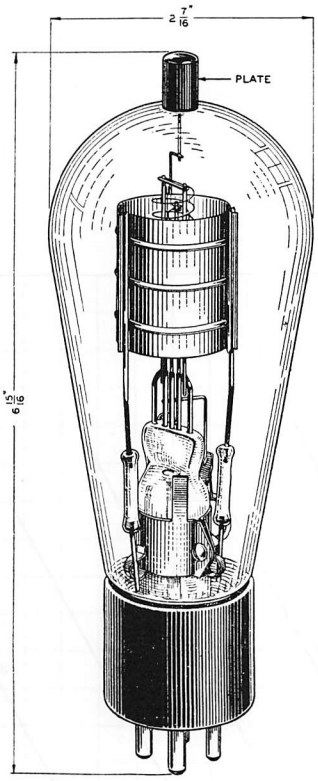
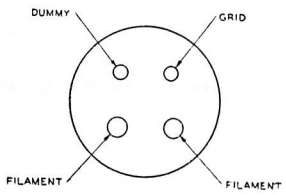
268A Vacuum Tube





Classification

The 268A Vacuum Tube is a three element tube, intended for use as an oscillator, radio-frequency amplifier, or modulator at high frequency.

Base and Socket

The 268A Vacuum Tube employs a standard four prong base, suitable for use in a Western Electric 130B (rigid), 131A (cushion), or similar type socket. The arrangement of electrode connections to the base terminals is shown above. The anode terminal is located at the top of the bulb and is arranged for a special, quick-release connector.

Rating and Characteristic Data

Filament Voltage	5.0 Volts
Nominal Filament Current	3.25 Amperes
Maximum Plate Voltage	750 Volts
Maximum Plate Current	.060 Ampere
Maximum Plate Dissipation	25 Watts
Average Amplification Factor	5
Average Plate Resistance	5000 Ohms
Average Mutual Conductance	1000 Micromhos

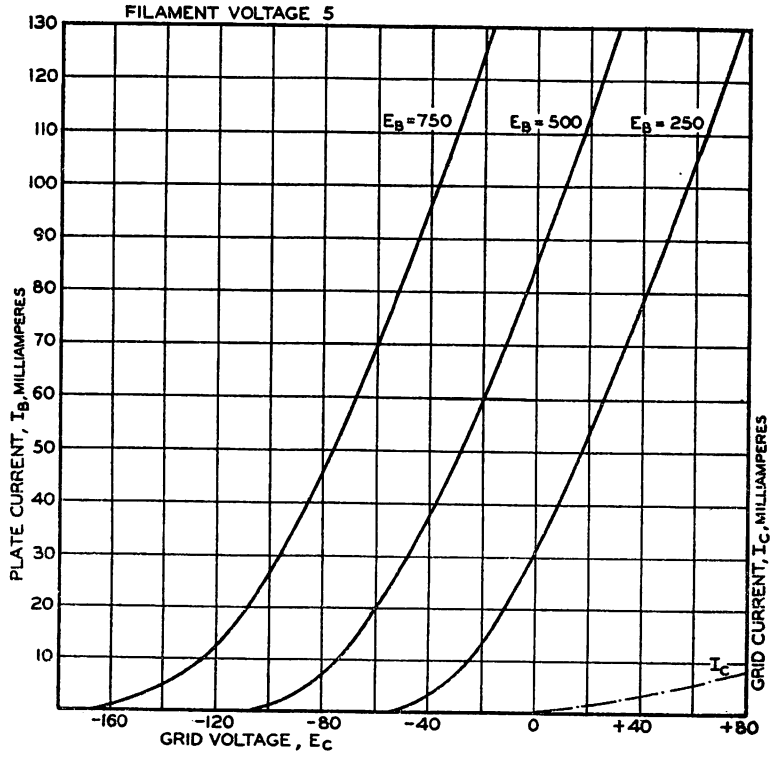
Approximate Direct Interelectrode Capacities (measured without socket)

Plate to Grid	2.3 MMF.
Plate to Filament	1.1 MMF.
Grid to Filament	5.4 MMF.

