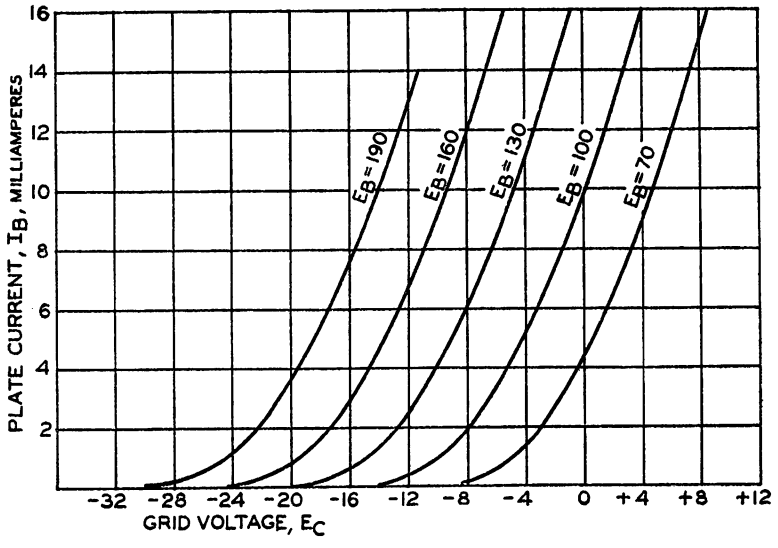
*Input in peak values is equal to grid voltage.

Approximate Direct Interelectrode Capacities (measured without socket)

Plate to Grid	5.9 MMF
Plate to Filament	3.7 MMF
Grid to Filament	5.2 MMF

Average Static Characteristics

The accompanying curves give the average static characteristics of the No. 101F Vacuum Tube.



General Features

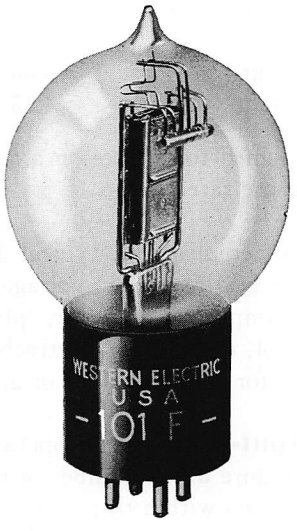
The No. 101F Vacuum Tube was designed for use where a very long life is essential. This makes it particularly suitable for applications where continuous service is desired. The microphonic response of this tube is low.

The electrical characteristics are such that moderate power outputs are obtainable with small plate currents and with plate voltage under 200 volts.

The characteristics are similar to those of the No. 101D, however, the No. 101F operates at a filament current of 0.5 instead of 1.0 ampere.

Western Electric

101F Vacuum Tube



Classification—Low-power, filamentary triode

Applications

Voice-frequency and carrier-frequency amplifier for telephone repeater equipment and other applications where small power outputs are required.

Modulator and demodulator in carrier systems.

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

Base—Four-pin, bayonet type, having special contact metal at the ends of the contact pins.

Socket—Four-contact, bayonet-slot type, preferably provided with contact-metal contacts, such as the Western Electric 100L for front of panel mounting or 100R for rear of panel mounting.

Mounting Positions—Either vertical or horizontal. If mounted in a horizontal position, the plane of the filament, which is indicated in Figure 2, should be vertical.

Average Direct Interelectrode Capacitances

	A	B	C
Grid to plate, $\mu\mu f$	5.9	5.7	5.8
Grid to filament, $\mu\mu f$	5.2	5.6	6.1
Plate to filament, $\mu\mu f$	3.7	5.1	5.4

Column A—Based tube without socket.

Column B—Tube alone when measured in 100L socket mounted on a metal plate; socket and mounting plate connected to filament.

Column C—Tube alone when measured in 100R socket mounted in a metal plate; socket and mounting plate connected to filament.

Filament Rating

Filament current	0.50 ampere, d.c.
Nominal filament voltage	4.15 volts

The filament of this tube is designed to operate on a current basis and should be operated at a current not appreciably exceeding the rated value.

Characteristics—Grid-plate characteristics of a typical 101F tube are shown in Figure 3 for several values of plate voltage. The grid and plate voltages are measured from the negative end of the filament. Corresponding amplification-factor, plate-resistance, and transconductance characteristics are shown in Figures 4, 5 and 6, respectively, as functions of grid voltage. Plate characteristics are given in Figure 7 for several values of grid bias.

Operating Conditions and Output—Permissible operating grid and plate voltages are included within the area, ABCD, in Figure 3. A number of recommended and maximum operating conditions, represented by selected points within this area, and the corresponding values of amplification factor and plate resistance 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 the recommended conditions.

The fundamental power output in milliwatts and the second and third harmonic levels in db below the fundamental, corresponding to the recommended and maximum operating conditions, are given in the latter part of the table for values of load resistance, R, both equal to and double the value of the plate resistance, r_p. The peak value of the sinusoidal input voltage, E_{gm}, which gives the indicated power output, P_m, 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:

$$P = P_m \left(\frac{E_g}{E_{gm}}\right)^2$$

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

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

Microphonic Noise—For a plate voltage of 130 volts, a grid bias of −8 volts, and a load resistance of 100,000 ohms, the mean microphonic output level of the 101F tube, measured in a laboratory reference test set, is 19 db below 1 volt. The range of levels of individual tubes extends from 8 to 30 db below 1 volt. Since microphonic noise output depends on the type and intensity of the mechanical disturbances which produce 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	Grid Bias	Plate Current	Amplification Factor	Plate Resistance	Load Resistance	Power Output	2nd Harmonic	3rd Harmonic
	Volts	Volts	Milliamperes		Ohms r_p	R	Milliwatts	db	db
Recommended Operating Conditions	100	− 4	5.5	6.5	5800	$R = r_p$	16	32	55
						$R = 2r_p$	14	38	65
	130	−10	4.0	6.4	6900	$R = r_p$	80	22	36
						$R = 2r_p$	75	28	46
	130	− 8	6.0	6.5	5800	$R = r_p$	62	26	46
						$R = 2r_p$	55	33	55
	130	− 4	10.9	6.6	4600	$R = r_p$	20	37	60
						$R = 2r_p$	18	43	65
	160	−14	4.8	6.4	6500	$R = r_p$	170	20	32
						$R = 2r_p$	160	26	42
	160	−10	9.3	6.5	4900	$R = r_p$	120	28	47
						$R = 2r_p$	110	34	55
Maximum Operating Conditions	160	− 8	11.9	6.6	4400	$R = r_p$	85	32	55
						$R = 2r_p$	75	37	60
	190	−18	5.5	6.4	6300	$R = r_p$	275	17	29
						$R = 2r_p$	255	24	37
	190	−16	7.5	6.5	5400	$R = r_p$	270	22	35
						$R = 2r_p$	250	28	45
	190	−14	10.0	6.5	4800	$R = r_p$	250	25	43
						$R = 2r_p$	215	31	50

