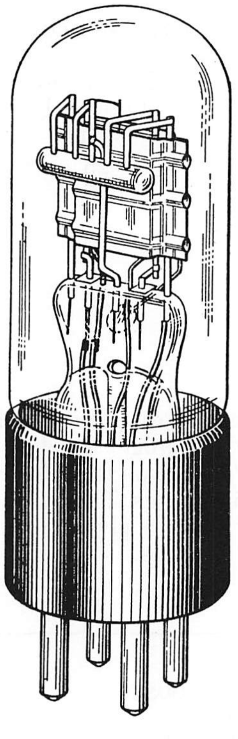
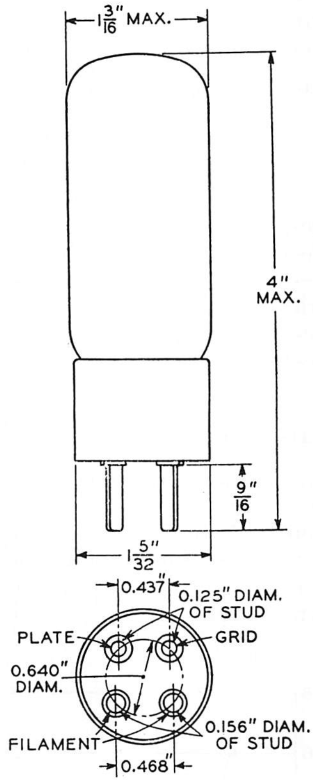
264B Vacuum Tube





Classification

The No. 264B Vacuum Tube is a three-element filament type tube for use as an audio-frequency amplifier in applications requiring a tube with low microphonic noise response in apparatus where high input resistance is necessary.

It replaces the No. 264A Vacuum Tube and is the same electrically and mechanically except that it is equipped with a base employing silver plated contact studs.

Base and Socket

The No. 264B Vacuum Tube employs a four-prong thrust-type base suitable for use in a Western Electric No. 143A Vacuum Tube Socket which is equipped with silver plated contact springs.

Rating and Characteristic Data

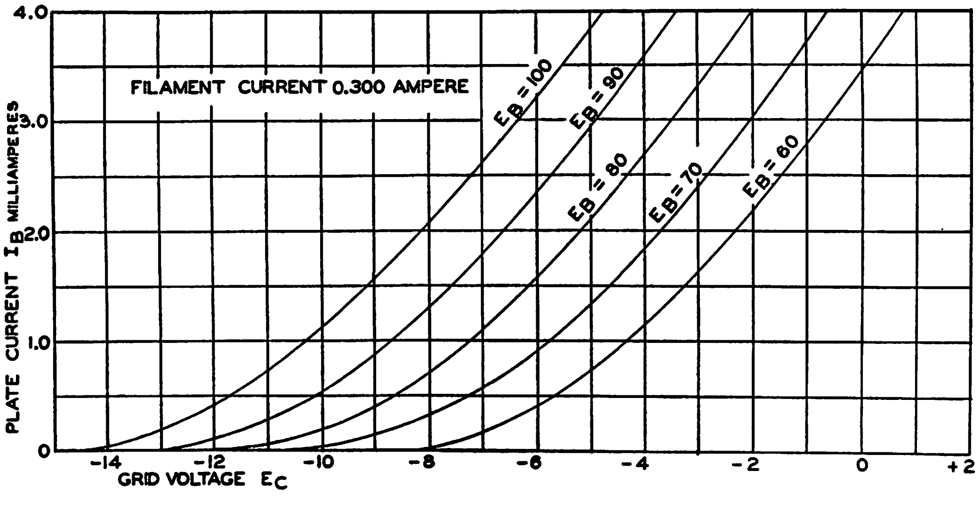
Filament Voltage	1.5 Volts, D.C.
Nominal Filament Current	0.3 Ampere
Maximum Plate Voltage	100 Volts
Grid Voltage	-7.0 Volts
Average Plate Current	2.6 Milliamperes
Average Plate Resistance	11,800 Ohms
Average Amplification Factor	7.05

Approximate Direct Interelectrode Capacities

Plate to Grid	5.3 MMF
Plate to Filament	2.2 MMF
Grid to Filament	3.5 MMF

Average Static Characteristics

The accompanying curves give the static characteristics of the No. 264B Vacuum Tube. These curves have been obtained with the filament operating on direct current and the grid and plate returns connected to the negative filament terminal.



