M/104

COMPONENTS GROUP MOBILE EXHIBITION

BRIMAR VALVES

COMPONENTS GROUP

Standard Telephones and Cables Limited

Price Two Shillings and Sixpence

VALVE RATINGS

GENERAL: The following notes have been compiled to assist equipment designers in determining satisfactory operating conditions for the valves in their equipment. The recommendations below are based largely on the British Standard Code of Practice CP 1005 entitled "The Use of Electronic Valves", to which the user is referred for fuller information. The recommendations are necessarily of a general nature and should be interpreted accordingly. Where specific recommendations are published in the data relating to a particular valve, these should always be followed.

RATINGS: Ratings may be defined as values which establish either limiting capabilities or limiting conditions for an electron device. They are determined for specified values of environment and operation, and may be stated in any suitable terms. Limiting conditions may be either maxima or minima.

Ratings cannot be considered as barriers on one side of which satisfactory operation is obtained, while on the other side immediate failure will occur. The expectation of life decreases continuously as the maximum ratings are approached, particularly with respect to bulb temperature. Exceeding the rating accelerates this decline. With a few exceptions, the more conservative the use of the valve with respect to limiting ratings, the greater is the life expectancy and reliability. Ratings in the Brimar No. 8 Manual are based on either the "Absolute Maximum" system or the "Design Centre" system. The two systems are defined below. Unless otherwise specified, the ratings published are "Design Centre" ratings.

ABSOLUTE MAXIMUM RATINGS: Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environmental variations and the effects of changes in operating conditions due to variations in the characteristics of the device under consideration, and of all other devices in the equipment.

The equipment manufacturer should design so that initially and throughout life no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variations, signal variations, environmental conditions and variations in characteristics of the device under consideration, and of all other devices in the equipment.

DESIGN CENTRE RATINGS: Design Centre Ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data and should not be exceeded under normal conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device in average applications, taking responsibility for normal changes in operating conditions due to rated supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions and variations in the characteristics of all electron devices.

The equipment manufacturer should design so that initially no design-centre value for the intended service is exceeded with a bogey device in equipment operating at the stated normal supply voltage.

N.B.—A bogey electron device is an electron device whose characteristics have the published nominal values for the type. A bogey electron device for any particular application can be obtained by considering only those characteristics which are directly related to the application.

HEATER AND FILAMENT SUPPLIES: Valves are designed to operate with a specified heater or filament voltage or current, and will give optimum life and performance when operated under the specified conditions. Deliberate over- or under-running of heaters or filaments to obtain apparently desirable characteristics is to be deprecated.

Valves operated in parallel from a transformer will give satisfactory operation if the voltages on the heaters or filaments are within ±5% of the rated value when the mains supply voltage is at its declared value, provided that the mains voltage does not deviate from this value by more than ±10%.

In the case of valve heaters connected in series with a controlling resistance, the current should be within ±2½% of the rated value at the declared mains supply voltage, and with valves having nominal heater voltage drop, provided that the mains voltage does not vary by more than ±10% from its nominal value.

Car radio valves are designed to give satisfactory performance over the range of voltages encountered in operation from a battery of lead-acid cells connected to a charger. The normal range of variation is from 1.8 to 2.5 volts per cell, with short-term fluctuations up to 2.7 volts per cell.

1.4 volt battery valves are designed for a mean voltage of 1.3 volts, which is the approximate mean voltage of a dry cell over its useful life. These valves will operate satisfactorily over the range 1.1 to 1.5 volts. If they are operated with their filaments connected in series, the anode and screen currents will return to the negative HT terminal through the filament chain, and in general the current in each filament will be different, unless the appropriate filaments are shunted by a suitable resistor to by-pass the additional current. It is recommended that this practice be followed to equalise the voltage drops across the filaments.

Where variations of heater or filament supplies outside the recommended limits can not be avoided, it will usually be necessary to apply reduced ratings to the valves.

HEATER-CATHODE INSULATION: The heater-cathode rating, unless otherwise qualified, shall be interpreted as the maximum instantaneous value of combined alternating and steady voltage, either positive or negative in respect of the cathode. The maximum potential difference between heater and cathode should be kept as low as possible, and should not exceed 250 volts, except where otherwise specified.

The insulation resistance between heater and cathode should not be included in R.F. circuits where frequency stability or preservation of waveform is important or in A.F. circuits followed by high gain.

Transformer windings supplying heaters should not be left "floating". Where no D.C. connection between the winding and the cathode exists, a resistor of the order of 100 kΩ should be connected between the heater and the cathode.

A valve should not be rendered inoperative by opening the cathode circuit unless there is a resistor not exceeding 250 kΩ connected between heater and cathode.

CATHODE CIRCUIT: Valves should not be run for long periods with the cathode hot, but with no cathode emission, unless it is specified in the data that the valve is suitable for this class of service.

CONTROL-GRID CIRCUIT: The resistance between the control grid and cathode should be kept as low as possible, and published data should be consulted for limiting values. For most small receiving valves, unless otherwise specified, the resistance should not exceed 1 MΩ with auto-bias, and 0.5 MΩ with fixed

bias. Certain types of small receiving valves, such as some R.F. amplifiers, may employ values up to 3.5 MΩ with auto-bias. In general the value used with receiving valves having anode dissipations in excess of 10 watts should not be greater than 0.5 MΩ with auto-bias, and 0.1 MΩ with fixed bias, unless otherwise specified. If the resistance is common to more than one control grid circuit its value should be reduced proportionately.

Valves should not be used in applications which result in appreciable grid current unless such conditions are specified in the published data.

When valves are operated at low values of grid bias, grid current will flow, damping the input circuit, unless the bias exceeds the contact potential, which will vary somewhat with individual samples and with life.

It is undesirable that grid bias should be provided solely by grid rectification, unless the circuit is designed so as to prevent damage to the valve in the event of loss of drive.

Valves having very high values of mutual conductance are sensitive to small variations of grid bias and auto-bias should be used in preference to fixed bias. The stability of D.C. operating conditions may be increased by using a positive bias on the grid, in conjunction with a suitably increased value of cathode bias resistor.

SCREEN GRID CIRCUIT: The source resistance of the screen voltage supply should be kept as low as practicable, and for most applications a potential divider network, or other voltage source having good regulation, is preferred to a series resistor. This is particularly applicable to pentodes having aligned grids, and to unaligned tetrodes, which the screen current is subject to relatively wide variation with operating conditions and between individual valves. In the case of pentodes with unaligned grids, the variation is smaller, and series resistors may be used.

Where variable grid bias is applied to control gain, the use of a high impedance supply to the screen will result in the lengthening of the grid base.

At low anode voltages the screen current tends to increase greatly, and care is required to avoid exceeding the screen dissipation. The anode voltage should not be removed while the screen is energised.

SUPPRESSOR GRID CIRCUIT: The suppressor grid should normally be connected to the cathode, although in certain applications connection to the negative end of the cathode bias resistor or to the A.G.C. line is permissible. If negative bias is applied to the suppressor, care is required to ensure that the screen dissipation is not exceeded. Unless the published data includes suppressor grid characteristics, it is unwise to place any reliance on the uniformity of this parameter. Resistance in series with the suppressor grid should be avoided, unless conditions involving the use of such resistance are specified in the published data.

Valves should not be operated in conditions which result in appreciable suppressor grid current, unless such operation is indicated in the published data. Where pentodes are connected as triodes, the suppressor grid should be connected to the cathode, unless otherwise specified.

MOUNTING AND VENTILATION: The mounting position of most modern indirectly heated valves is unrestricted. If directly heated types are mounted horizontally, the plane of the filament should be vertical. Due attention should be paid to the effect of the mounting position on ventilation and cooling.

The pins of small glass based valves should be protected by pin protectors, but where this precaution has not been followed, the pins should be straightened in a pin-straightener before the valve is inserted in a socket. The connecting wires to valveholders having floating contacts should be as flexible as possible, and wiring jigs should be employed while the connections are being made.

Where valves are used with printed circuits the design of the sockets should be such as to ensure that after assembly the insertion and withdrawal forces are within the limits encountered with normal chassis mounting sockets. These limited are defined in British Standard BS448.

The use of spare socket contacts as wiring supports is not recommended, and on no account should any connection be made to pins marked I.C.

Flying lead valves are usually secured in position by the envelope. Any clamps used for this purpose should be of high thermal capacity and conductivity and should make intimate contact with the envelope over as large an area as possible. Well-designed clamps of this type may substantially improve the cooling of the valve with consequent increase of life expectancy and reliability. The leads of valves of this type should not be bent sharply close to the glass, and care is required in making soldered connections to avoid overheating the seals. In the case of miniature and sub-miniature types, the wire should not be soldered closer than 3 mm to the glass, and a thermal shunt between the point of soldering and the glass seal should be employed during the operation.

The presence of strong electromagnetic or electrostatic fields is liable to affect the performance of valves, which should be positioned or screened so as to avoid such effects.

Ventilation and layout of equipment should be such as to ensure a safe bulb temperature under all conditions. Unless otherwise specified the maximum temperature of the hottest part of the bulb under operating conditions should not exceed by more than 20°C the temperature which would be obtained if the valve were operated at its maximum rating in conditions of free air circulation at an ambient temperature of 20°C.

To allow free radiation of heat from a valve, surrounding surfaces should not be polished, and should be as cool as possible. The inner and outer surfaces of screening cans should be matt blackened, and adequate ventilation holes should be provided at the top and bottom.

The use of screening cans which are not in thermal contact with the envelope may seriously interfere with the cooling of the valve, and the use of screening cans of high thermal capacity and conductivity in intimate thermal contact with the envelope is to be preferred, particularly with valves which tend to approach the limiting bulb temperature. The thermal capacity of screening cans is usually increased by the use of the chassis as a " heat sink ", and careful consideration must be given to the question of cooling where no metallic chassis exists, as in the case of equipment using printed circuits.

Valves should not be mounted adjacent to components running at very high temperatures.

CROSS COUPLING: A certain amount of cross coupling may exist between the sections of multi-unit valves, and it should not be assumed that such valves will give satisfactory performance in applications other than those specified, even if the characteristics of the individual units are satisfactory for the proposed application.

RECTIFIER RATINGS: A new system of rating has been used for the current equipment types of rectifiers in the Brimar No. 8 Manual. Reference to these charts enables the valve to be used at maximum efficiency within its ratings over a wide range of operating conditions. There are three rating charts for each rectifier and additional information is published in the form of characteristic curves for typical operating conditions within the limits imposed by the charts.

Charts I, II and III are applicable to operation with a Capacitor Input Filter, and for certain types, limiting conditions for Choke Input Filter operation are also shown on Chart I. For choke input operation, the point G on Chart I indicates the maximum permissible open circuit anode supply voltage, and the boundary A B C D G defines the maximum permissible rectified current at any specified anode supply voltage. There is a limiting minimum value of input choke at any specified values of supply voltage and load current below which satisfactory operation will not be obtained. Minimum choke lines are drawn on the appropriate characteristic curves, and for a particular value of choke the curves are valid only in the region to the right of the appropriate choke line. For capacitor input operation, the area of permissible operation is defined on Chart I by the Boundary A E D G, but reference must also be made to Charts II

and III which define the conditions limiting the steady state peak anode current, and peak surge current (under hot-switching conditions), to their rated values.

Use of the charts and curves proceeds as follows. For a circuit with a choke input filter, the operating conditions must be chosen to lie within the appropriate boundary on Chart I, and the minimum choke value may be calculated, or read from the characteristic curves. The latter make no allowance for the voltage drop in the supply transformer nor in the choke, due to their resistance. This voltage drop may be taken as the product of the mean rectified current and the effective circuit resistance.

In the case of a capacitor input filter, reference is first made to Chart III to determine the minimum value of peak surge current limiting resistor which may be used with the specified supply voltage. The D.C. output voltage must then be determined under the specified conditions of supply voltage and load current, either experimentally or by reference to the characteristic curves. The rectification efficiency is calculated from the expression:—

$$\text{Rectification Efficiency} = \frac{Vo}{E\sqrt{2}}$$

Where Vo = D.C. output voltage
E = R.M.S. Supply voltage per anode.