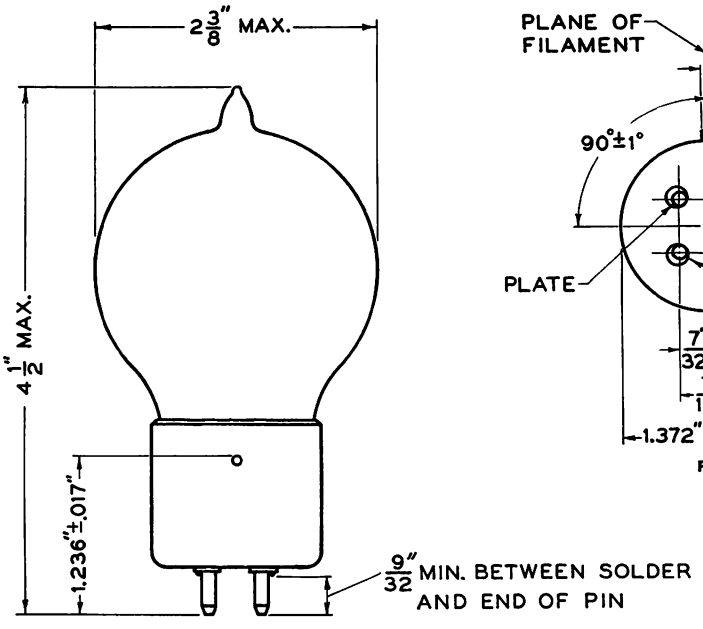


FIG. 1

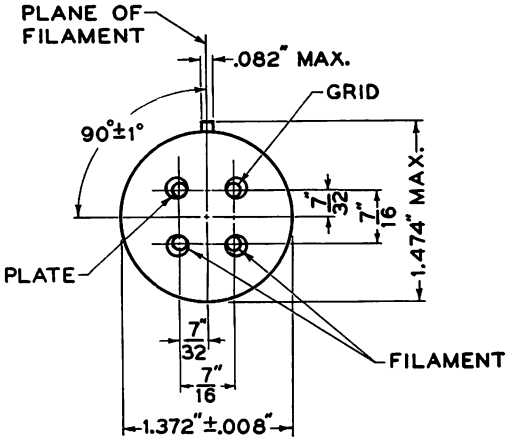


FIG. 2

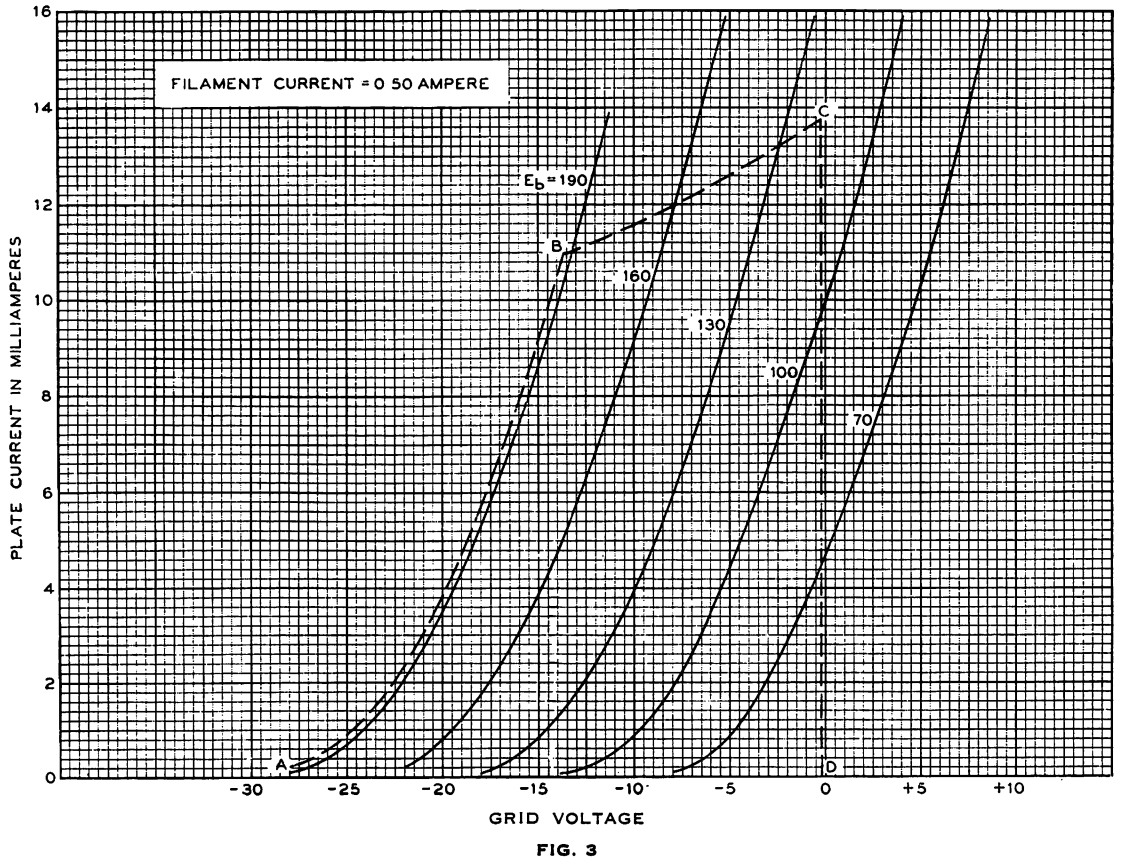


FIG. 3

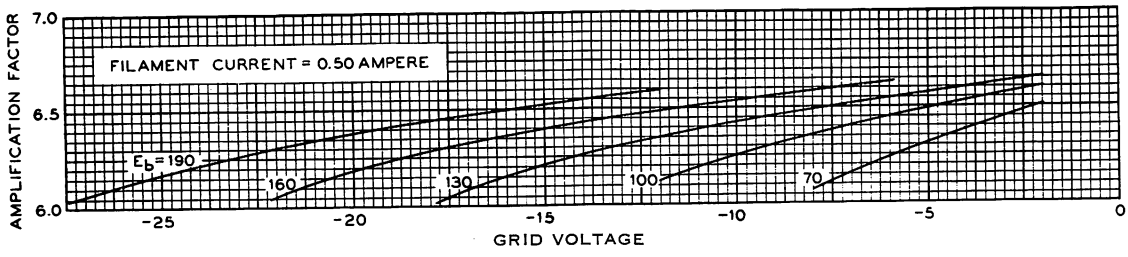