General Features

Due to the rigid construction and the short filament which has been designed to reduce vibration to a minimum, the microphonic response of the No. 264B Vacuum Tube is very low.

The base prongs have been silver coated to eliminate contact noises which develop at the interface between base prong and socket spring when both are of base metal.

Care in manufacture and also inspection tests insure a high input resistance.

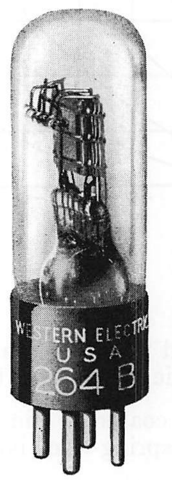
These features together with its low power consumption make this tube particularly suitable for use in the early stages of high gain amplifiers.

The rugged construction of the tube and ample electron emission supplied by the filament operating at a low temperature, insure the maintenance of uniform electrical characteristics throughout a long life.

ISSUE 1
NOVEMBER 1, 1934

Western Electric

264B Vacuum Tube



Classification—Small, low-noise, filamentary triode

The 264B tube replaces the 264A and is identical with it except that the base pins of the 264B tube are silver-plated to minimize contact noise.

Application—Audio-frequency amplifier particularly where exceptionally low tube noise or exceptionally high input resistance are required.

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

Base—Small, four-pin thrust type, with pins silver-plated.

Socket—Standard, four-contact type, preferably with contacts silver-plated, such as the Western Electric 143B socket.

Mounting Positions—The 264B tube may be mounted in any position.

Average Direct Interelectrode Capacitances

Grid to plate	5.3 μμf.
Grid to filament	3.5 μμf.
Plate to filament	2.2 μμf.

Filament Rating

Filament current	0.300 ampere, d.c.
Nominal filament voltage	1.5 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 is practicable.

Characteristics—Grid-plate characteristics of a typical 264B tube are shown in Figure 3 for several values of plate voltage. Corresponding amplification factor, plate resistance, and transconductance characteristics are given in Figures 4, 5, and 6, respectively. Plate characteristics for several values of grid bias are shown in Figure 7. In each case, the grid and plate voltages are measured from the negative end of the filament.

Operating Conditions and Output—Permissible grid and plate voltages are included within the area, ABCD, in Figure 3. Values of amplification factor, plate resistance, and transconductance, and typical performance data are given in the table on page 3 for recommended and maximum operating conditions represented by selected points within this area. 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 performance data include the fundamental power or voltage output and the second and third harmonic levels for the indicated values of load resistance. The fundamental output is given in terms of the power, P_m, in milliwatts, for values of load resistance, R, equal to and double the value of the plate resistance, r_p, and in terms of the voltage, E_{pm}, in peak volts, for values of load resistance five times the plate resistance. The second and third harmonic levels, F_{2m} and F_{3m}, are given in decibels below the fundamental in each case. The peak value of the sinusoidal input voltage, E_{gm}, is numerically equal to the grid bias for each operating condition. For a smaller input voltage, E_g, the fundamental power and voltage output and the harmonic levels are given approximately by the following relations:

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

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

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

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

Table

	Plate Voltage Volts	Grid Bias Volts	Plate Current Milliamperes	Amplification Factor	Plate Resistance Ohms r_p	Transconductance Micromhos	Load Resistance R	Power Output Milliwatts	Voltage Output Peak Volts	Second Harmonic db	Third Harmonic db
Recommended Operating Conditions	60	−2.0	2.35	7.3	11,700	620	$R=r_p$	2.4	—	38	65
							$R=2r_p$	2.1	—	44	70
							$R=5r_p$	—	12	51	85
	90	−7.0	1.90	7.2	12,800	560	$R=r_p$	25	—	24	39
							$R=2r_p$	23	—	31	49
							$R=5r_p$	—	41	39	65
	100	−8.0	2.10	7.2	12,400	580	$R=r_p$	33	—	24	37
							$R=2r_p$	30	—	31	47
							$R=5r_p$	—	48	39	60
Maximum Operating Conditions	90	−5.5	2.80	7.2	11,300	640	$R=r_p$	18	—	30	50
							$R=2r_p$	16	—	36	60
							$R=5r_p$	—	33	44	70
	100	−7.0	2.70	7.2	11,400	630	$R=r_p$	28	—	28	44
							$R=2r_p$	25	—	34	55
							$R=5r_p$	—	42	42	65

Microphonic Noise—With a plate voltage of 100 volts, a grid bias of −8 volts, and a load resistance of 100,000 ohms, the mean microphonic noise output level of the 264B tube measured in a laboratory reference test set is 41 db below 1 volt. The range of levels of individual tubes extends from 30 to 52 db below 1 volt. Since microphonic noise level 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 tubes which have been tested in the same way.