It is then ascertained whether the rectification efficiency lies within the limit imposed by Chart II at the specified current. If the limit is exceeded the series resistance in each anode must be increased. The values of series resistance chosen in compiling the characteristic curves for capacitor input filter operation are such as to satisfy the conditions imposed by Chart II at the maximum permitted value of rectified current. Where a design calls for a lower value of current, the rectification efficiency may be increased by reducing the value of the series resistor, provided that it is still greater than the minimum value specified by Chart III.

The value of series resistance chosen to satisfy the conditions imposed by Charts II and III will restrict the peak steady state and peak surge currents to the permitted values irrespective of the value of the reservoir capacitor and there is consequently no upper limit to the value of the capacitor which may be used.

Where hot-switching is likely to occcur frequently, it is recommended that choke input operation should be used.

The series resistance per anode includes any resistance inherent in the circuit such as the total effective resistance of the transformer windings. The total effective transformer resistance R_t is given by $R_t = n^2R_p + R_S$ where R_p is the primary resistance, R_S the secondary resistance, and n is the ratio of the secondary turns to the primary turns. The number of secondary turns is that of the proportion of the secondary winding supplying each anode, i.e. for a full wave circuit, half of the total secondary winding.

Base Connection Symbols

Symbols used in this Manual are based on British Standard Specification No. 1409.

ELECTRODE SYMBOLS

a = anode.
a′, a″ etc., = anode 1, anode 2 etc.
bp = beam plates.
g = grid.
g_1, g_2 etc. = grid 1, grid 2 etc.
h = heater
f = filament.
k = cathode.
t = fluorescent target.
s = internal shield.
M = external metallizing.

VALVE SYMBOLS

The following symbols are used to distinguish between two or more sections in the same valve :—

d = diode. h = hexode or heptode. p = pentode.
q = tetrode. r = rectifier. t = triode.

Example g_{2h} = 2nd grid of the hexode section.

The following symbols are used to distinguish between similar electrodes in two or more sections in the same valve.

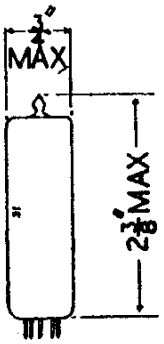
Example :

a′ = anode of Section 1 g_1' = grid 1 of Section 1
a″ = ,, ,, ,, 2 g_1'' = ,, 1 ,, ,, 2

OTHER SYMBOLS

*IC = internal connection. NP = no pin. SC = side contact.
NC = no connection. J = jumper. TC = top contact.

*Pin marked IC—in no circumstances should this pin be employed. The valve maker is at liberty to make any internal connection to pins so labelled.

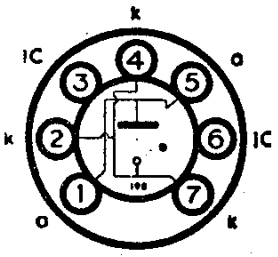


Current Equipment Type

TYPE 0A2

MINIATURE

VOLTAGE REGULATOR



B7G Base

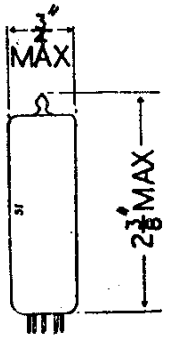
0A2
0A3
(see type VR75/30)
0B2

CHARACTERISTICS

Minimum Starting Voltage	... ...	185 volts
Nominal Operating Voltage	... ...	150 volts
Minimum Operating Current	... ...	5 mA
Maximum Operating Current	... ...	30 mA
Maximum Peak Current (10 secs. max.)	... ...	75 mA
Regulation (minimum to maximum currents) Nominal	... ...	2 volts
Maximum	... ...	6 volts

Note.—The correct polarity must be observed, i.e. anode positive with respect to cathode.

Type 0A2 *is a commercial equivalent to the* CV1832

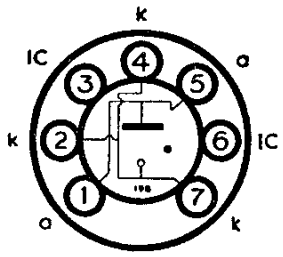


Current Equipment Type

TYPE 0B2

MINIATURE

VOLTAGE REGULATOR



B7G Base

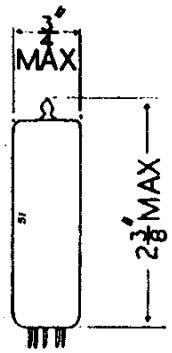
CHARACTERISTICS

Minimum Starting Voltage	... ...	133 volts
Nominal Operating Voltage	... ...	108 volts
Minimum Operating Current	... ...	5 mA
Maximum Operating Current	... ...	30 mA
Maximum Peak Current (10 secs. max.)	... ...	75 mA
Regulation (minimum to maximum currents) Nominal	... ...	1 volt
Maximum	... ...	4 volts

Note.—The correct polarity must be observed, i.e. anode positive with respect to cathode.

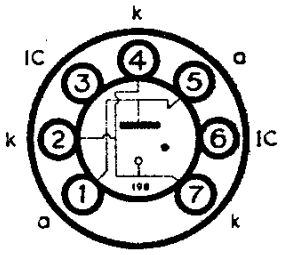
Type 0B2 *is a commercial equivalent to the* CV1833

0C2
0C3
(See type VR105/30)
0D3
(See type VR150/30)
0Z4



Current Equipment Type

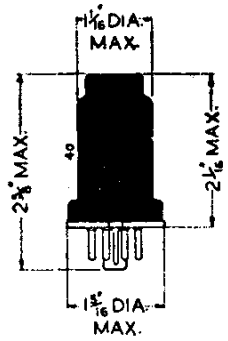
TYPE 0C2
MINIATURE VOLTAGE REGULATOR



CHARACTERISTICS

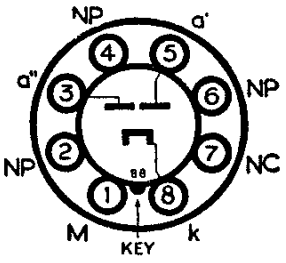
Minimum Starting Voltage	... ...	115 volts
Nominal Operating Voltage	... ...	75 volts
Minimum Operating Current	... ...	5 mA
Maximum Operating Current	... ...	30 mA
Maximum Peak Current (10 secs. max.)	... ...	75 mA
Regulation (minimum to maximum currents) nominal	... ...	3 volts
maximum	... ...	4.5 volts

Note.—The correct polarity must be observed, i.e. anode positive with respect to the cathode.



Obsolescent Type

TYPE 0Z4
(OCTAL BASE)
FULL-WAVE RECTIFIER
For Car Radio



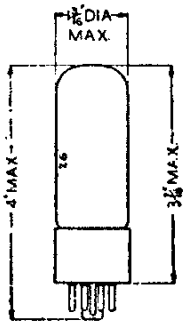
OPERATING CHARACTERISTICS

The BRIMAR type 0Z4 is a full-wave gas filled rectifier with an ionic heated cathode, no external heater supply being required.
A minimum anode to cathode potential of 300 volts peak is necessary for consistent starting and this value increases somewhat during life.
Type 0Z4 is fitted with a metal shell which must be efficiently earthed to prevent the radiation of R.F. interference to other parts of the receiver.

(Heater supply—not required)

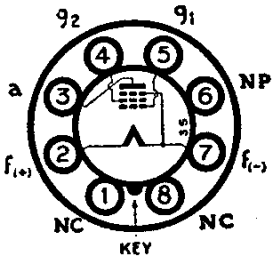
Starting Peak Voltage	300 volts min.
Peak Anode to Anode Voltage	1,000 volts max.
Peak Anode Current (each anode)	200 mA max.
D.C. Output Voltage	300 volts max.
D.C. Output Current	30 mA min. to 75 mA max.
Voltage Drop...	24 volts

1A5G
1A5GT
1A7G
1A7GT



Obsolescent Types

TYPES 1A5G, 1A5GT
(OCTAL BASE)
LOW-DRAIN BATTERY POWER PENTODES



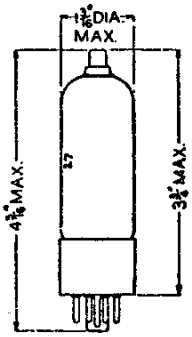
CHARACTERISTICS

Filament Voltage	... ...	1.4 volts	Grid (g_1) Voltage	... ...	-4.5 volts
Filament Current	... ...	0.05 amp.	Anode Impedance	... ...	0.3 meg.
Anode Voltage	... ...	90 volts	Mutual Conductance	..	0.85 mA/V
Anode Current	... ...	4.0 mA	Amp. Factor ...	... ...	255
Screen (g_2) Voltage	... ...	90 volts	Optimum Load	... ...	25,000 ohms
Screen Current	... ...	0.8 mA	Power Output	... ...	0.115 watts
		Harmonic Distortion	.. 7 per cent.		

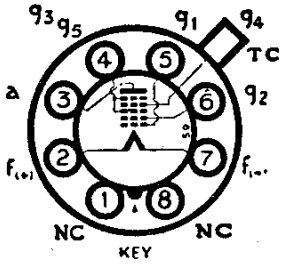
---

bsolescent Types

TYPES 1A7G, 1A7GT

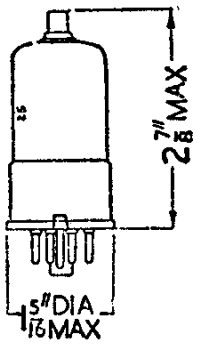


1A7G



Note.—Type 1A7GT has Pin 1 connected to metal shell.

BATTERY HEPTODE FREQUENCY CHANGERS (OCTAL BASE)

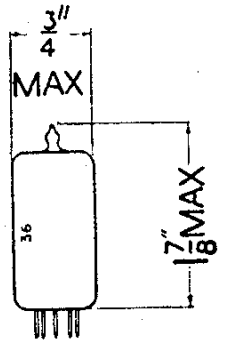


1A7GT

CHARACTERISTICS

Filament Voltage	... ...	1.4 volts	Oscillator Anode Voltage	...	90 volts
Filament Current	... ...	0.05 amp	Oscillator Anode Current	...	1.2 mA
Anode Voltage	... ...	90 volts	Oscillator Grid (g_1) Resistor		0.2 meg.
Anode Current	... ...	0.55 mA	Oscillator Grid Current	...	0.035 mA
Screen Supply Voltage	...	90 volts	Control Grid (g_4) Voltage	...	0 volts
Screen Series Resistor	...	70,000 ohms	Anode Impedance	... ...	0.6 meg.
Screen Current	... ...	0.6 mA	Conversion Conductance	...	0.25 mA/V

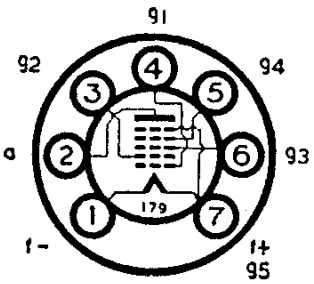
1AC6
1C5G
1C5GT



B7G Base

Replacement Type

TYPE 1AC6
MINIATURE BATTERY HEPTODE FREQUENCY CHANGER



RATINGS

Filament Voltage	1.4 volts	Screen (g_4) voltage	90 volts max.
Filament Current	0.05 amp.	Oscillator Anode (g_2) Voltage	60 volts max.
Anode Voltage	90 volts max.	Cathode Current	4 mA max.

OPERATING CHARACTERISTICS

Anode Voltage	85 volts	Oscillator Grid Resistor*	27 k Ω
Anode Current	0.7 mA	Oscillator Grid Current	115 μA
Screen Voltage	60 volts	Conversion Conductance	325 μA/V
Screen Current	0.15 mA	Control Grid Bias (For conversion of 3.25 μA/V)	—6 volts
Oscillator Anode Voltage	30 volts	Anode Impedance	0.65 meg.
Oscillator Anode Current	1.6 mA		

INTER-ELECTRODE CAPACITANCES

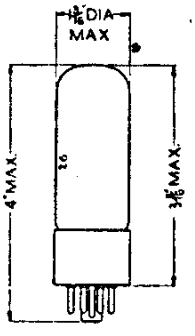
(with no external shield)

R.F. input (c_{g_3}, all)	7.5 pF	Oscillator output (c_{g_2}, all)	5.0 pF
I.F. output (c_a, all)	8.5 pF	c_{g_3}, g_1	0.2 pF max.
Oscillator input (c_{g_1}, all)	4.0 pF	c_{g_3}, a	0.4 pF max.