FIG. 4

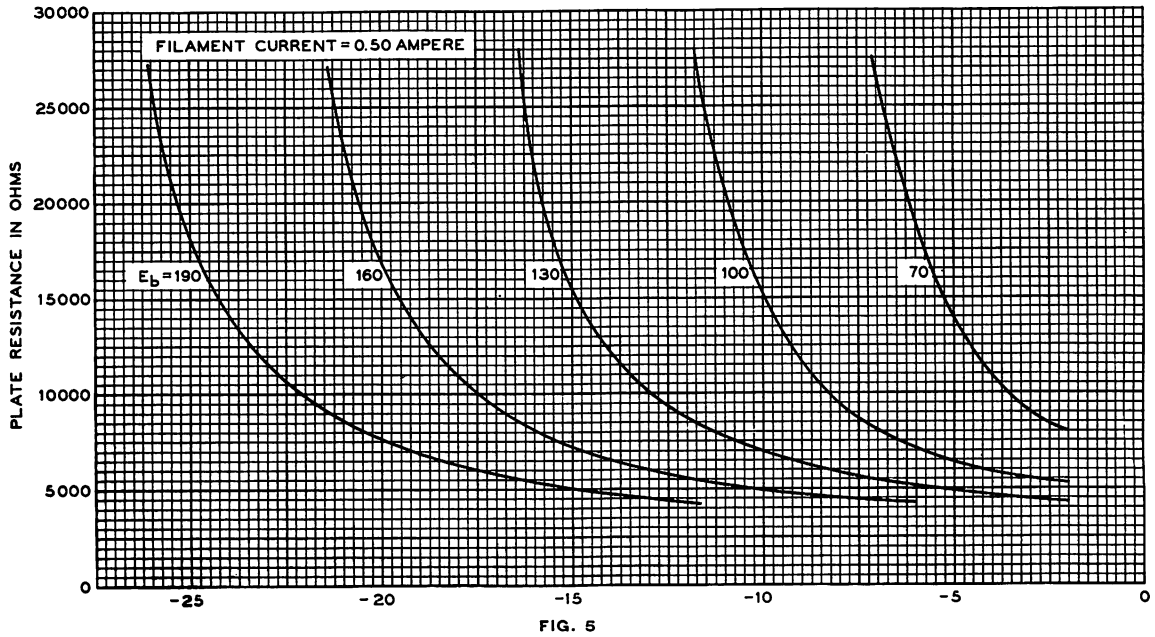


FIG. 5

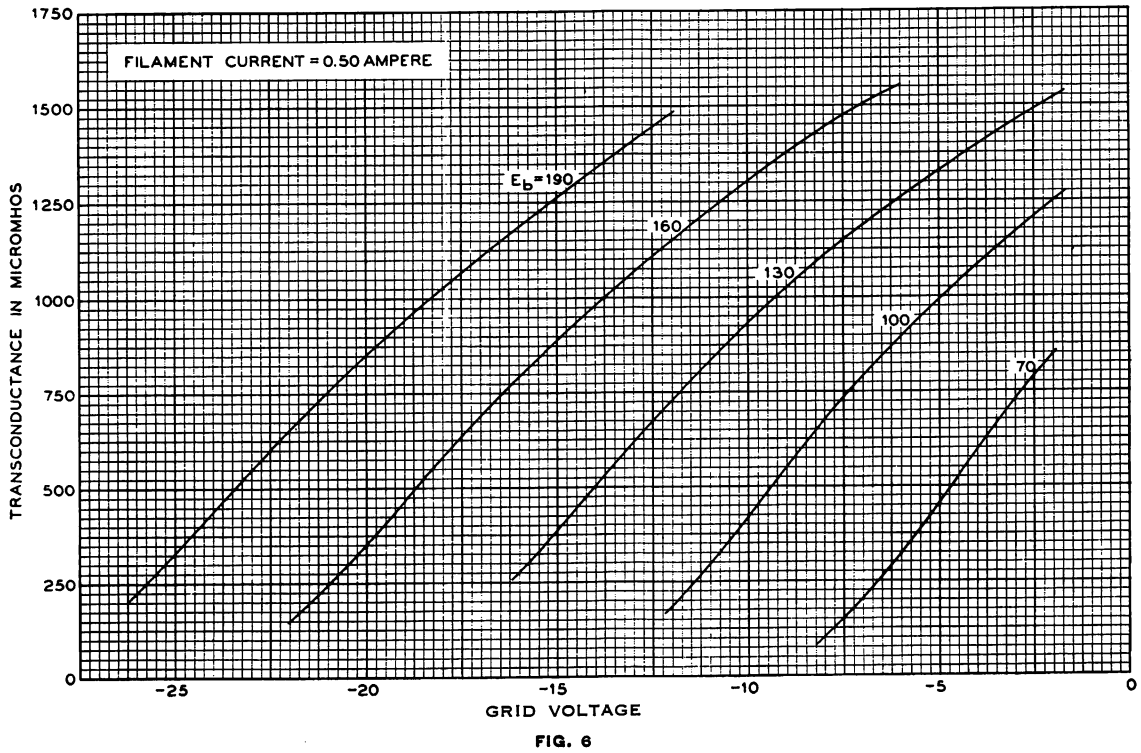


FIG. 6

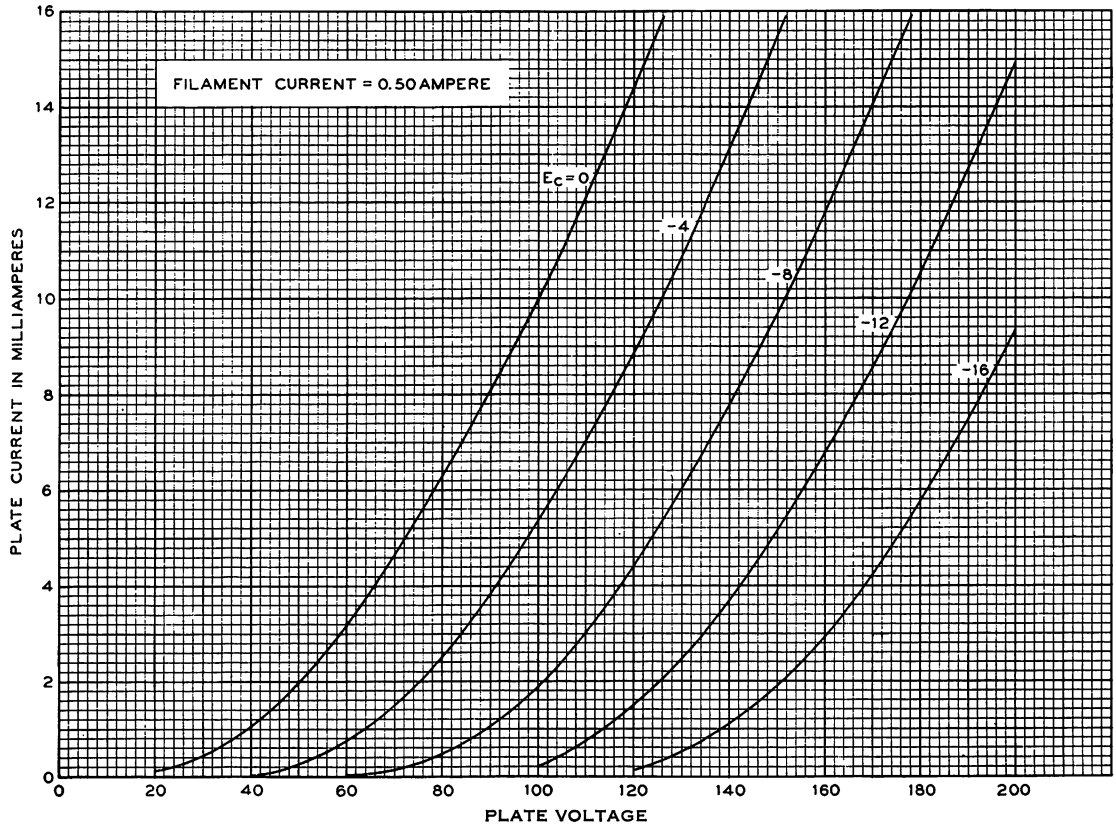
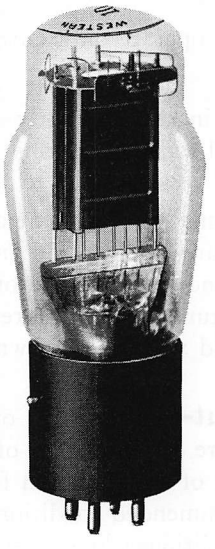