Fluctuation Noise—An irreducible minimum of noise in a vacuum tube is produced by uncontrollable, minute fluctuations in the rate of flow of electrons to the anode. With a plate voltage of 100 volts, a grid bias of −8 volts, and a load resistance of 100,000 ohms, the mean equivalent fluctuation noise input of the 264B tube for the audio-frequency range from 40 to 10,600 cycles is 116 db below 1 volt. Individual 264B tubes may differ from this value by as much as 5 db. By reducing the plate voltage to 26 volts and the grid bias to −0.5 volt, the mean fluctuation noise level may be reduced by about 4.5 db without seriously affecting the voltage amplification for small signals. The equivalent noise input voltage is equal to the measured output voltage divided by the voltage amplification of the tube in the measuring circuit.

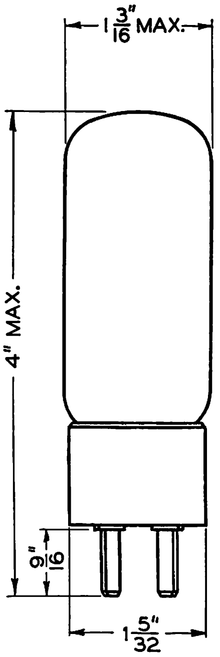


FIG. 1

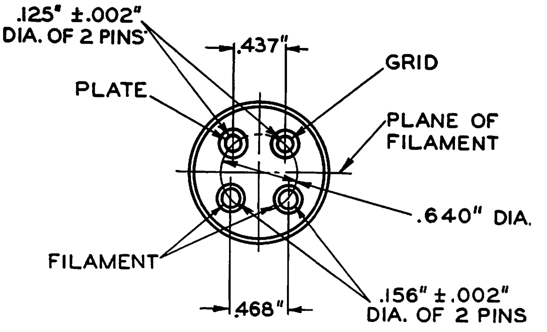


FIG. 2

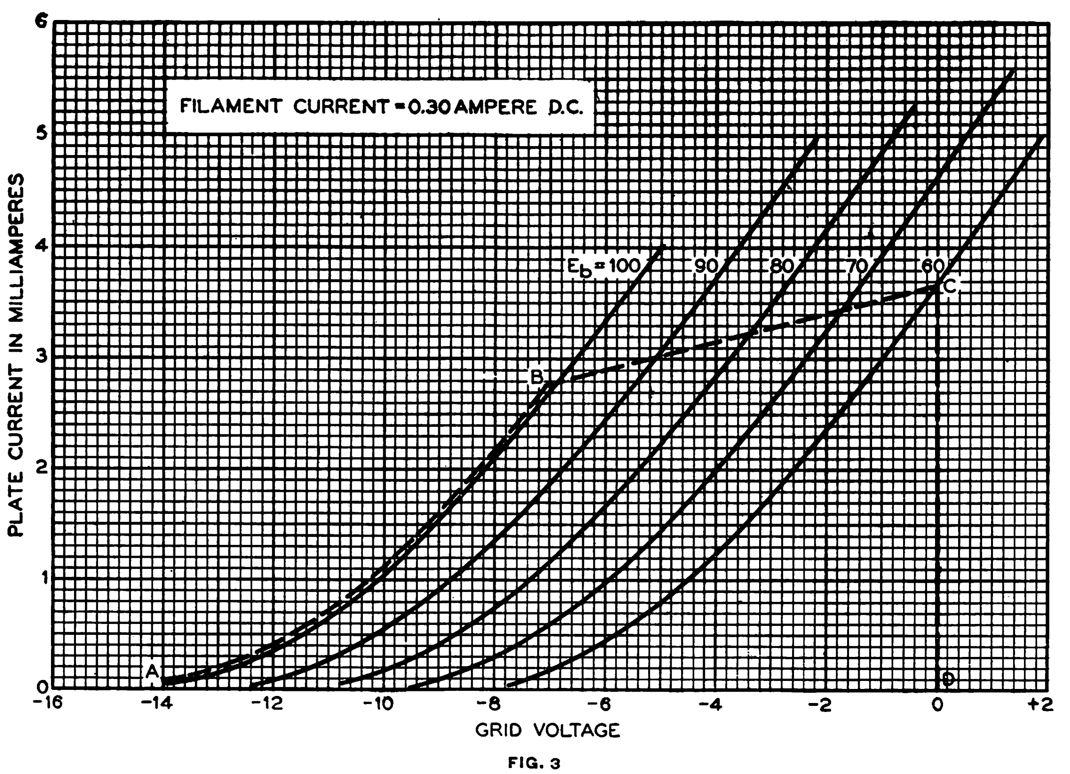


FIG. 3

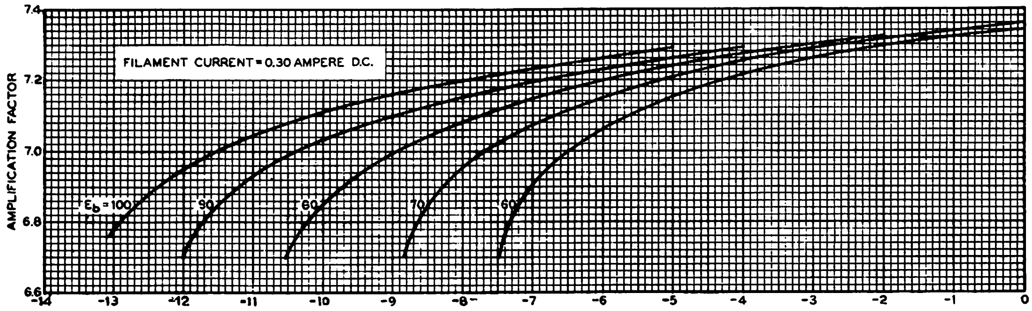


FIG. 4

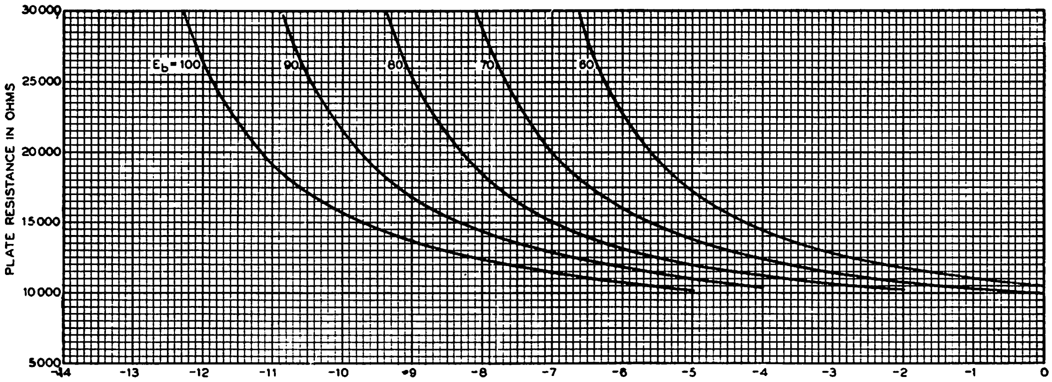


FIG. 5

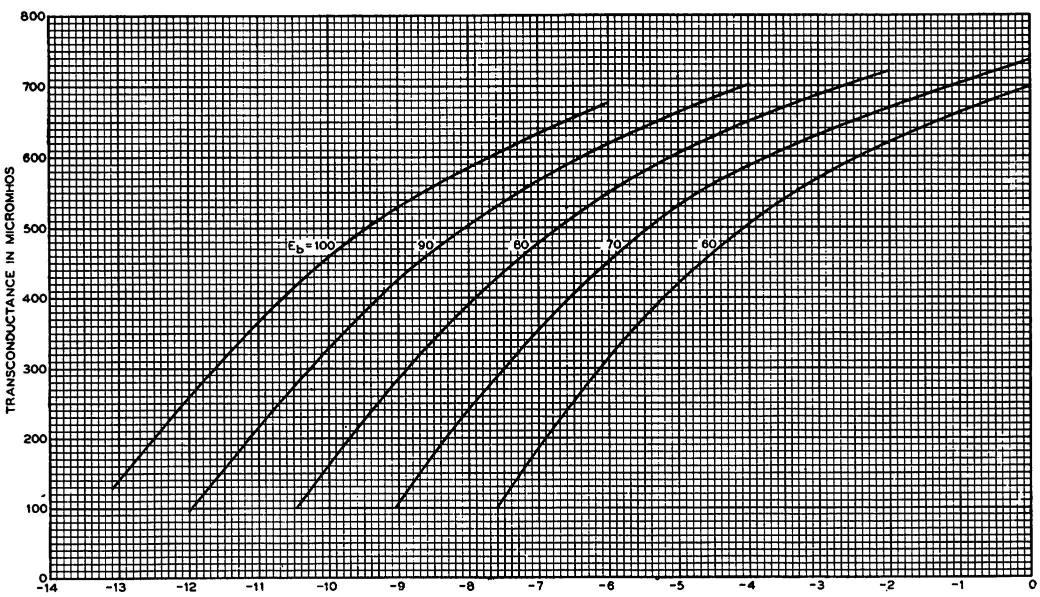


FIG. 6

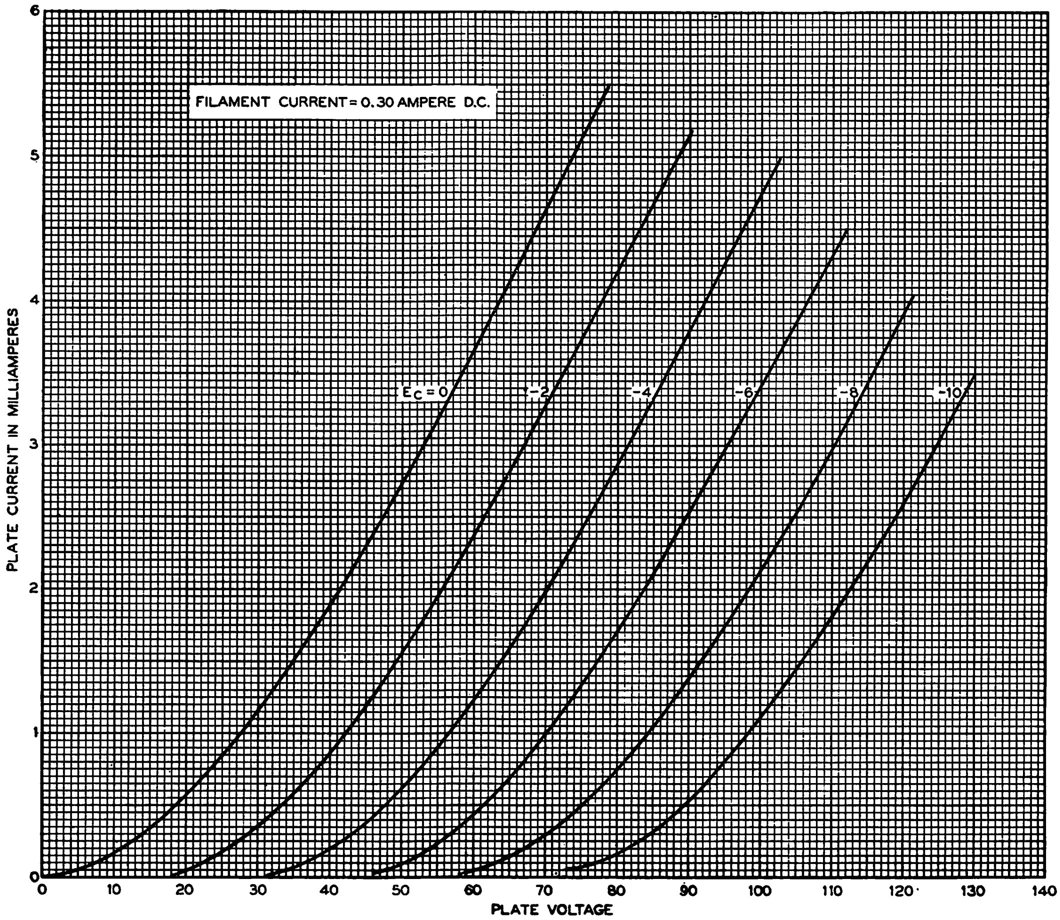


FIG. 7

A development of Bell Telephone Laboratories, Incorporated, the research laboratories of the American Telephone and Telegraph Company, and the Western Electric Company