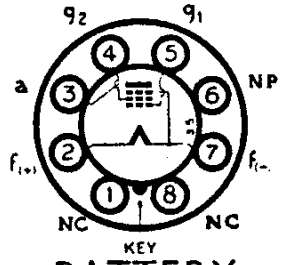
* *The oscillator grid resistor should be returned to the positive filament connection pin 7.*

Obsolescent Type

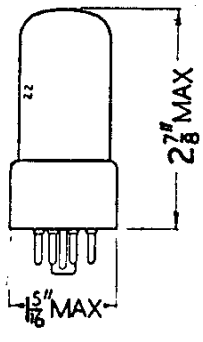
TYPES 1C5G, 1C5GT (OCTAL BASE)



1C5G



BATTERY POWER PENTODES



1C5GT

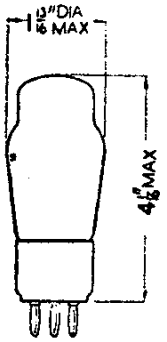
BRIMAR types 1C5G and 1C5GT are identical with the exception of their overall dimensions, which are shown in the drawings above.

OPERATING CHARACTERISTICS

Filament Voltage	1.4 volts	Filament Current	0.1 amp

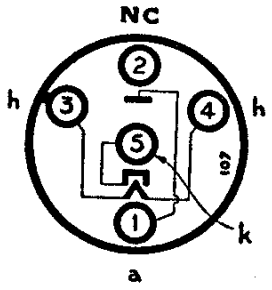
Other characteristics as 3S4 (parallel filament connections)

1D5
1D6
1H5G
1H5GT



Replacement Type

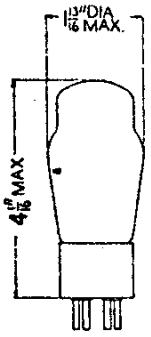
TYPE 1D5 (ENGLISH BASE) HALF-WAVE A.C./D.C. RECTIFIER



CHARACTERISTICS

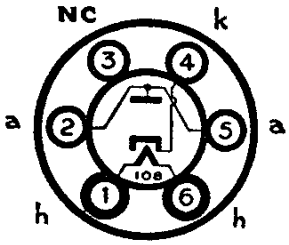
Heater Voltage	... 40 volts	R.M.S. Input	... 250 volts max.
Heater Current	... 0.2 amp.	Series Anode Limiting Resistor	50 ohms min.
Peak Inverse Voltage ...	... 700 volts max.	Rectified Current ...	... 100 mA max.
D.C. Heater-Cathode Potential	350 volts max.	Reservoir Condenser ...	... 16 μF max.

For characteristic curves refer to type **25Z4G.**



Replacement Type

TYPE 1D6 (U.X. BASE) HALF-WAVE A.C./D.C. RECTIFIER



CHARACTERISTICS

BRIMAR type 1D6 is an indirectly heated rectifier for use in universal receivers. It is designed to replace types 25Z5, 25Y5 and 25RE where these valves are used in half-wave circuits. For voltage doubling applications two 1D6 valves are necessary.

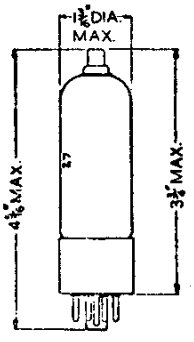
Heater Voltage	... 25 volts	Rectified Current ...	... 100 mA max.
Heater Current	... 0.3 amp.	Series Anode Limiting Resistor	50 ohms min.*
R.M.S. Input Voltage ...	... 250 volts max.	Reservoir Condenser ...	... 16 μF max.

* *For Input Voltages exceeding 117 volts R.M.S.*

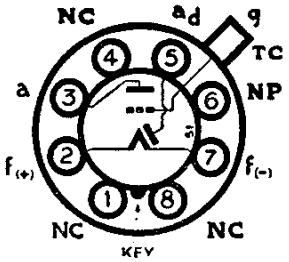
For further data concerning type **1D6** *and characteristic curves refer to type* **25Z4G.**

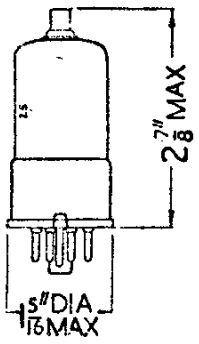
Obsolescent Types

TYPES 1H5G, 1H5GT (OCTAL BASE)



1H5G





1H5GT

Note.—Type **1H5GT** *has Pin 1 connected to metal shell.*

BATTERY SINGLE DIODE TRIODES

BRIMAR types 1H5G and 1H5GT are identical with the exception of their overall dimensions which are given in the drawings above.

RATINGS

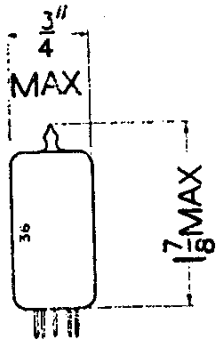
Filament Voltage ...	... 1.4 volts	Anode Voltage ...	... 110 volts max.
	Filament Current ...	... 0.05 amp.	

CHARACTERISTICS

Anode Voltage	... 90 volts	Mutual Conductance ...	... 0.275 mA/V
Anode Current	... 0.15 mA	Anode Impedance ...	... 0.24 meg.
Control Grid Voltage ..	... 0 volts*	Amplification Factor ...	... 65

* *Grid returned to negative filament (Pin 7).*

1L4

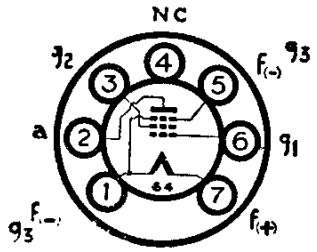


B7G Base

Current Equipment Type

TYPE 1L4

MINIATURE BATTERY R.F. PENTODE



BRIMAR type 1L4 may be used as R.F. or I.F. amplifier in stages where A.V.C. is not applied. It is also suitable for R.C. coupled A.F. amplifier operation.

RATINGS

Filament Voltage	1.4 volts
Filament Current	0.05 amp
Anode Voltage	110 volts max.
Screen (g_2) Voltage	90 volts max.
Cathode Current	6.5 mA max.

CHARACTERISTICS

Anode Voltage	90	90	volts
Anode Current	2.9	4.5	mA
Screen Voltage	67.5	90	volts
Screen Current	1.2	2.0	mA
Control Grid (g_1) Voltage	0	0	volts*
Mutual Conductance	0.93	1.03	mA/V
Anode Impedance	0.6	0.35	meg.
Control Grid Voltage	—6	—8	volts

(For Anode current of 0.01 mA)

RESISTANCE COUPLED OPERATION

Anode and Screen Supply Voltages	45	67.5	90	volts
Anode Load Resistor	0.5	0.5	1.0	meg.
Screen Series Resistor	0.66	1.5	2.0	meg.
Control Grid Resistor	1.0	1.0	1.0	meg.*
Peak Output	17	30	35	volts
Voltage Gain	30	45	55	—

(For 6 volts peak output, distortion 2%)

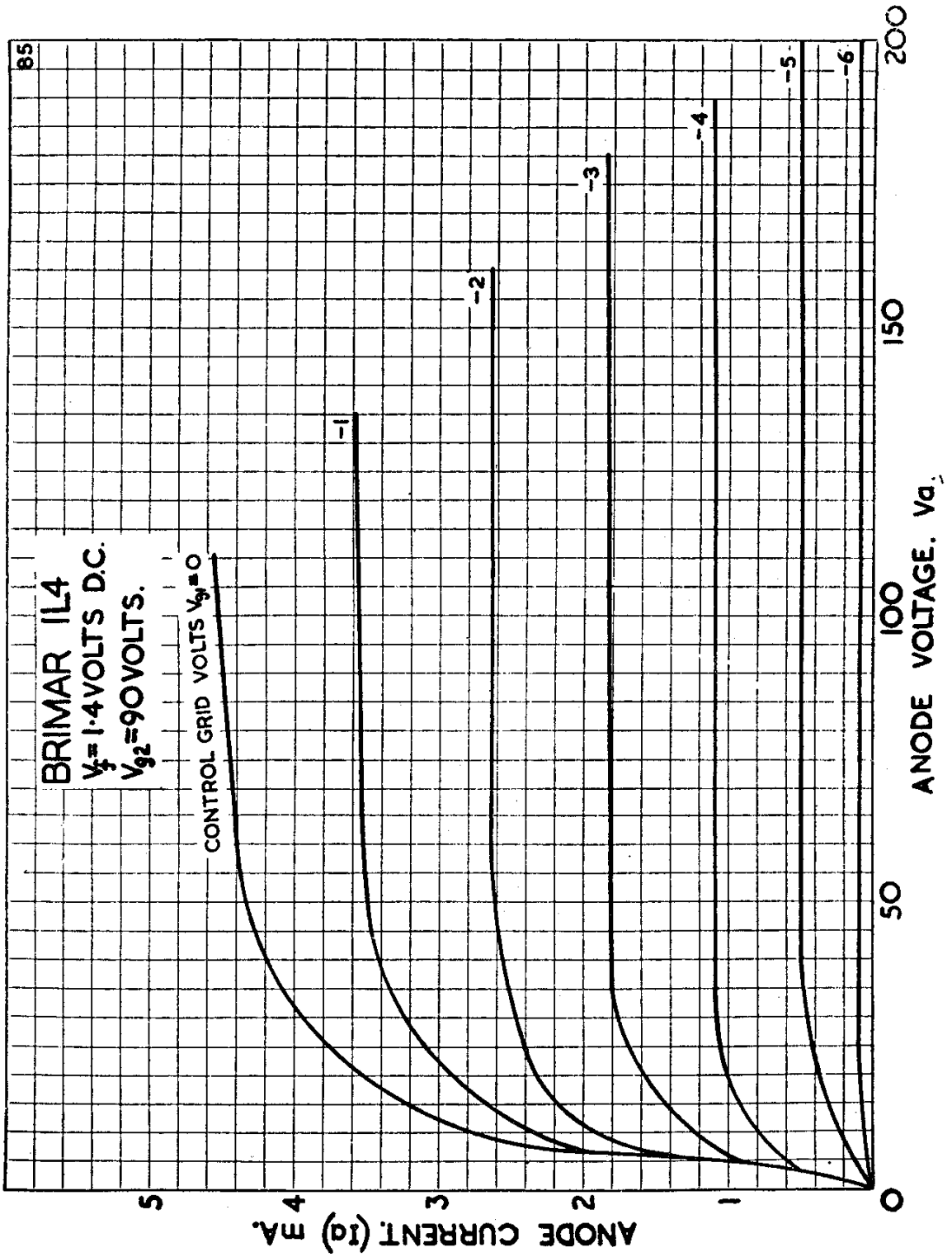
**The Grid return should be made to negative filament (pin 1) via a resistance of at least 0.5 meg. to minimize variations due to contact potential.*

INTER-ELECTRODE CAPACITANCES †

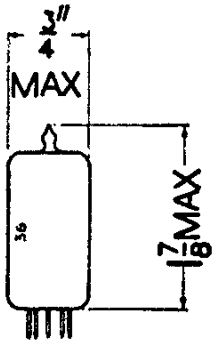
Input	3.6	pF
Output	7.5	pF
Control Grid to Anode	0.008	pF max.

† *With no external shield.*

Type 1L4 *is a commercial equivalent to the* CV1758


BRIMAR 1L4
V_f = 1·4 VOLTS D.C.
V_{g2} = 90 VOLTS.
CONTROL GRID VOLTS V_{g1} = 0
-1
-2
-3
-4
-5
-6
85
ANODE CURRENT (Ia) mA.
0
1
2
3
4
5
ANODE VOLTAGE, Va.
0
50
100
150
200

1R5
1S4

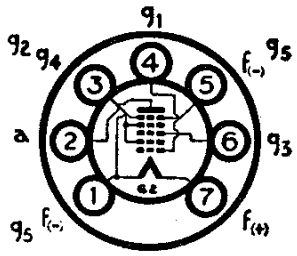


B7G Base

Replacement Type

TYPE 1R5

MINIATURE BATTERY HEPTODE FREQUENCY CHANGER



RATINGS

Filament Voltage	1.4 volts
Filament Current	0.05 amp.
Anode Voltage	90 volts max.
Screen (g_2, g_4) Voltage	67.5 volts max.
Cathode Current	5.5 mA max.