FILAMENT CURRENT = 0.50 AMPERE
$E_C = 0$
-4
-8
-12
-16
PLATE CURRENT IN MILLIAMPERES
0
2
4
6
8
10
12
14
16
0
20
40
60
80
100
120
140
160
180
200
PLATE VOLTAGE

FIG. 7

Western Electric

101F Vacuum Tube
(Dome)



Classification—Low-power, filamentary triode

This tube replaces the old design 101F 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 101F tube. Due to the improved insulation between elements, it is suitable for use in place of the 101J tube.

Applications—Voice frequency and carrier-frequency amplifier for telephone repeater equipment and other applications where small power outputs are required.

Modulator and demodulator in carrier-systems.

Oscillator in voice and carrier frequency applications.

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 four-pin bayonet type base having special contact 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	5.9 μμf
Grid to filament	4.2 μμf
Plate to filament	2.7 μμf

These values are for a based tube without socket.

Filament Rating

Filament current	0.50 ampere, d.c.
Nominal filament voltage	4.15 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 this resistance change 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 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 includes the fundamental power output in milliwatts and the second and third harmonic levels in db below the fundamental for values of load resistance equal to the plate resistance and for a load resistance of 12000 ohms. The peak value of the sinusoidal input voltage E_{gm}, which gives the indicated output P_m, 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:

$$P = P_m\left(\frac{E_g}{E_{gm}}\right)^2$$

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

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

Microphonic Noise

For a plate voltage of 130 volts, a grid bias of −8 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 30 db below 1 volt. The range of levels of individual tubes extends from 20 to 40 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	Grid Bias	Plate Current	Amplification Factor	Plate Resistance	Load Resistance	Power Output	Second Harmonic	Third Harmonic
	Volts	Volts	Milliamperes		Ohms	Ohms	Milliwatts	db	db
Recommended Operating Conditions	100	−4	6.2	6.5	5900	5900	15	35	60
						12000	13	42	65
	130	−10	4.8	6.5	6600	6600	79	24	38
						12000	75	30	46
	130	−8	6.8	6.5	5800	5800	60	30	48
						12000	53	37	60
	130	−4	11.7	6.6	4700	4700	18	41	70
						12000	15	50	75
	160	−14	5.4	6.5	6300	6300	155	21	32
						12000	145	27	41
	160	−10	10.0	6.5	5000	5000	100	30	48
						12000	90	40	60
Maximum Operating Conditions	160	−8	12.5	6.5	4600	4600	70	34	55
						12000	65	44	70
	190	−18	6.1	6.5	6100	6100	250	19	30
						12000	245	26	39
	190	−16	8.4	6.5	5300	5300	240	22	40
						12000	220	32	48
	190	−14	10.9	6.5	4900	4900	205	27	43
						12000	180	37	55