Audio-Frequency Amplifier or Modulator Rating—Peak Grid Drive Equal to or less than the Bias—Class A Service	
Maximum Plate Dissipation	20 Watts
Plate Voltage	750 Volts
Plate Current	.030 Ampere
Grid Bias Voltage	—95 Volts
Load Resistance	18,000 Ohms
Undistorted Output	4 Watts
Radio-Frequency Amplifier—Grid Bias Practically at Plate Current Cut-Off, Grid Drive Greater than the Bias—Class B Service	
Maximum Plate Voltage	750 Volts
Maximum Plate Current	.060 Ampere
Maximum Plate Dissipation	25 Watts
Grid Bias Voltage	—160 Volts
Peak Output	30 Watts
Oscillator or Radio-Frequency Amplifier—Grid Bias Below Cut-Off—Class C Service	
Maximum Modulated Plate Voltage (D.C.)	500 Volts
Maximum Non-Modulated Plate Voltage (D.C.)	750 Volts
Maximum Plate Current	.060 Ampere
Maximum Plate Dissipation	25 Watts
Maximum Radio-Frequency Charging Current in Grid and Plate Leads	3 Amperes
Approximate Grid Bias	—200 Volts
Maximum Output	30 Watts

Average Static Characteristics

The accompanying curves give the average static characteristics of the 268A Vacuum Tube. These curves are taken with the filament operating on alternating current and with the plate and grid returns connected to the center point on the filament transformer.



General Features

The 268A Vacuum Tube has been designed with very low interelectrode capacities which make it entirely suitable for operation over a very wide frequency range. The design of the internal structure gives rise to negligible primary emission and relatively low secondary emission thereby assuring satisfactory grid characteristics.

The thoriated tungsten filament of this tube is made in a spiral of such form as to maintain the tube internal impedance low and constant during its life. The mechanical structure has adequate strength for severe usages.

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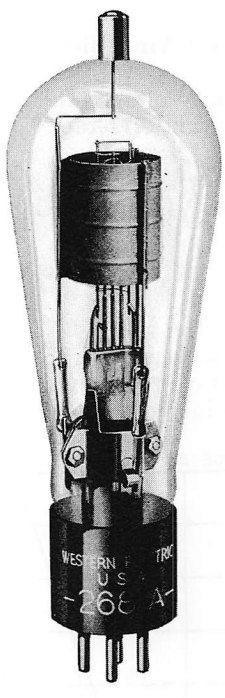
Western Electric

268A Vacuum Tube



Classification—Filamentary air-cooled triode

May be used as an audio-frequency amplifier or as a radio-frequency amplifier, modulator or oscillator.

Dimensions—Dimensions and outline diagrams are shown in Figures 1 and 2. The overall dimensions are:

Maximum overall length	$6\frac{15}{16}''$
Maximum diameter	$2\frac{7}{16}''$

Mounting—Four-pin bayonet base for use in a W.E. 143B or similar socket. The anode terminal is located at the top of the bulb.

Filament—Thoriated tungsten

Filament voltage	5.0 volts, a.c. or d.c.
Nominal filament current	3.25 amperes
Average thermionic emission	0.60 ampere

Average Direct Interelectrode Capacitances

Plate to grid	2.3 μμf
Grid to filament	5.4 μμf
Plate to filament	1.1 μμf

Characteristics—Performance data given below are based upon a typical set of conditions. Variations can be expected with different circuits and tubes.

Figures 3 and 4 give the static characteristics of a typical tube plotted against grid and plate voltages.

Average Characteristics at maximum direct plate voltage and dissipation Class A (E_b = 750 volts, I_b = 25 milliamperes)

Amplification factor	5
Plate resistance	6250 ohms
Grid to plate transconductance	800 micromhos

Operation

Maximum Ratings

Max. direct plate voltage	750 volts
Max. direct plate current	60 milliamperes
Max. plate dissipation	25 watts
Max. direct grid current	10 milliamperes
Max. r-f grid current	3 amperes
Max. frequency for the above ratings	30 megacycles
Max. plate voltage for upper frequency limit of 60 Mc	400 volts
Max. plate voltage for frequencies between 30 and 60 Mc in proportion	

Class A Audio Amplifier or Modulator

Direct plate voltage	750	500 volts
Grid bias	−100	−37 volts
Direct plate current	25	40 milliamperes
Load impedance	18000	5000 ohms
Undistorted output	4.0	1.0 watts

Class B Audio Amplifier or Modulator for Balanced 2 Tube Circuit

Direct plate voltage	750	500 volts
Grid bias	−120	−70 volts
Direct plate current per tube		
No drive	12	12 milliamperes
Max. drive	60	60 milliamperes
Plate dissipation	20	15 watts
Load resistance plate-to-plate	11200	7400 ohms
Load resistance per tube	2800	1850 ohms
Approximate maximum output—2 tubes	50	33 watts
Recommended power for driving stage	5	5 watts