OPERATING CHARACTERISTICS

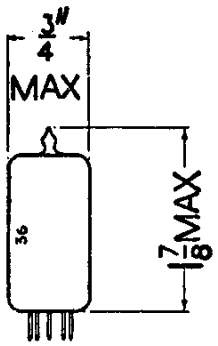
Anode Voltage	45	90	90	volts
Anode Current	0.7	0.8	1.6	mA
Screen Voltage	45	45	67.5	volts
Screen Current	1.9	1.9	3.2	mA
Oscillator Grid (g_1) Resistor	0.1	0.1	0.1	meg.
Oscillator Grid Current	0.15	0.15	0.25	mA
Control Grid (g_3) Voltage	0	0	0	volts
Anode Impedance	0.6	0.8	0.6	meg.
Conversion Conductance	0.24	0.25	0.3	mA/V
Control Grid Bias	−9	−9	−14	volts

(For conversion conductance of 0.005 mA/V)

INTER-ELECTRODE CAPACITANCES *

R.F. Input (Control Grid to all other electrodes)	7.0 pF
I.F. Output (Anode to all other electrodes)	7.0 pF
Oscillator Input (Oscillator Grid to other electrodes)	3.8 pF
Control Grid to Oscillator Grid	0.2 pF max.
Oscillator Grid to Anode	0.1 pF max.
Control Grid to Anode	0.4 pF max.

** With no external shield.*

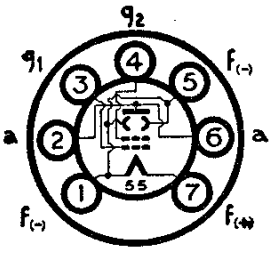


B7G Base

Replacement Type

TYPE 1S4

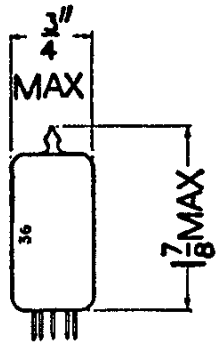
MINIATURE BATTERY OUTPUT BEAM TETRODE



OPERATING CHARACTERISTICS

Filament Voltage ... 1.4 volts Filament Current ... 0.1 amp.

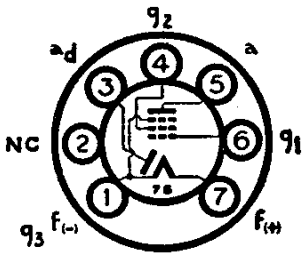
For characteristics refer to type 3S4 (parallel filament connection)



B7G Base

Replacement Type

TYPE 1S5
MINIATURE BATTERY DIODE PENTODE



RATINGS

Filament Voltage	1.4 volts	Screen (g_2) Voltage	90 volts max.
Filament Current	0.05 amp.	Cathode Current	3.0 mA max.
Anode Voltage	90 volts max.		

CHARACTERISTICS

Anode Voltage	45	67.5	volts
Anode Current	0.75	1.6	mA
Screen Voltage	45	67.5	volts
Screen Current	0.18	0.4	mA
Control Grid (g_1) Voltage	0	0	volts *
Mutual Conductance	0.50	0.625	mA/V
Anode Impedance	1.0	0.6	meg.

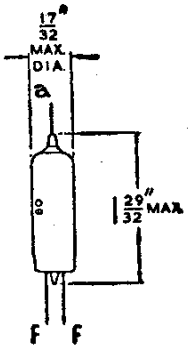
** Control grid return taken to negative filament (Pin 1).*

INTER-ELECTRODE CAPACITANCES †

Input...	2.2 pF	Control Grid to Anode	0.2 pF
Output	2.4 pF	Diode to all other electrodes ...	3.0 pF

† *With no external shield.*

Replacement Type



TYPE 1T2
(WIRE ENDED) HIGH VOLTAGE RECTIFIER

The BRIMAR type 1T2/R16 is a directly heated half-wave rectifier designed for use in the E.H.T. supply of television receivers.

RATINGS

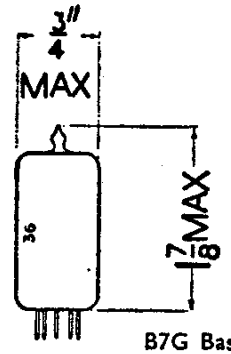
Filament Voltage	1.4 volts*
Filament Current	0.14 amp.
Peak Inverse Voltage	15 kV. max.
Peak Anode Current	12 mA max.
Direct Anode Current	2 mA max.

INTER-ELECTRODE CAPACITANCES

Anode to Filament ($C_{a,f}$)	0.65 pF

** Correct filament operation is essential in order to secure long life. Filament temperature during normal operation may be compared with that of a second valve running from a low frequency filament supply whose voltage can be accurately measured. At least 1 inch of leads should be allowed when soldering the valve into position to avoid damage to the glass seals.*

1T4
1U5
1X2B
(see type R19)
2A3

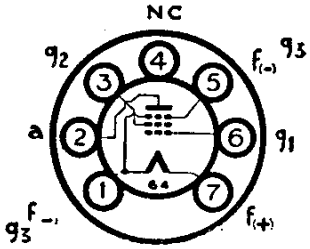


B7G Base

Replacement Type

TYPE 1T4

MINIATURE VARI-MU BATTERY R.F. PENTODE



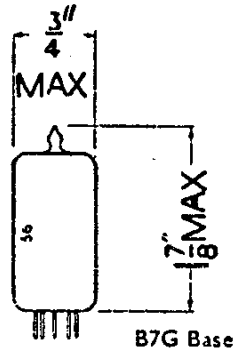
RATINGS

Filament Voltage ...	... 1.4 volts	Anode Voltage ...	... 90 volts max.
Filament Current ...	... 0.05 amp.	Screen (g_2) Voltage	... 67.5 volts max.
	Cathode Current ...	... 5.5 mA max.	

CHARACTERISTICS

Anode Voltage	45	90	90 volts
Anode Current	1.7	1.8	3.5 mA
Screen Voltage	45	45	67.5 volts
Screen Current	0.7	0.65	1.4 mA
Control Grid (g_1) Voltage	0	0	0 volts *
Mutual Conductance	0.7	0.75	0.9 mA/V
Anode Impedance	0.35	0.8	0.5 meg.
Control Grid Bias	—10	—10	—16 volts
(for Mutual Conductance of 0.01 mA V).			

** Control grid return taken to negative filament (Pin 1)*

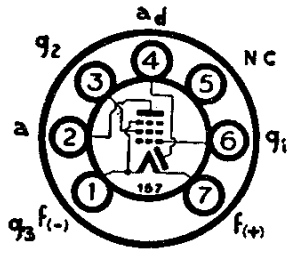


B7G Base

Replacement Type

TYPE 1U5

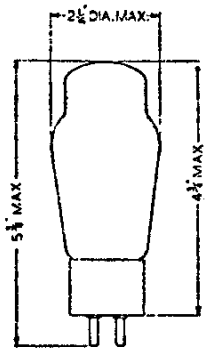
MINIATURE BATTERY DIODE PENTODE



RATINGS

Filament Voltage	1.4 volts	Filament Current	0.05 amp.
Grid to Diode Capacity ...	0.03 pF	Grid to Anode Capacity ...	0.1 pF

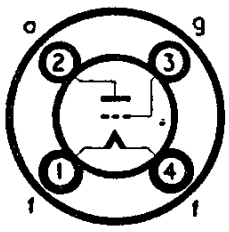
All other characteristics are identical to those of type 1S5.



Obsolescent Type

TYPE 2A3

(U.X. BASE) POWER TRIODE

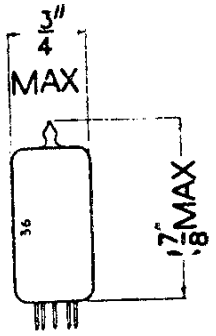


CHARACTERISTICS (CLASS "A")

Filament Voltage ...	... 2.5 volts	Cathode Bias Resistor	... 750 ohms
Filament Current ...	... 2.5 amp.	Mutual Conductance	... 5.2 mA V
Anode Voltage ...	... 250 volts	Anode Impedance ...	... 800 ohms
Anode Current ...	... 60 mA	Optimum Load ..	... 2,500 ohms
Control Grid Voltage	... -45 volts	Power Output .	... 3.5 watts

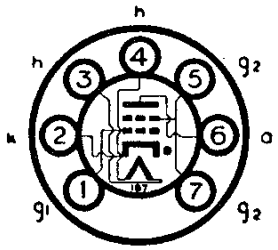
2D21

Current Equipment Type



B7G Base

TYPE 2D21
MINIATURE
HOT CATHODE
GAS FILLED
THYRATRON



RATINGS

Heater Voltage	6.3 volts
Heater Current	0.6 amp.
Cathode Heating Time	10 secs. min.
Peak Forward Anode Voltage	650 volts max.
Peak Inverse Voltage	1,300 volts max.
Peak Screen Grid Voltage before Conduction	–100 volts max.
†Average Screen Grid Voltage during Conduction	–10 volts max.
Peak Control Grid Voltage before Conduction	–100 volts max.
Peak Cathode Current	0.5 amp. max.
†Average Cathode Current	0.1 amp. max.
Surge Current (Duration 0.1 sec. max.)	10 amps. max.
†Average Screen Current	0.01 amp. max.
†Average Control Grid Current	0.01 amp. max.
Grid Circuit Resistance	10 MΩ max.
Peak Heater-Cathode Voltage, Heater Negative	100 volts max.
Peak Heater-Cathode Voltage, Heater Positive	25 volts max.
Ambient Temperature Range	–75°C. to 90°C.

† *Averaged over any interval of 30 seconds.*

OPERATING CHARACTERISTICS

Voltage Drop	8 volts approx.
Control Grid Control Ratio ($Rg_1 = 0\,\Omega$)	250 approx.
Screen Grid Control Ratio ($Rg_2 = 0\,\Omega$)	1,000 approx.

RELAY SERVICE

Anode Voltage	117	460	volts R.M.S.
Direct Screen Grid Voltage	0	0	volts
Control Grid Voltage (180° out of phase with Va)	5	—	volts R.M.S.
Direct Control Grid Voltage	—	–6	volts
Control Grid Signal Voltage	5	6	volts peak
Control Grid Circuit Resistance	1.0	1.0	MΩ
*Anode Circuit Resistance	1.2	2.0	kΩ