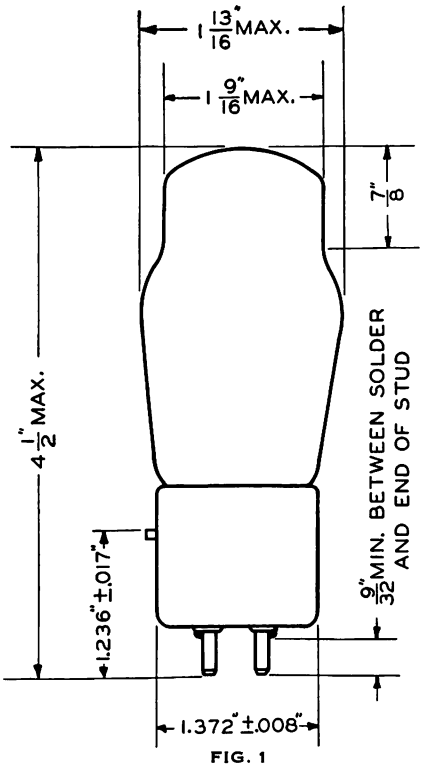


FIG. 1

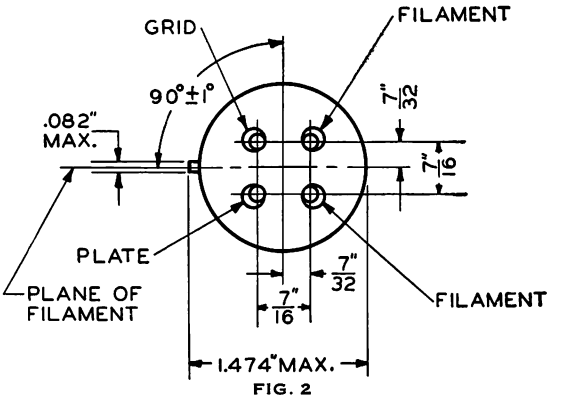


FIG. 2

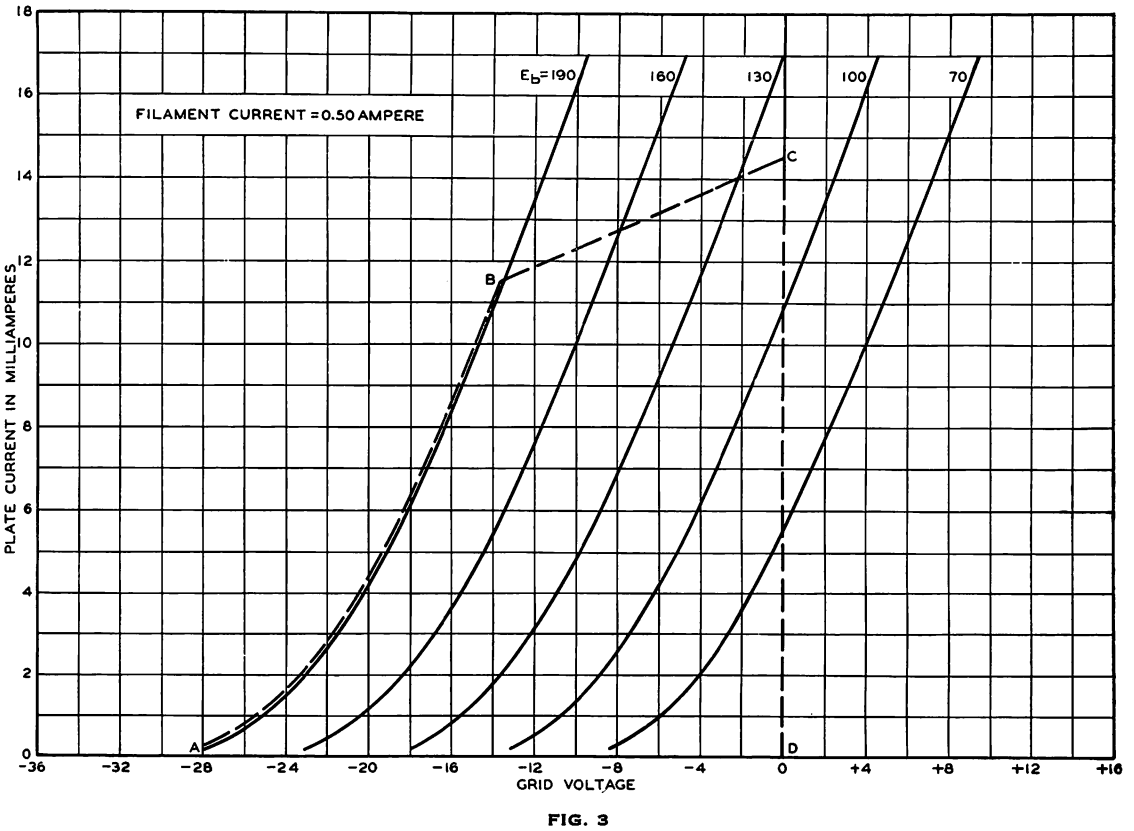


FIG. 3

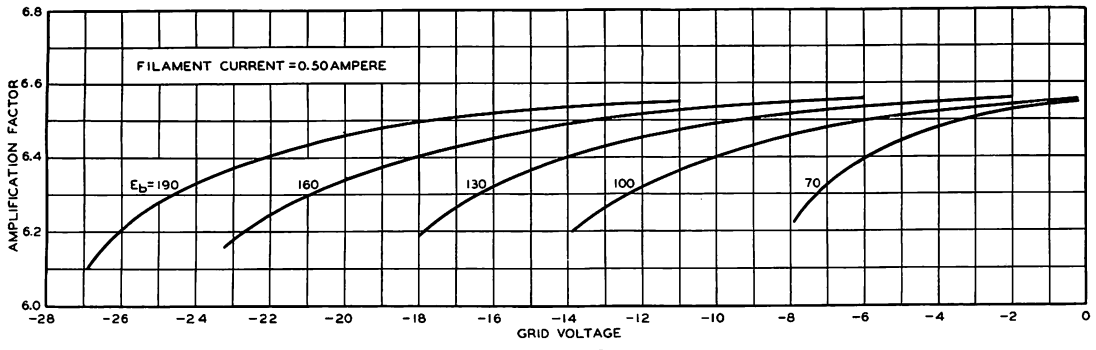


FIG. 4

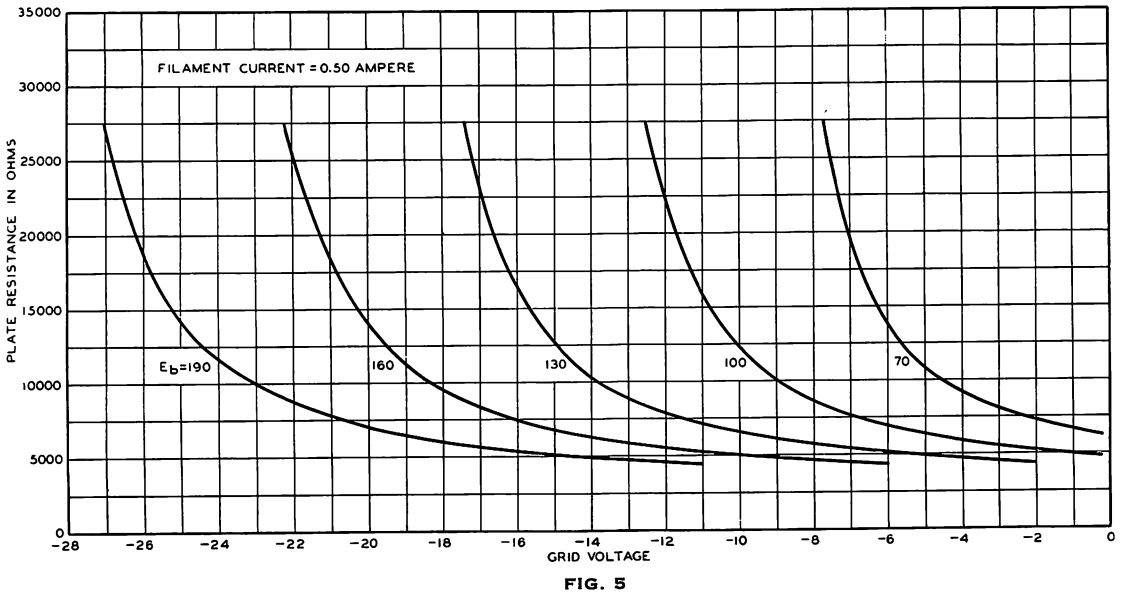


FIG. 5

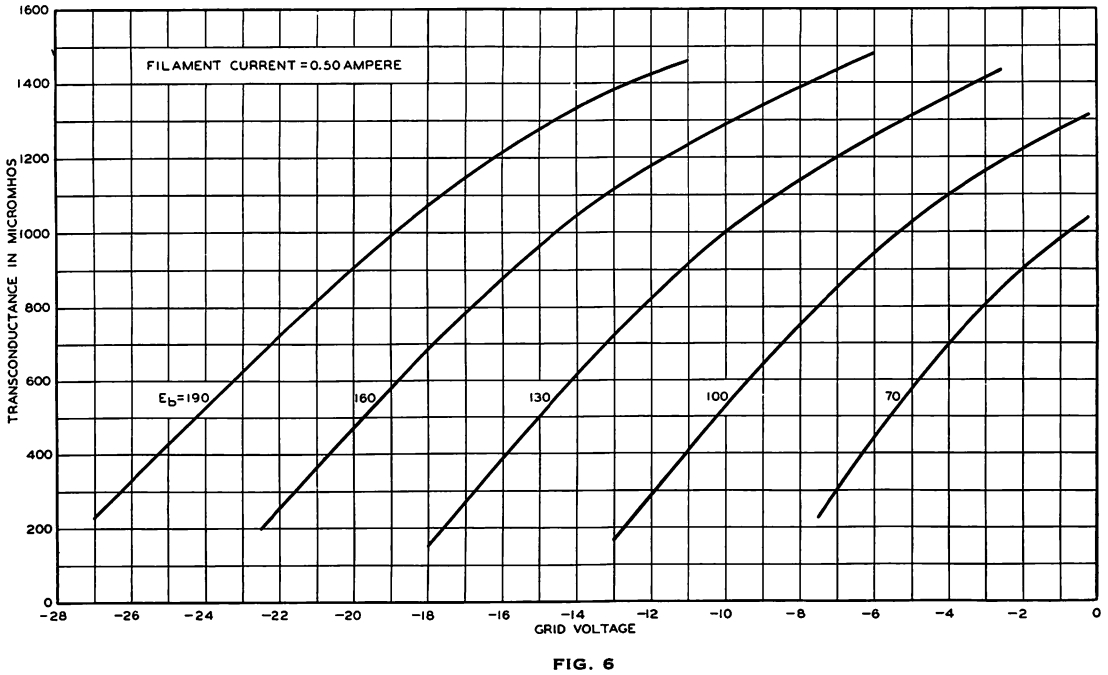


FIG. 6

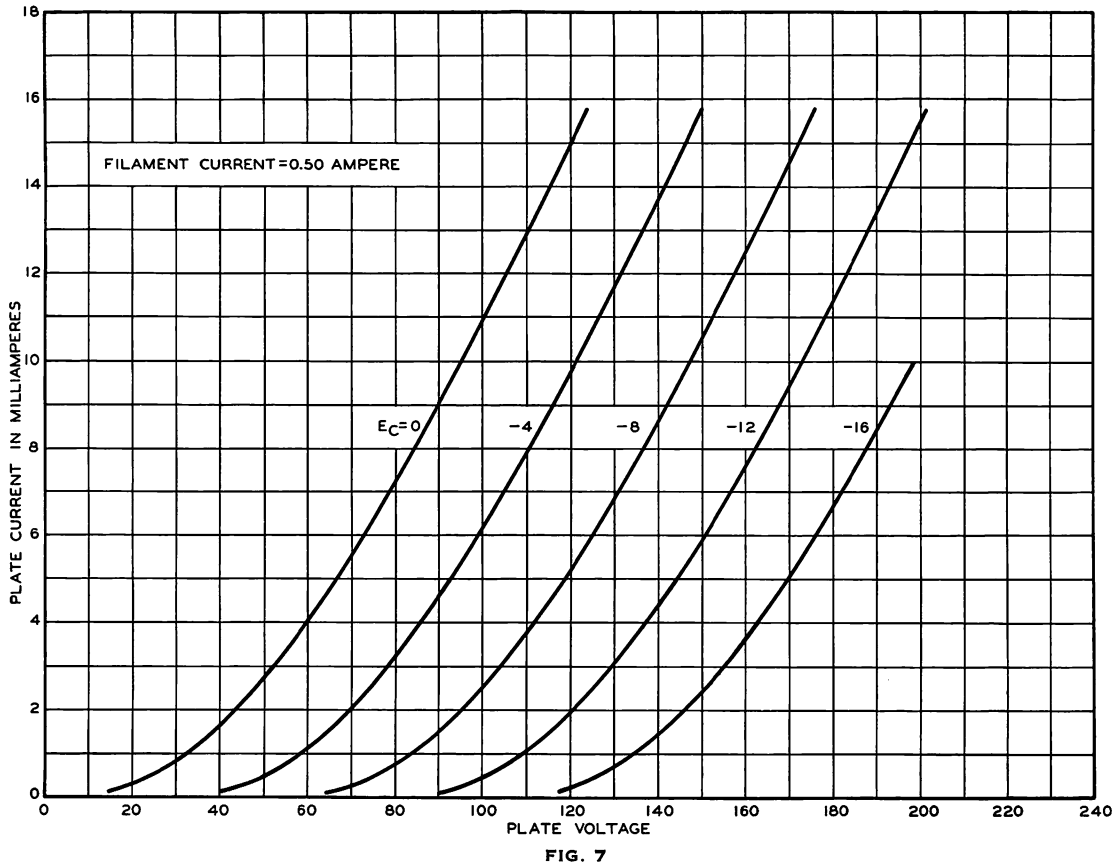
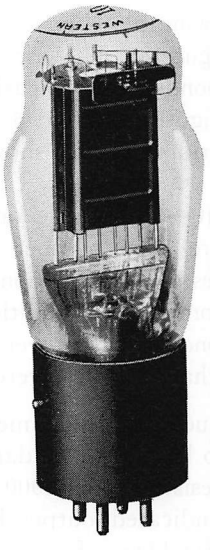

FILAMENT CURRENT=0.50 AMPERE
E_C=0
-4
-8
-12
-16
PLATE CURRENT IN MILLIAMPERES
PLATE VOLTAGE
0
2
4
6
8
10
12
14
16
18
0
20
40
60
80
100
120
140
160
180
200
220
240

FIG. 7

Western Electric

101FA Vacuum Tube



Classification—Low-power, filamentary triode

This tube is similar to the 101F (dome) tube except for modifications in the characteristics to obtain higher gain.

Applications—Voice-frequency repeaters and other telephone equipment requiring higher gain than can be obtained from the 101F tube.

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 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 $2\frac{5}{8}$ 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	4.9 $\mu\mu$f
Plate to filament	2.7 $\mu\mu$f

These values are for a based tube without socket.

Filament Rating

Filament current	0.50 ampere, d.c.
Nominal filament voltage	4.15 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 this resistance change 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 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 includes the fundamental