Class B Radio-Frequency Amplifier

Direct plate voltage	750	500 volts
Direct plate current for carrier conditions	50	60 milliamperes
Grid bias	−165	−105 volts
Approximate carrier watts for use with 100% modulation	12.5	10 watts

Class C Radio-Frequency Oscillator or Power Amplifier—Unmodulated

Direct plate voltage	750		500 volts
Direct plate current	60		60 milliamperes
Grid bias	−255 to −340		−165 to −220 volts
Nominal power output	30		20 watts
Plate dissipation	15		10 watts

Class C Radio-Frequency Amplifier—Plate Modulated

Direct plate voltage	500		350 volts
Direct plate current	60		60 milliamperes
Grid bias	−220		−160 volts
Max. direct grid current	10		10 milliamperes
Nominal carrier power output for use with 100% modulation	20		14 watts

Operating Precautions

Mechanical—Figures 1 and 2 show the overall dimensions and basing arrangement for the tube.

The tubes should not be subjected to mechanical shock or excessive vibration. Mechanical vibration may cause breakage of the thoriated tungsten filaments.

A free circulation of air must be provided to insure adequate cooling of the glass during operation.

Electrical—Overload protection should always be provided for the plate circuit. A suitable fuse or circuit breaker should remove the plate voltage if the plate current exceeds 75 milliamperes. Although the tube is sufficiently rugged to withstand momentary overloads, a prolonged overload caused by inefficient adjustment of the circuit, may damage the tube. When adjusting a new circuit, reduced plate voltage or a series resistance of 1000 to 5000 ohms in the plate circuit should be used until it is operating properly.

The filament should always be operated at the rated voltage measured at the tube terminals. A 5% decrease in filament voltage reduces the thermionic emission approximately 25%. Either direct or alternating current may be used for heating the filament. If direct current is used, the plate and grid circuit returns should be connected to the negative filament terminal. If alternating current is used, the circuit returns should be connected to the center tap of the filament heating transformer winding or to the center tap of a resistor placed between the filament terminals. A resistance of 20 to 30 ohms of three watt rating is suitable.

In cases where severe and prolonged overload has temporarily impaired the electronic emission of the filament, the activity may be restored by operating the filament, with the plate and grid voltages off, 30% above normal voltage for 10 minutes followed by a longer period at normal voltage.

Audio Amplifier or Modulator

Class A—Peak grid drive equal to or less than the grid bias.

Grid bias may be obtained from the drop across a resistance in the plate current return or from a battery or rectifier supply.

Plate dissipation allowable for this type of service is generally lower than is safe for other uses since the energy is dissipated in the plate in smaller areas due to relatively high voltage drop in the tube.

The plate dissipation is equal to the plate voltage multiplied by the normal plate current. Performance data are based upon the use of a resistance load. Undistorted output is calculated on the basis of 5% second harmonic distortion.

Class B—Grid bias practically at cut-off and grid driving voltage higher than the bias.

Two tubes may be used in a balanced circuit. An adequate driving stage and an input transformer with good regulation must be used so that the grid current drawn during positive grid swings does not produce appreciable distortion. The output transformer must transform the load impedance to the proper value for the tubes used. The power output obtainable will be determined by the quality of the transformer used and the amount of distortion which can be tolerated. The grid bias must be held constant and therefore cannot be obtained by grid leak or series resistor methods. A battery or other source having good regulation is necessary.

The power required of a modulator for complete modulation of a Class C amplifier is one-half the direct power input to the plates of the Class C amplifier.

Radio-Frequency Oscillator or Power Amplifier

Class B—Radio-Frequency Amplifier

The Class B radio-frequency amplifier is used to amplify a modulated radio-frequency carrier wave without appreciable distortion. It operates similarly to the Class B audio amplifier except that a single tube may be used, the tuned output circuit serving to preserve the wave shape. The push-pull circuit, however, eliminates the even order harmonics and thus increases the efficiency slightly.

Class C—Radio-Frequency Oscillator or Power Amplifier—Grid bias below cut-off.

Unmodulated

This type of operation is suitable for telegraphy, or the production of a continuous flow of radio-frequency power for purposes other than communication.