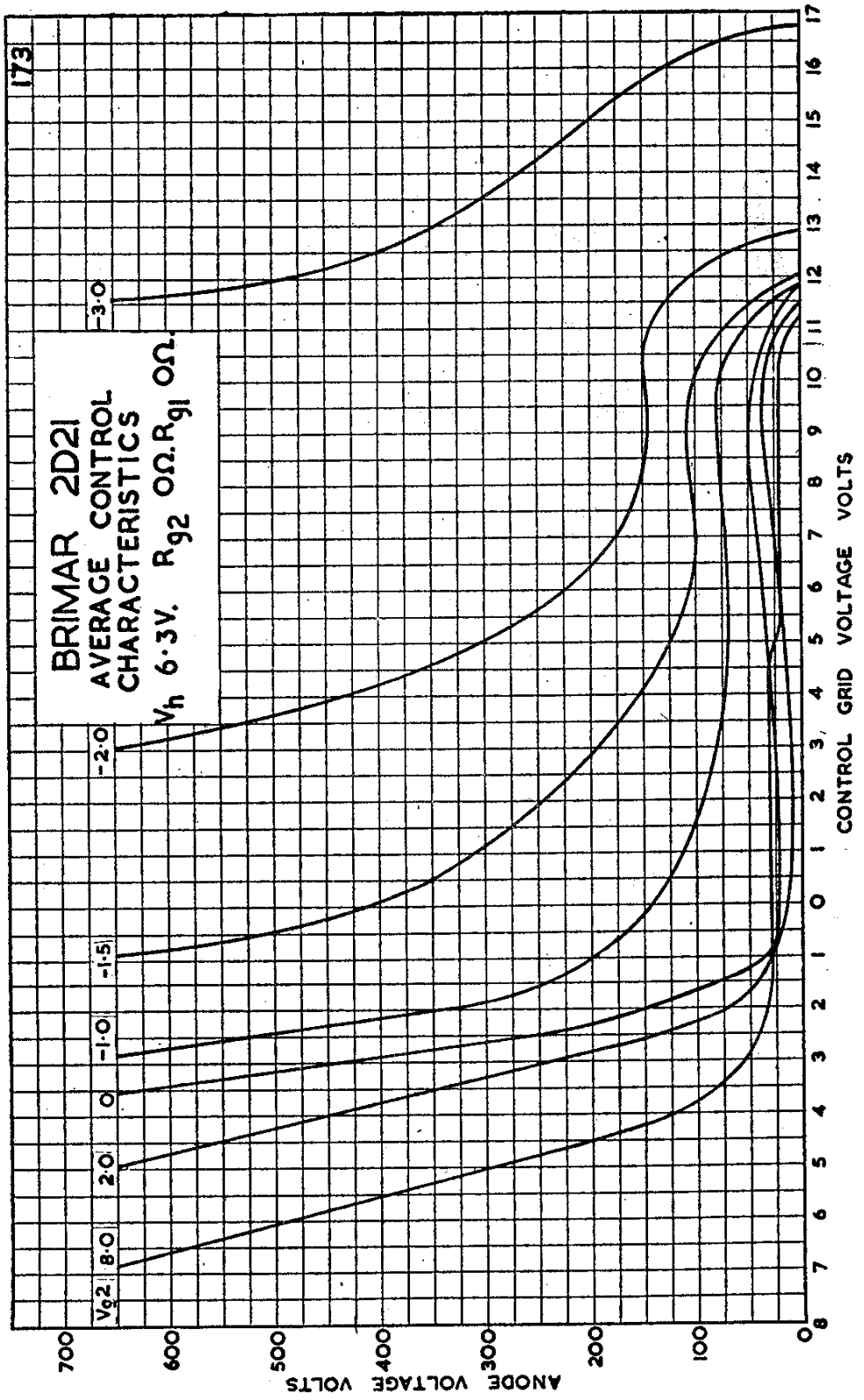
* *Anode circuit resistance, including the valve load, must be sufficient to prevent the cathode current from exceeding the valve ratings.*

INTER-ELECTRODE CAPACITANCES

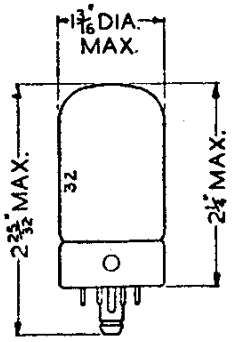
Grid to Anode	0.026 pF	Output	1.6 pF
Input	2.4 pF		

Type 2D21 is a commercial equivalent to the CV797.

2D21

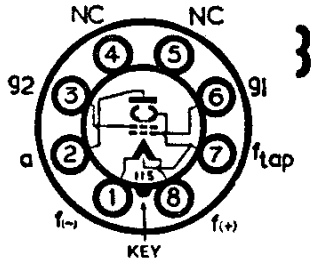

BRIMAR 2D21
AVERAGE CONTROL CHARACTERISTICS
V_h 6·3V. R_{g2} OΩ. R_{g1} OΩ.
173
-3·0
-2·0
-1·5
-1·0
0
2·0
8·0
V_{g2}
ANODE VOLTAGE VOLTS
CONTROL GRID VOLTAGE VOLTS

3D6
3Q4
3Q5GT



Replacement Type

TYPE 3D6
(LOCTAL BASE)
BATTERY OUTPUT
BEAM TETRODE

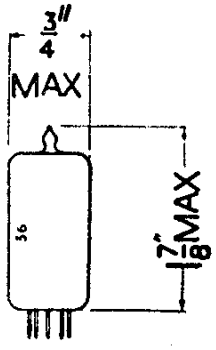


RATINGS

Filament Voltage	2.8	or 1.4	volts
Filament Current	0.11	or 0.22	amp.
Anode Voltage	180		volts max. (Absolute)
Screen (g_2) Voltage	135		volts max.
Cathode Current	30		mA max.

OPERATING CHARACTERISTICS (Parallel Filaments)

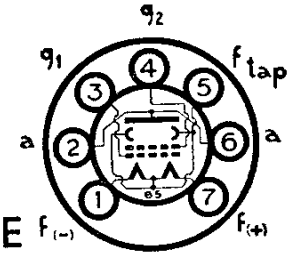
Anode Voltage	90	135	volts
Anode Current	9.5	9.8	mA
Screen Voltage	90	90	volts
Screen Current	1.6	1.2	mA
Control Grid (g_1) Voltage	–4.5	–4.5	volts
Anode Impedance	0.10	0.15	meg.
Mutual Conductance	2.4	2.4	mA/V
Optimum Load	8,000	12,000	ohms
Power Output	0.27	0.5	watts



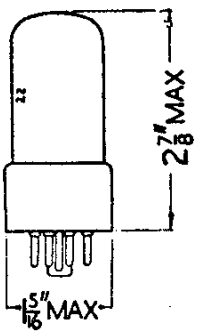
B7G Base

Replacement Type

TYPE 3Q4
MINIATURE BATTERY
OUTPUT BEAM TETRODE

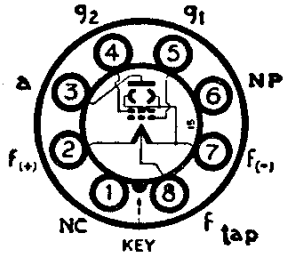


Except for the base connections, type 3Q4 is identical to type 3V4, to which reference should be made.



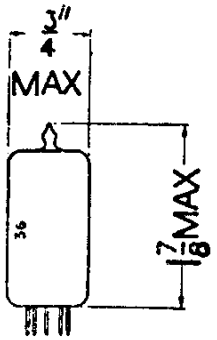
Obsolescent Type

TYPE 3Q5GT
BATTERY OUTPUT
BEAM TETRODE



Characteristics and ratings are similar to those of type 3V4.

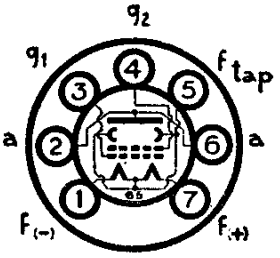
3S4



B7G Base

Replacement Type

TYPE 3S4
MINIATURE BATTERY OUTPUT BEAM TETRODE



RATINGS

	Parallel Filaments	Series Filaments†	
Filament Voltage	1.4	2.8	volts
Filament Current	0.1	0.05	amp.
Anode Voltage	90	90	volts max.
Screen (g_2) Voltage	67.5	67.5	volts max.
Cathode Current (no signal) ...	9.0	4.5††	mA max.
Cathode Current (max. signal) ...	11.0	5.5††	mA max.

OPERATING CHARACTERISTICS

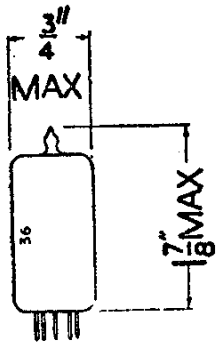
	Parallel Filaments		Series Filaments†		
Anode Voltage	67.5	90	67.5	90	volts
Anode Current	7.2	7.4	6.0	6.1	mA
Screen Voltage	67.5	67.5	67.5	67.5	volts
Screen Current	1.5	1.4	1.2	1.1	mA
Control Grid (g_1) Voltage ...	−7.0	−7.0	−7.0	−7.0	volts*
Mutual Conductance	1.55	1.575	1.4	1.425	mA/V
Anode Impedance	0.1	0.1	0.1	0.1	meg.
Optimum Load	5,000	8,000	5,000	8,000	ohms
Power Output	0.18	0.27	0.16	0.235	watts
Harmonic Distortion	10	12	12	13	per cent.

† *For series operation of the sections, a shunting resistor must be connected across the section between Pins No. 1 and No. 5 to by-pass any cathode current in excess of the rated maximum per section. When other tubes in series-filament arrangement contribute to the filament current of the 3S4, an additional shunting resistor may be required between Pins No. 1 and No. 7.*

†† *Values are for each 1.4 volt section.*

* *Control grid volts measured from negative filament (Pin 5 in parallel connection, Pin 1 in series connection).*

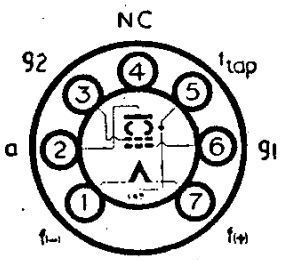
3V4
4D1



Replacement Type

TYPE 3V4

BATTERY OUTPUT BEAM TETRODE



RATINGS

	Series Filaments†	Parallel Filaments	
Filament Voltage	2.8	1.4	volts
Filament Current	0.05	0.1	amp.
Anode Voltage	90	90	volts max.
Screen (g_2) Voltage	90	90	volts max.
Cathode Current	6 *	12	mA max.

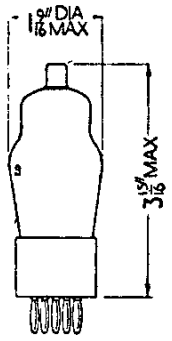
OPERATING CHARACTERISTICS

	Series Filaments†	Parallel Filaments	
Anode Voltage	90	90	volts
Anode Current	7.7	9.5	mA
Screen Voltage	90	90	volts
Screen Current	1.7	2.1	mA
Control Grid (g_1) Voltage	—4.5	—4.5	volts
Mutual Conductance	2.0	2.15	mA/V
Anode Impedance	0.12	0.1	meg.
Optimum Load	10,000	10,000	ohms.
Power Output	0.24	0.27	watts
Harmonic Distortion	7	7	per cent.

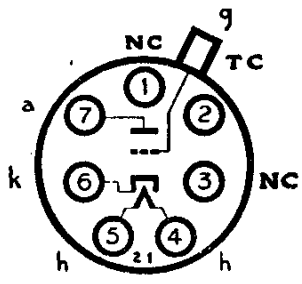
† *For series operation of the sections, a shunting resistor must be connected across the section between Pins No. 1 and No. 5 to by-pass any cathode current in excess of the rated maximum per section. When other types in series-filament arrangement contribute to the filamer current of the 3V4, an additional shunting resistor may be required between Pins No. 1 and No. 7.*

* *Values are for each 1.4 volt section.*

Obsolescent Type



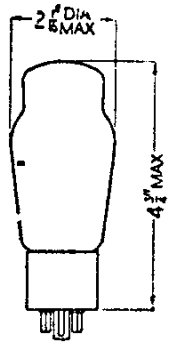
TYPE 4D1
(ENGLISH BASE)
GENERAL PURPOSE TRIODE



CHARACTERISTICS

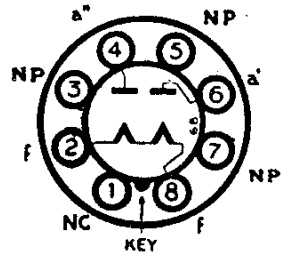
Heater Voltage	13 volts	Cathode Bias Resistor ...	300 ohms
Heater Current	0.2 amp.	Mutual Conductance ...	4.0 mA/V
Anode Voltage	250 volts max.	Anode Impedance ...	10,000 ohms
Anode Current	10 mA	Amplification Factor ...	40
Control Grid Voltage	—3 volts		

5R4GY



Current Equipment Type

TYPE **5R4GY**
(OCTAL BASE)
FULL-WAVE RECTIFIER



The BRIMAR type 5R4GY is a directly heated full wave rectifier for use in A.C. mains equipment where a large output is required.

Filament Voltage ... ... 5.0 volts Filament Current ... ... 2.0 amps.