power output in milliwatts and the second and third harmonic levels in db below the fundamental for values of load resistance equal to the plate resistance and for a load resistance of 12000 ohms. The peak value of the sinusoidal input voltage E_{gm}, which gives the indicated output P_m, 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:

$$P = P_m\left(\frac{E_g}{E_{gm}}\right)^2$$

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

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

Microphonic Noise

For a plate voltage of 130 volts, a grid bias of −8 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 30 db below 1 volt. The range of levels of individual tubes extends from 20 to 40 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	Grid Bias	Plate Current	Amplification Factor	Plate Resistance	Load Resistance	Power Output	Second Harmonic	Third Harmonic
	Volts	Volts	Milliamperes		Ohms	Ohms	Milliwatts	db	db
Recommended Operating Conditions	100	−4	5.3	9.0	5400	5400	30	28	47
						12000	25	33	55
	130	−8	4.4	8.9	6100	6100	94	20	34
						12000	91	26	43
	130	−6	7.5	9.0	4900	4900	72	26	44
						12000	63	34	55
	130	−4	11.6	9.2	4200	4200	39	34	55
						12000	30	43	70
	160	−10	6.6	8.9	5400	5400	170	21	35
						12000	150	28	45
Maximum Operating Conditions	160	−8	10.4	9.1	4500	4500	140	26	43
						12000	115	35	55
	190	−14	5.6	8.8	5800	5800	285	16	29
						12000	260	22	34
	190	−12	9.0	9.0	4800	4800	275	20	34
						12000	255	29	46