Plate Modulated

This type of operation is for use when the modulating voltage is superimposed on the plate supply voltage and to obtain good quality the output power should vary as the square of the plate voltage. For complete or 100% modulation, the plate voltage varies from zero to twice the applied direct value during a cycle of the audio frequency. With no modulation applied, the plate voltage is, of course, the direct value and the carrier power output is one-fourth of the peak power output under 100% modulation. In this case, since the plate voltage varies with modulation, the direct value must be rated lower than for other types of operation.

High Frequency Ratings

The frequency limits specified under maximum ratings are based on the tube being used as an oscillator. The tube may be used at full rating up to 30 megacycles. When operating at higher frequencies, the dielectric losses, charging currents and lead-in heating are increased greatly. The plate voltage and hence plate dissipation must be reduced to values specified for the upper frequency limit and for frequencies between these two limits the plate voltage should be proportionately reduced.

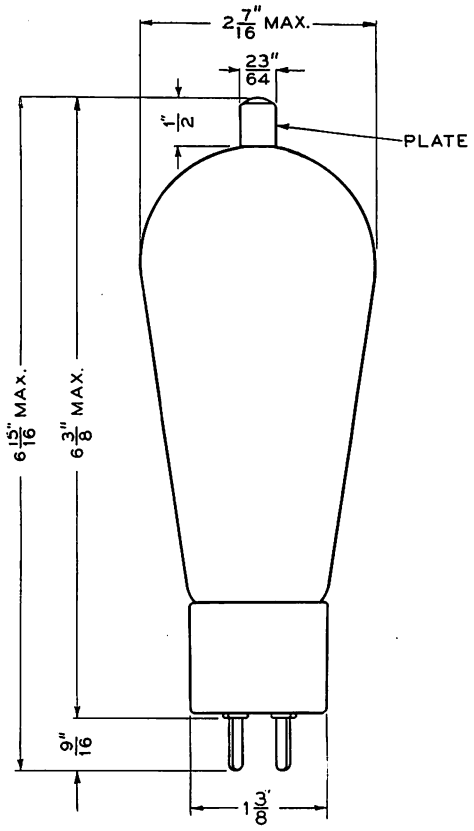

2 7/16" MAX.
23/64"
1/2"
PLATE
6 15/16" MAX.
6 3/8" MAX.
9/16"
1 3/8"

FIG. 1

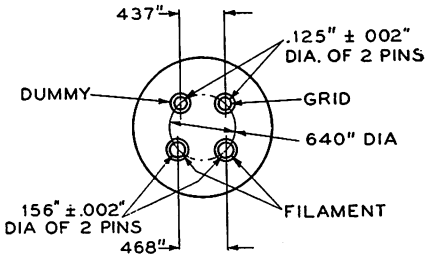

437"
.125" ± 002"
DIA. OF 2 PINS
DUMMY
GRID
640" DIA
156" ± .002"
DIA OF 2 PINS
FILAMENT
468"