RATINGS

Peak Inverse Voltage	2,800 volts max.
Peak Current (each Anode)	650 mA max.
Peak Surge Current	2.5 amps. max.
Anode Supply Voltage	—see Rating Chart I
D.C. Output Current	—see Rating Chart I

CHARACTERISTICS AS FULL-WAVE RECTIFIER

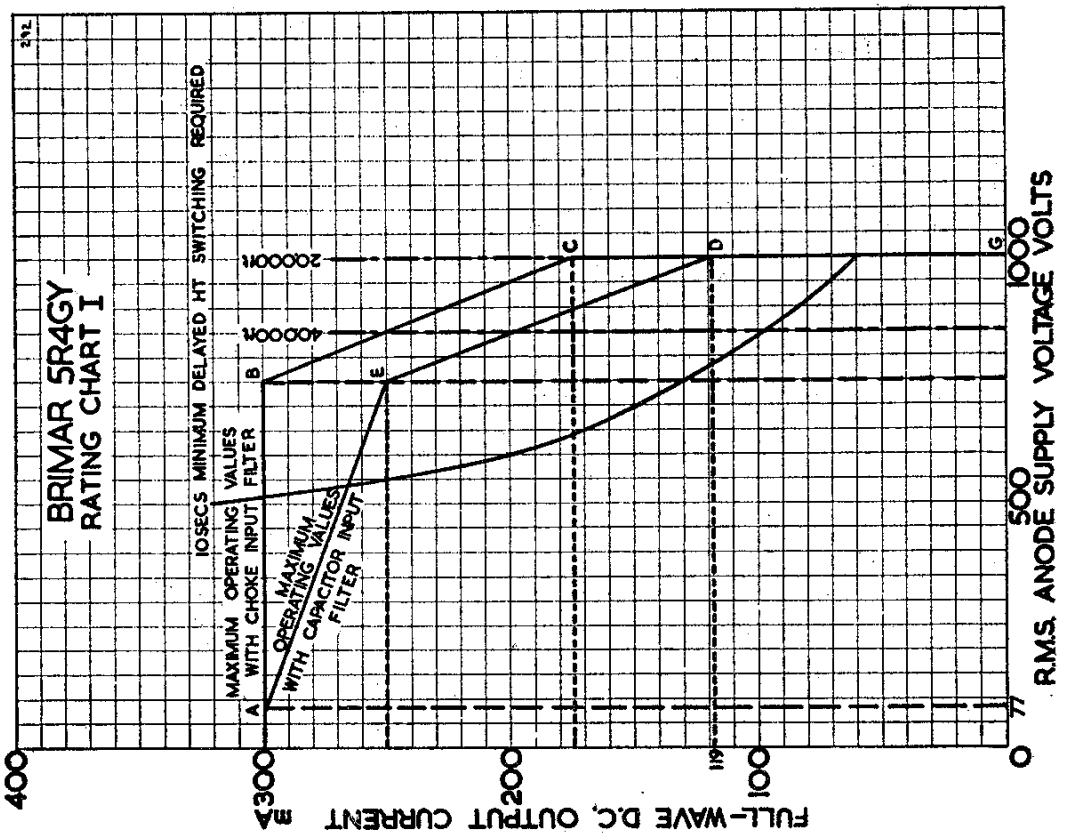
CAPACITOR INPUT‡		CHOKE INPUT	
R.M.S. Input per Anode ...	750 volts	R.M.S. Input per Anode ...	1,000 volts
Rectified Current	250 mA	Rectified Current	175 mA
D.C. Output Voltage... ...	620 volts	D.C. Output Voltage... ...	870 volts
Supply Impedance per Anode	505 Ω	Minimum Filter Input Choke†	5 Henries
Reservoir capacitor	8 μF		

† *Limiting value at 170 mA. For operating currents less than 170 mA refer to curve.*

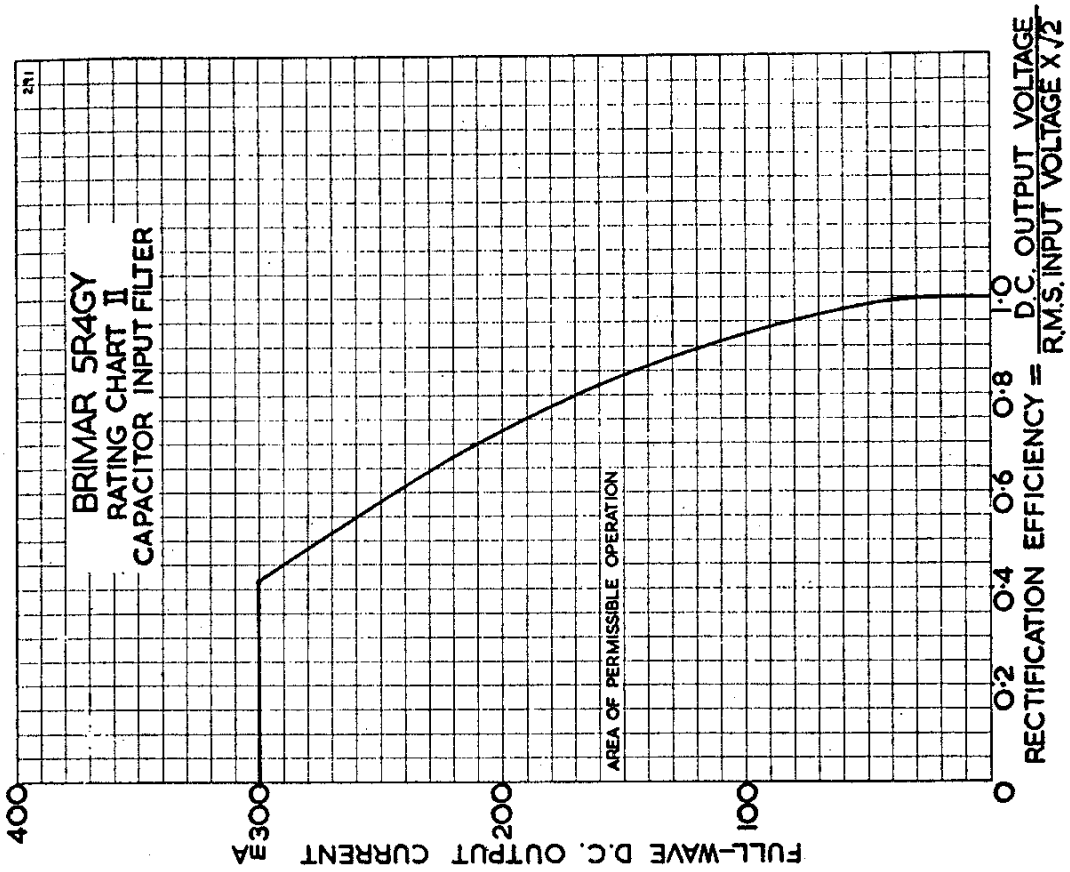
‡ *Delayed switching of approx. 10 seconds MUST BE EMPLOYED when the following ratings are exceeded with Capacitor Input Filter.*

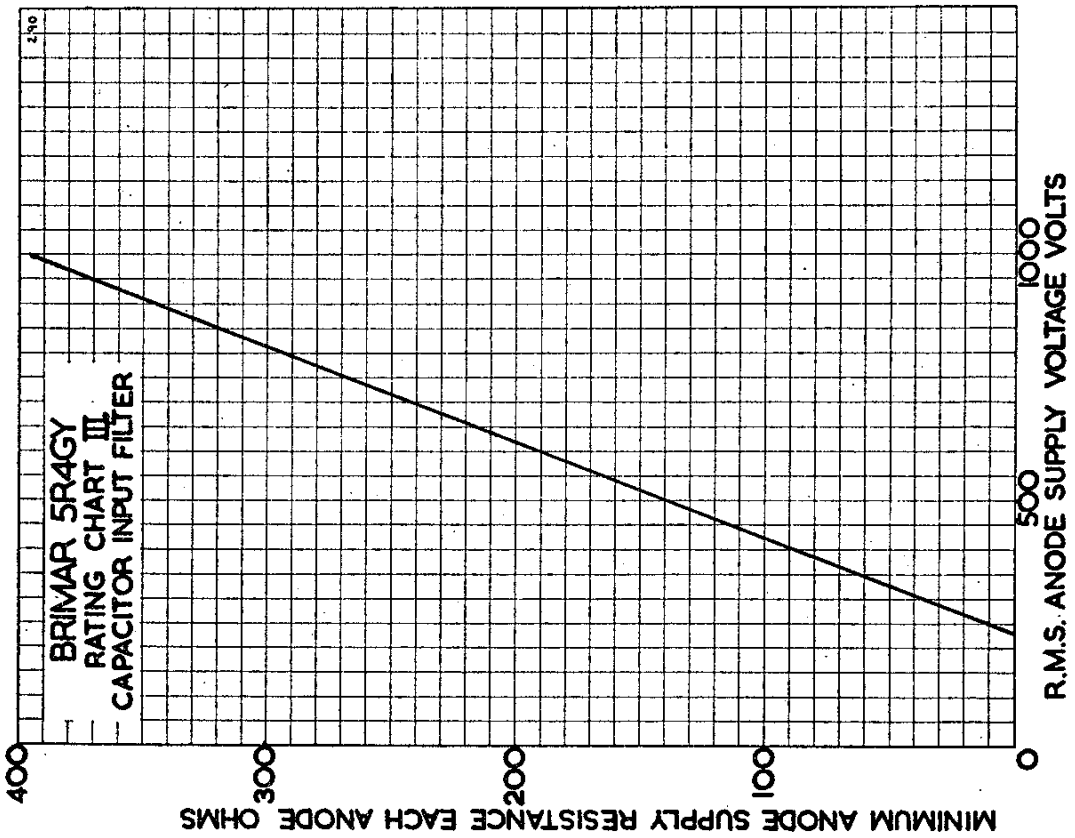
550 volts R.M.S. at 250 mA D.C.
600 volts R.M.S. at 200 mA D.C.
650 volts R.M.S. at 175 mA D.C.
700 volts R.M.S. at 150 mA D.C.
800 volts R.M.S. at 115 mA D.C.
900 volts R.M.S. at 75 mA D.C.

For notes on use of rating charts, refer to " Valve Ratings " section.