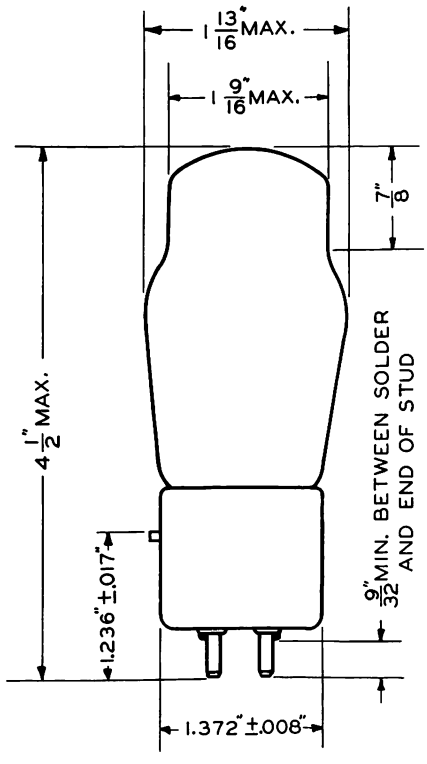


FIG. 1

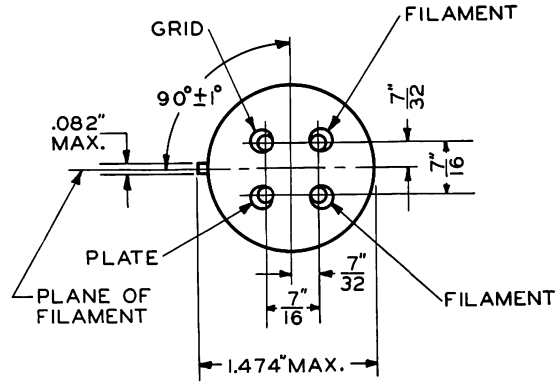


FIG. 2

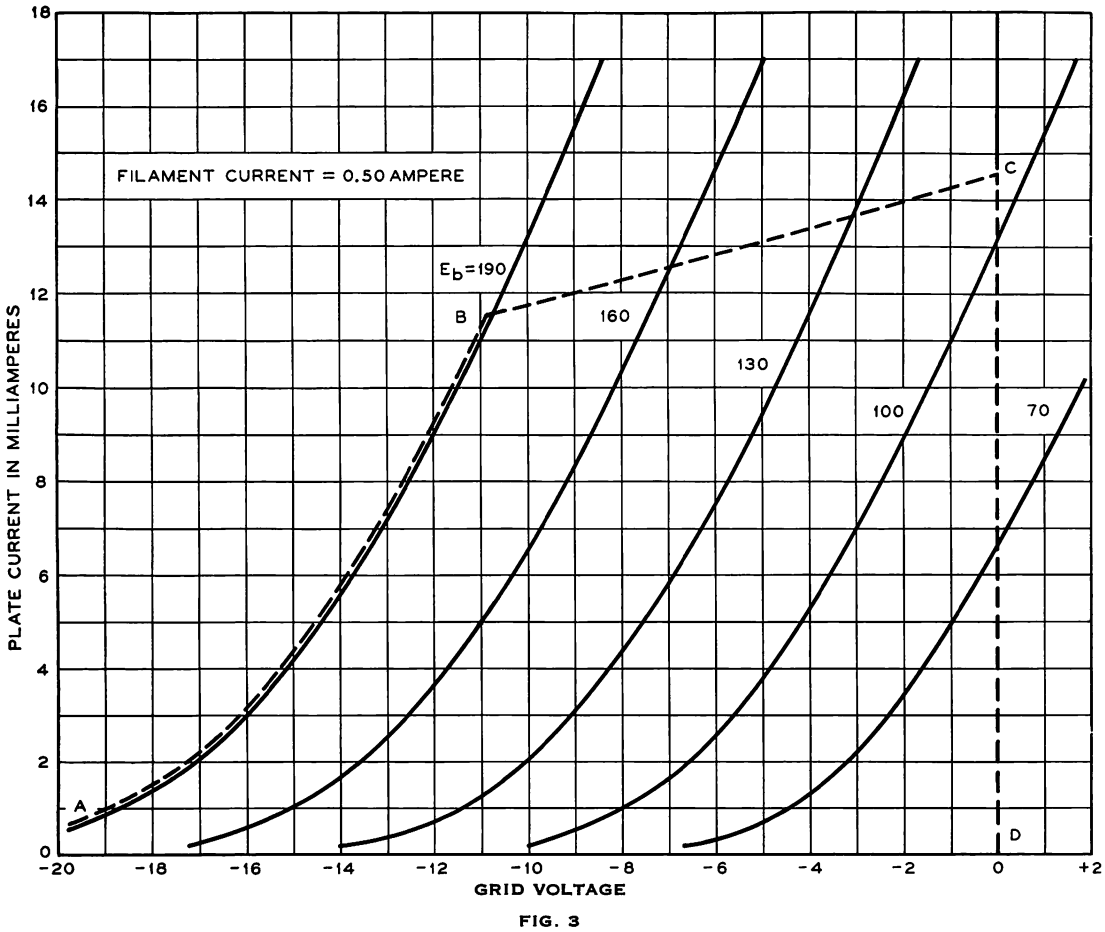


FIG. 3

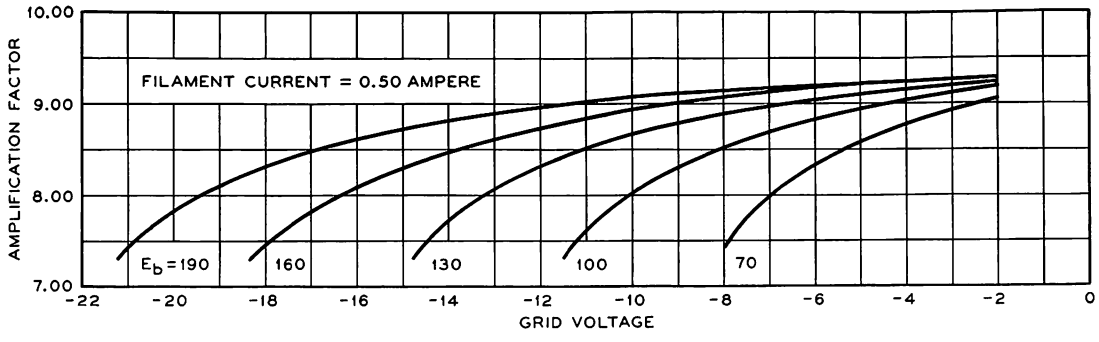


FIG. 4

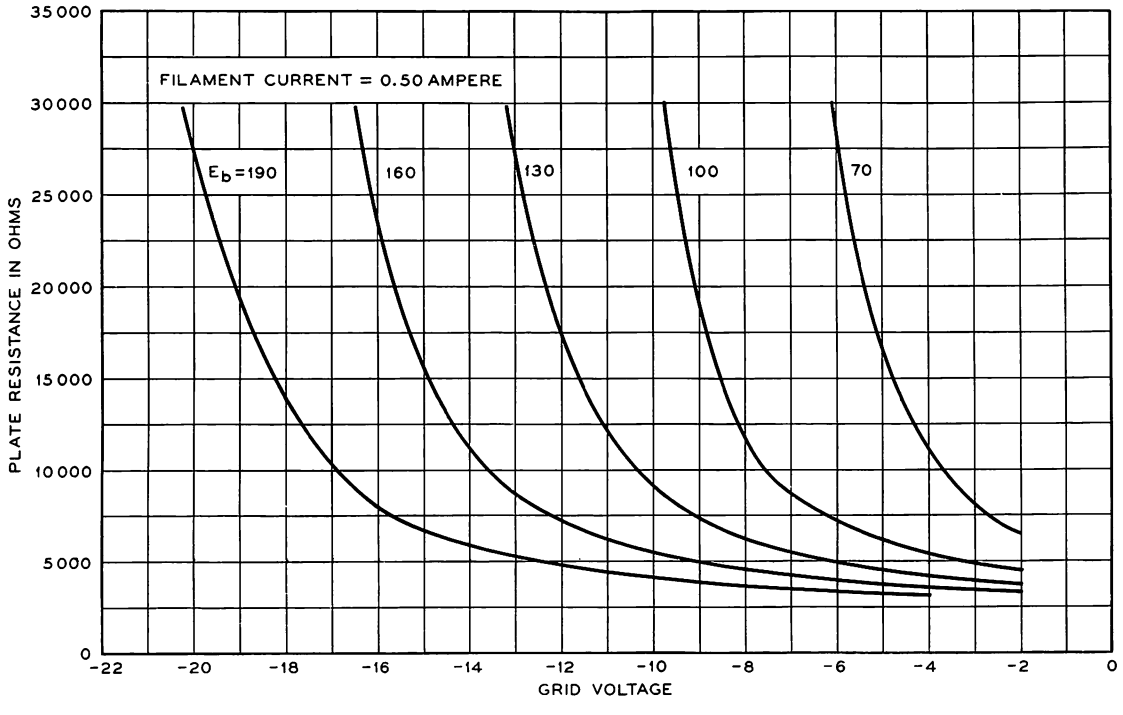


FIG. 5