FIG. 2

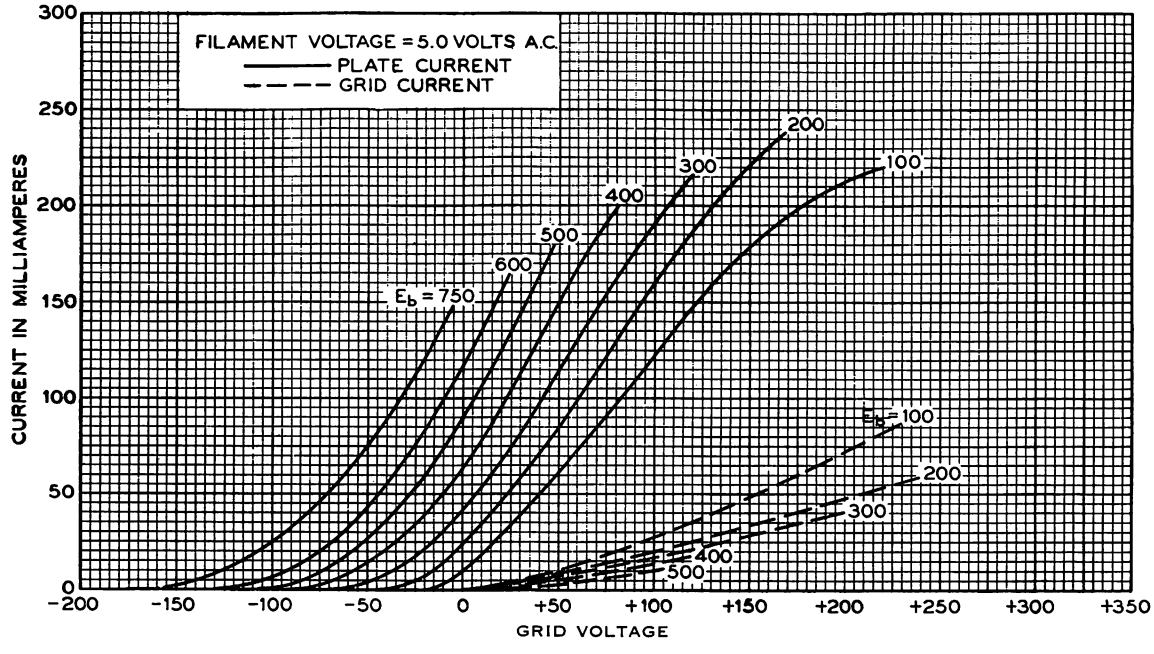

FILAMENT VOLTAGE = 5.0 VOLTS A.C.
PLATE CURRENT
GRID CURRENT
CURRENT IN MILLIAMPERES
GRID VOLTAGE
300
250
200
150
100
50
0
-200
-150
-100
-50
0
+50
+100
+150
+200
+250
+300
+350
200
100
300
400
500
600
Eb = 750
Eb = 100
200
300
400
500

FIG. 3

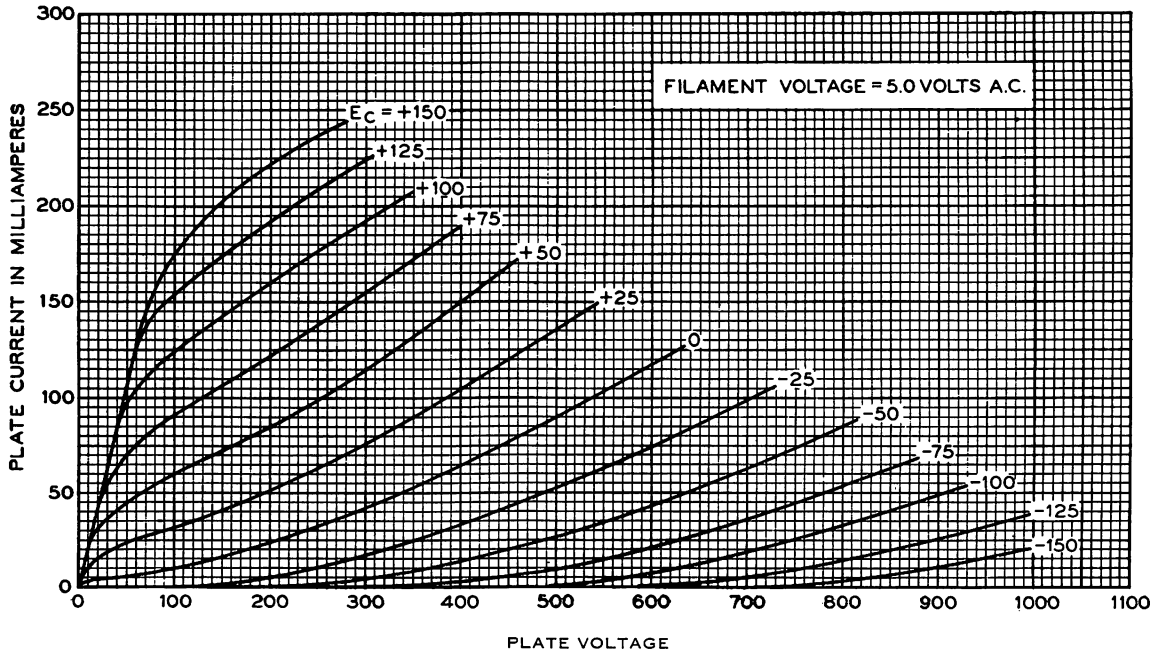

FILAMENT VOLTAGE = 5.0 VOLTS A.C.
PLATE CURRENT IN MILLIAMPERES
PLATE VOLTAGE
300
250
200
150
100
50
0
0
100
200
300
400
500
600
700
800
900
1000
1100
EC = +150
+125
+100
+75
+50
+25
0
-25
-50
-75
-100
-125
-150

FIG. 4