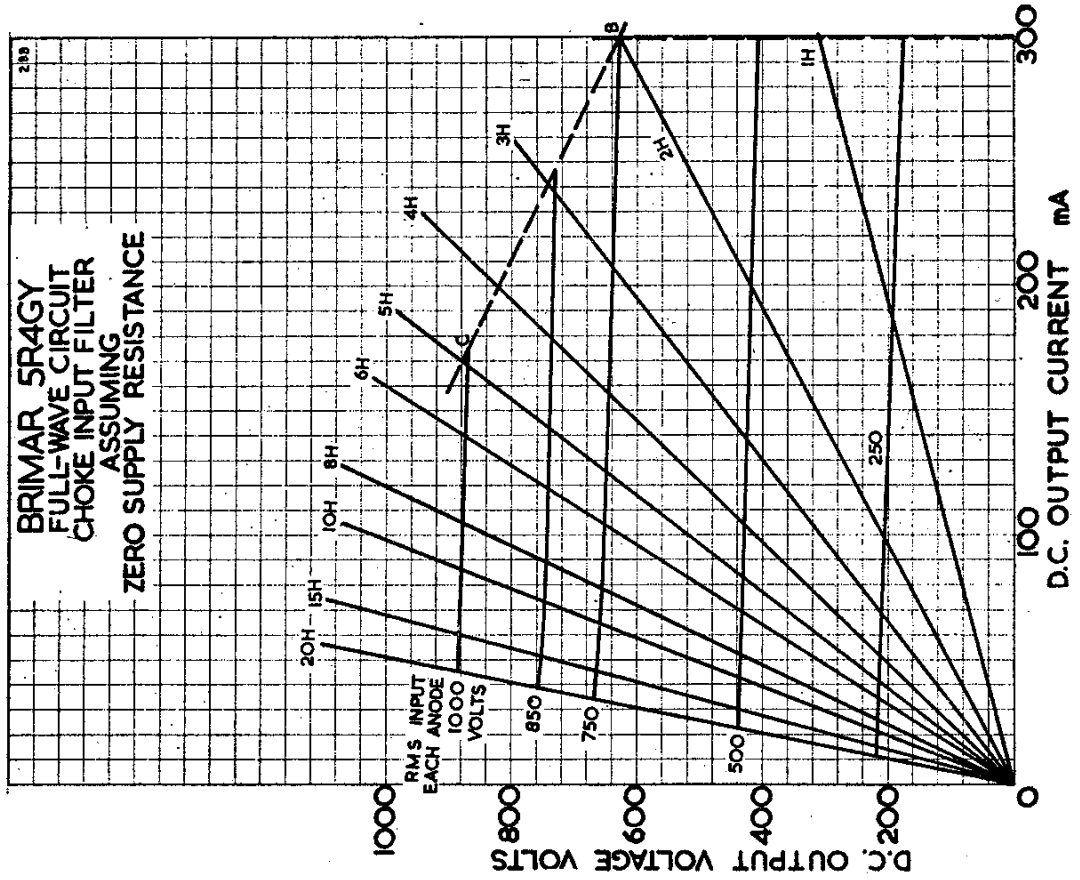


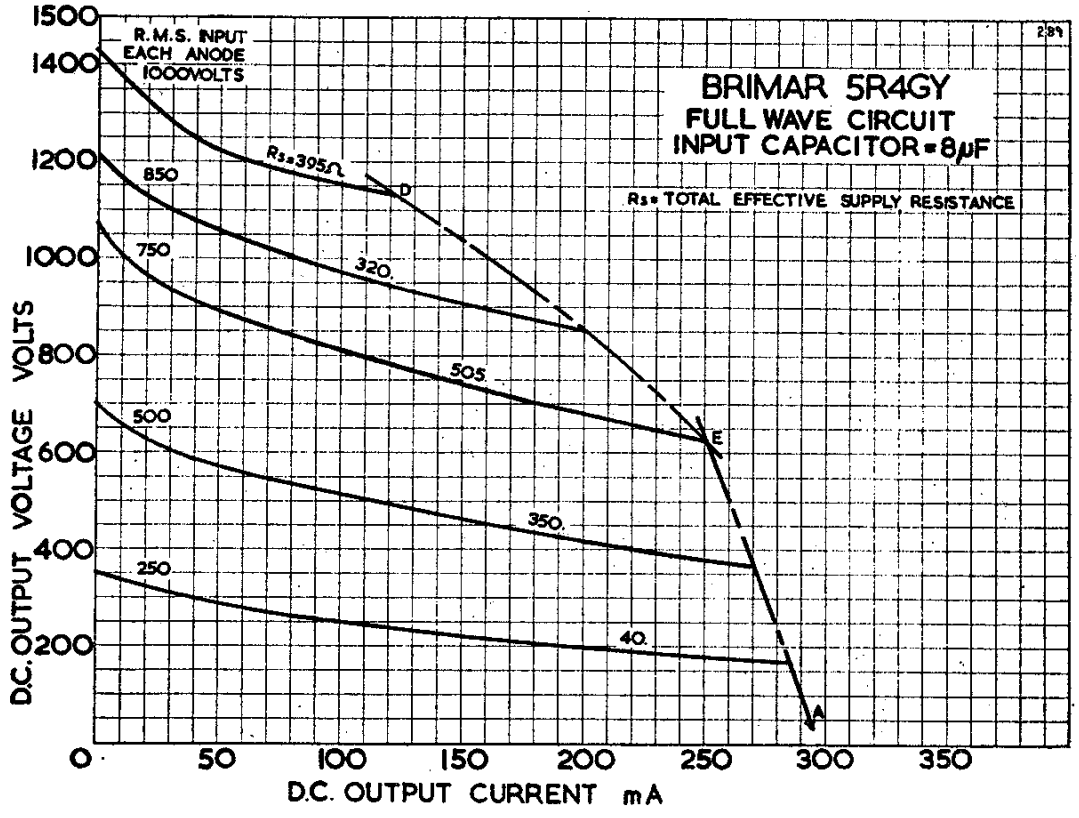
5R4GY


BRIMAR 5R4GY
RATING CHART II
CAPACITOR INPUT FILTER
AREA OF PERMISSIBLE OPERATION
FULL-WAVE D.C. OUTPUT CURRENT mA
400
300
200
100
0
0·2
0·4
0·6
0·8
1·0
RECTIFICATION EFFICIENCY = D.C. OUTPUT VOLTAGE / R.M.S. INPUT VOLTAGE X √2

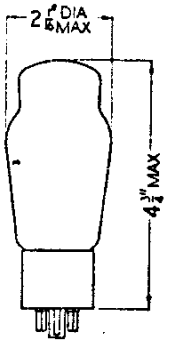

BRIMAR 5R4GY
RATING CHART III
CAPACITOR INPUT FILTER
MINIMUM ANODE SUPPLY RESISTANCE EACH ANODE OHMS
400
300
200
100
0
500
1000
R.M.S. ANODE SUPPLY VOLTAGE VOLTS

5R4GY


BRIMAR 5R4GY
FULL-WAVE CIRCUIT
CHOKE INPUT FILTER
ASSUMING
ZERO SUPPLY RESISTANCE
1H
2H
3H
4H
5H
6H
8H
10H
15H
20H
RMS INPUT EACH ANODE 1000 VOLTS
850
750
500
250
D.C. OUTPUT VOLTAGE VOLTS
D.C. OUTPUT CURRENT mA


R.M.S. INPUT EACH ANODE 1000VOLTS
BRIMAR 5R4GY
FULL WAVE CIRCUIT
INPUT CAPACITOR = 8μF
Rs = TOTAL EFFECTIVE SUPPLY RESISTANCE
Rs=395Ω
850
750
320
505
500
350
250
40
D.C. OUTPUT VOLTAGE VOLTS
D.C. OUTPUT CURRENT mA

5U4G

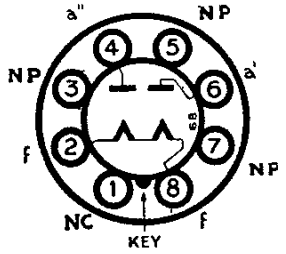


Current Equipment Type

TYPE 5U4G

(OCTAL BASE)

FULL-WAVE RECTIFIER



Filament Voltage ... ... 5.0 volts Filament Current ... ... 3.0 amps.

RATINGS

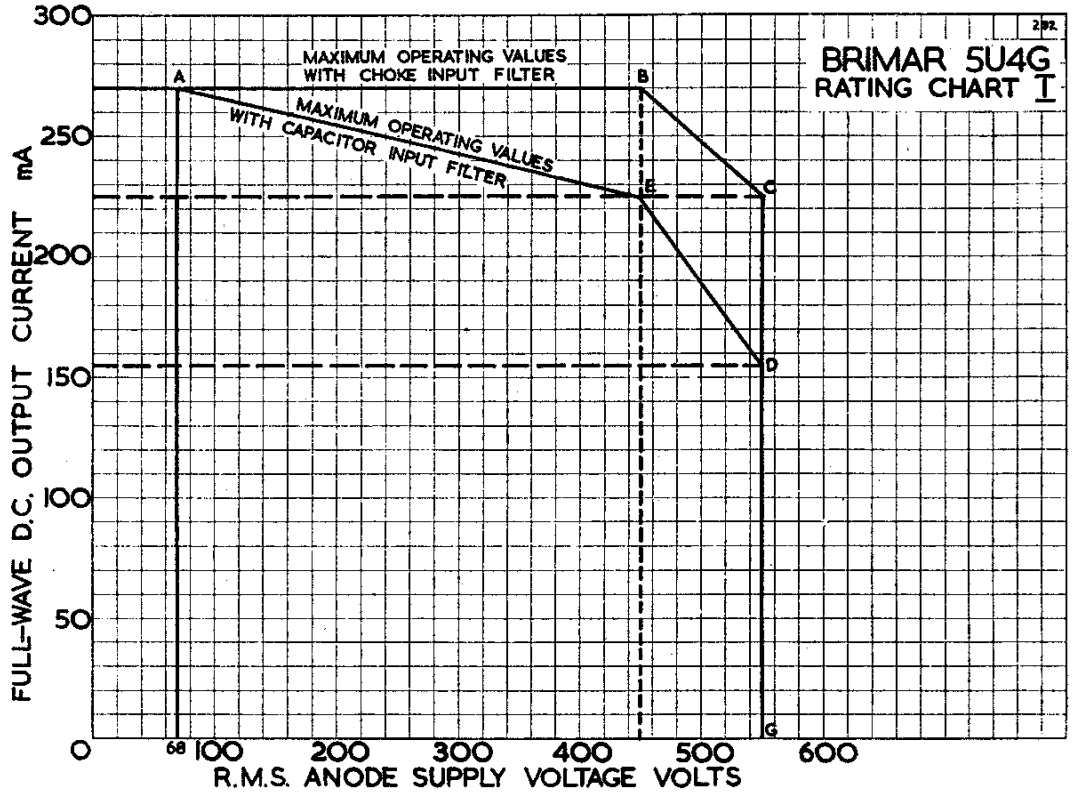
Peak Inverse Voltage	1,550 volts max.
Peak Current (each Anode)	675 mA max.
Peak Surge Current	2.25 amps. max.
Anode Supply Voltage	—see Rating Chart I
D.C. Output Current	—see Rating Chart I

CHARACTERISTICS AS A FULL-WAVE RECTIFIER

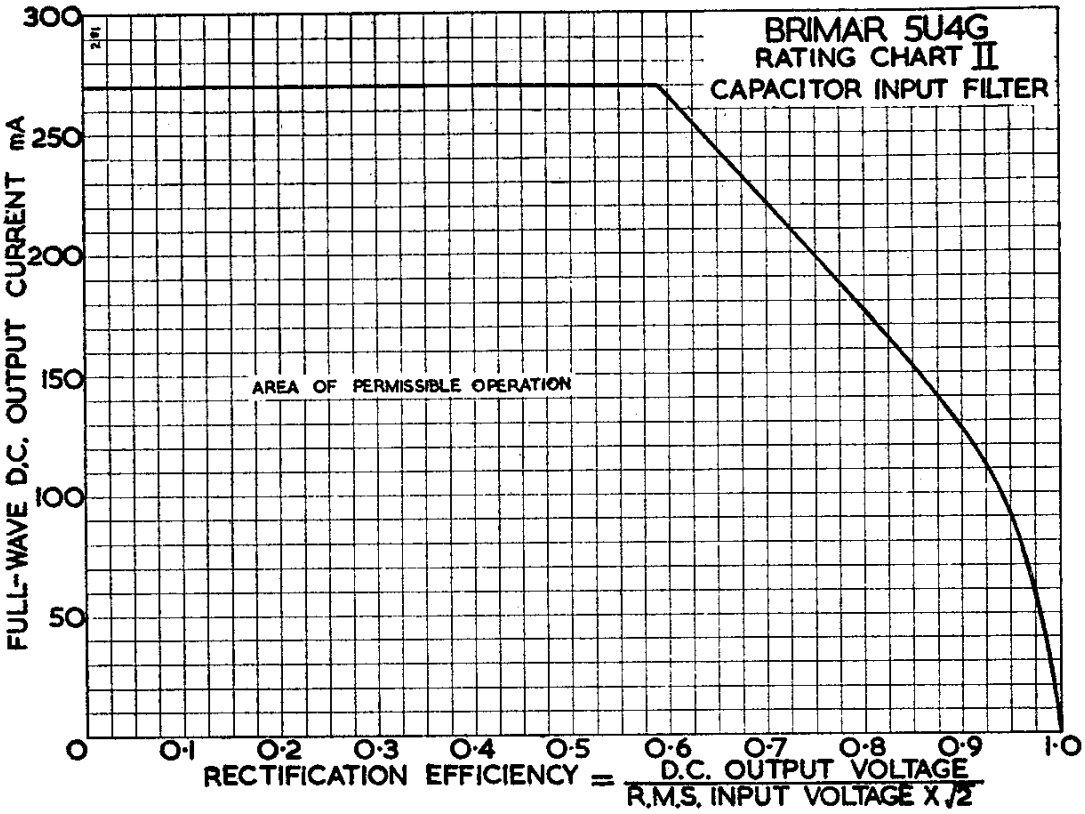
CAPACITOR INPUT		CHOKE INPUT	
R.M.S. Input per Anode ...	450 volts	R.M.S. Input per Anode ...	550 volts
Rectified Current	225 mA	Rectified Current	225 mA
D.C. Output Voltage... ...	430 volts	D.C. Output Voltage... ...	460 volts
Supply Impedance per Anode	145 Ω	Minimum Filter Input Choke†	2 Henries
Reservoir Capacitor	16 μF		