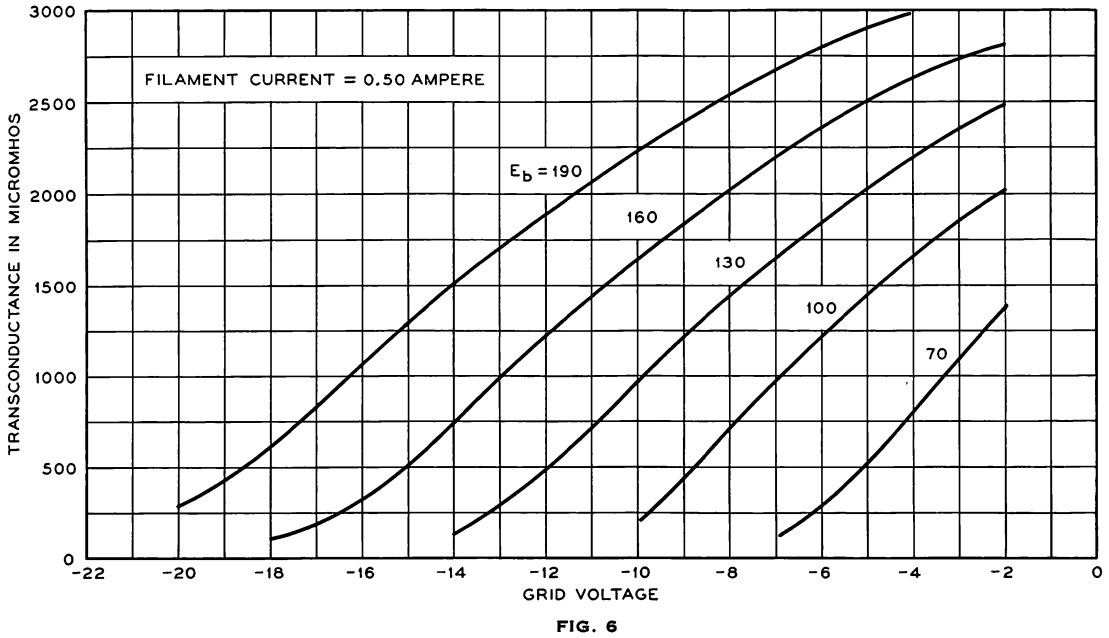


FIG. 6

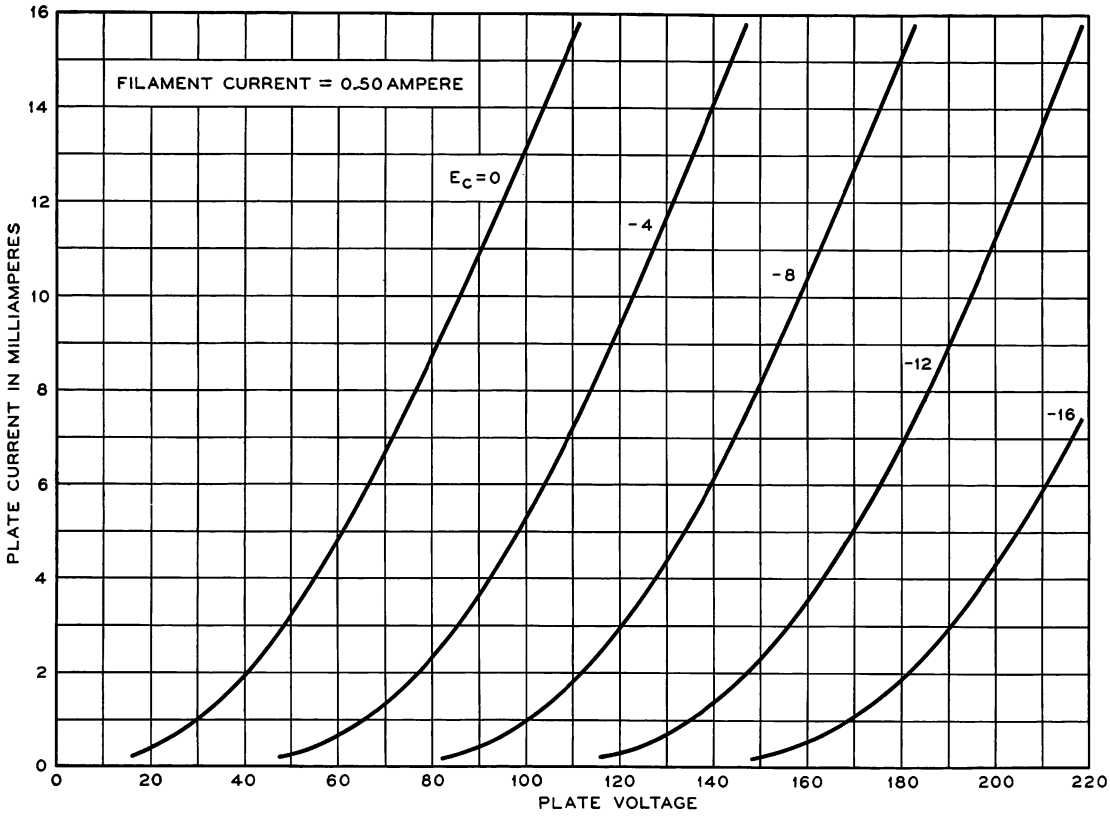

FILAMENT CURRENT = 0.50 AMPERE
$E_C = 0$
-4
-8
-12
-16
PLATE CURRENT IN MILLIAMPERES
PLATE VOLTAGE
0
2
4
6
8
10
12
14
16
0
20
40
60
80
100
120
140
160
180
200
220

FIG. 7