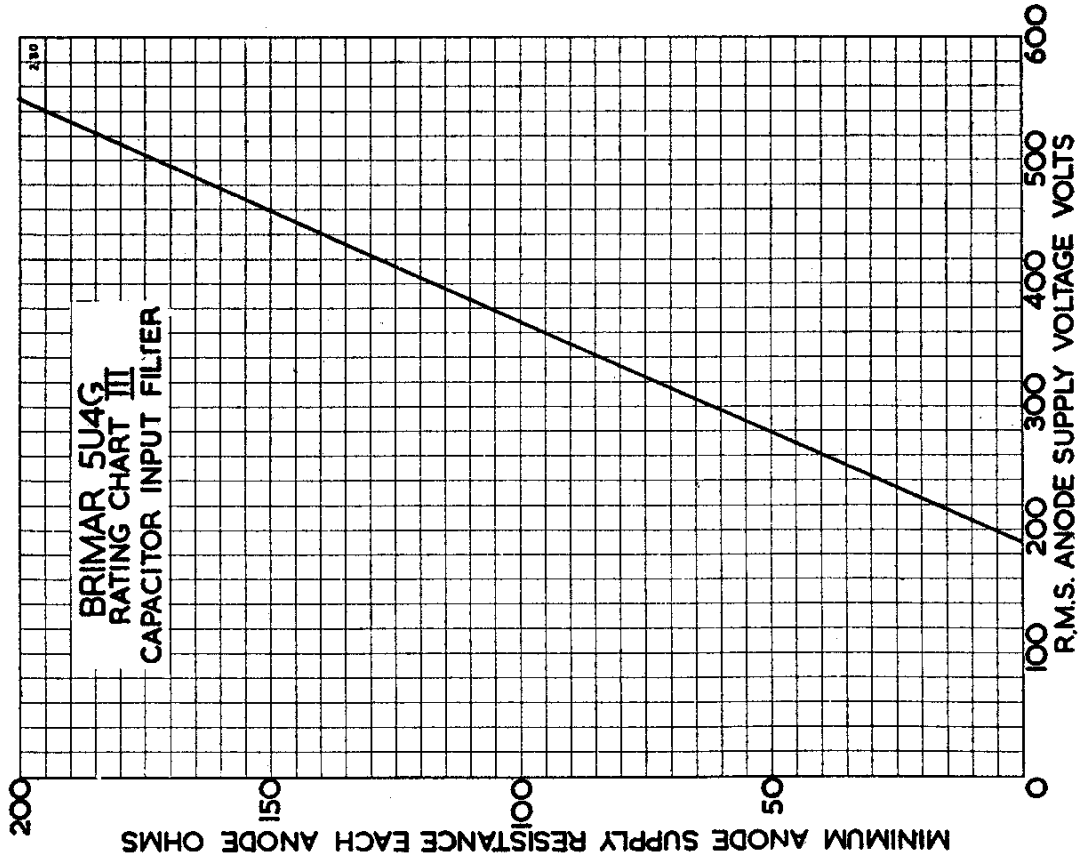
† *Limiting value at 220 mA. For operating currents less than 220 mA refer to curve.*

For notes on use of rating charts, refer to " Valve Ratings " section.

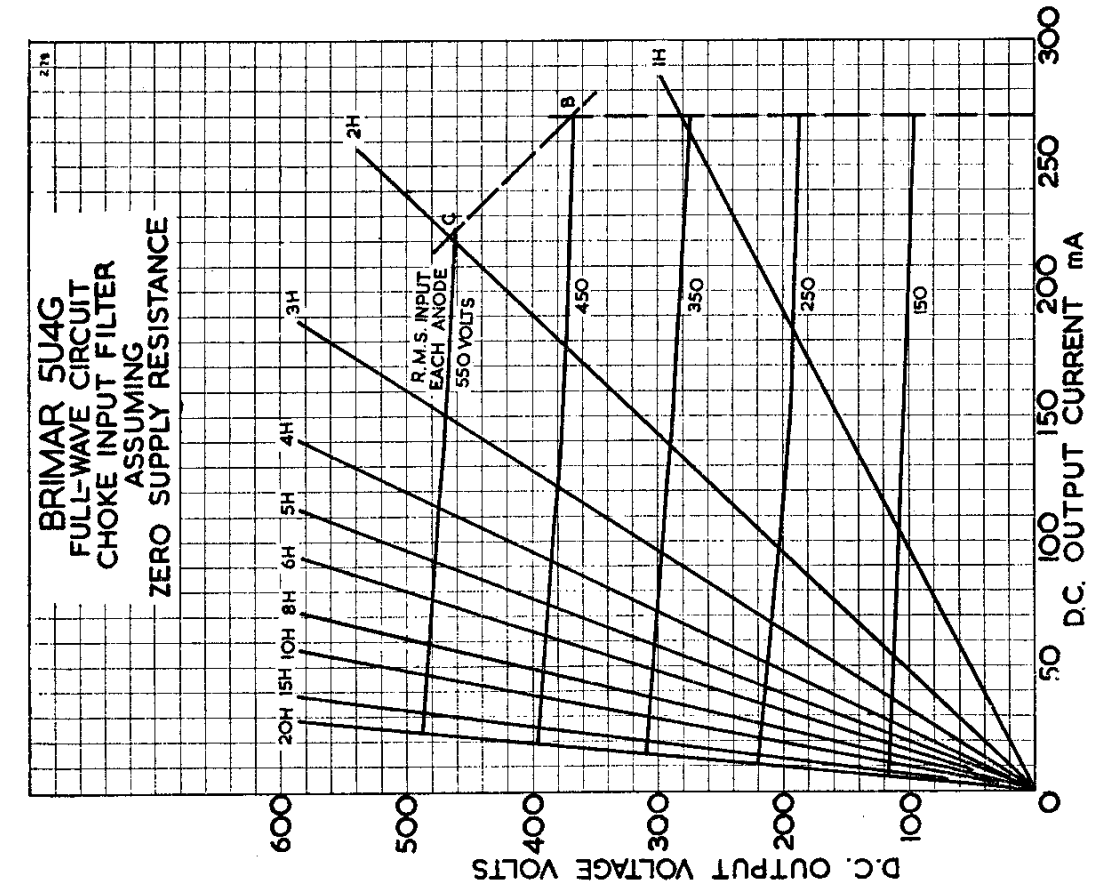


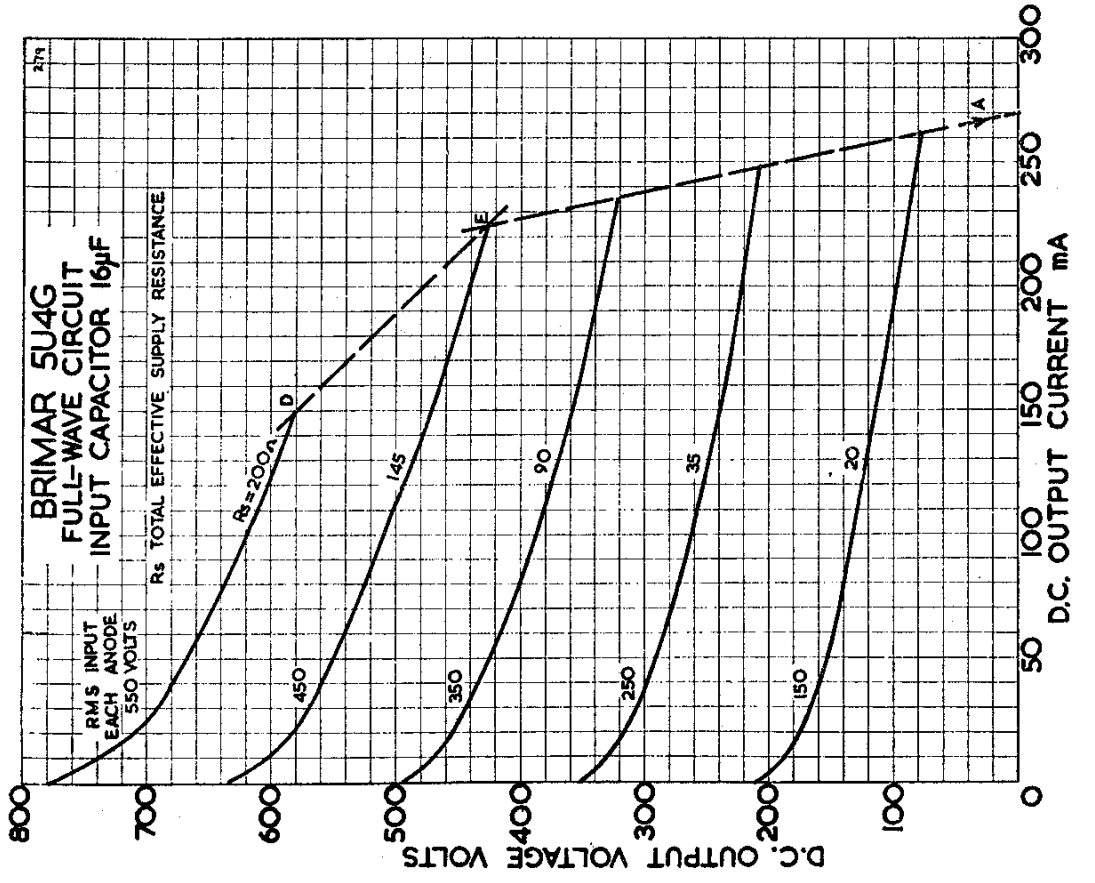
5U4G


BRIMAR 5U4G
RATING CHART II
CAPACITOR INPUT FILTER
AREA OF PERMISSIBLE OPERATION
FULL-WAVE D.C. OUTPUT CURRENT mA
300
250
200
150
100
50
0
0·1
0·2
0·3
0·4
0·5
0·6
0·7
0·8
0·9
1·0
RECTIFICATION EFFICIENCY = D.C. OUTPUT VOLTAGE / R.M.S. INPUT VOLTAGE X √2

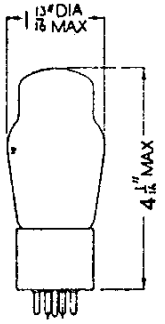

BRIMAR 5U4G
RATING CHART III
CAPACITOR INPUT FILTER
MINIMUM ANODE SUPPLY RESISTANCE EACH ANODE OHMS
200
150
100
50
0
R.M.S. ANODE SUPPLY VOLTAGE VOLTS
600
500
400
300
200
100
0

5U4G


BRIMAR 5U4G
FULL-WAVE CIRCUIT
CHOKE INPUT FILTER
ASSUMING
ZERO SUPPLY RESISTANCE
R.M.S. INPUT EACH ANODE 550 VOLTS
1H
2H
3H
4H
5H
6H
8H
10H
15H
20H
B
C
450
350
250
150
D.C. OUTPUT VOLTAGE VOLTS
D.C. OUTPUT CURRENT mA


BRIMAR 5U4G
FULL-WAVE CIRCUIT
INPUT CAPACITOR 16μF
Rs TOTAL EFFECTIVE SUPPLY RESISTANCE
R.M.S. INPUT EACH ANODE 550 VOLTS
Rs=200Ω
D
E
A
145
90
35
20
450
350
250
150
D.C. OUTPUT VOLTAGE VOLTS
D.C. OUTPUT CURRENT mA

5V4G

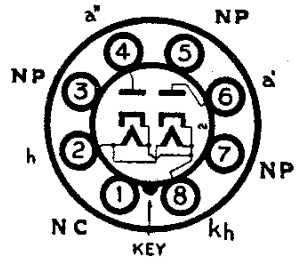


Current Equipment Type

TYPE 5V4G

(OCTAL BASE)

FULL-WAVE RECTIFIER



Filament Voltage ... ... 5.0 volts Filament Current ... ... 2.0 amps.

RATINGS

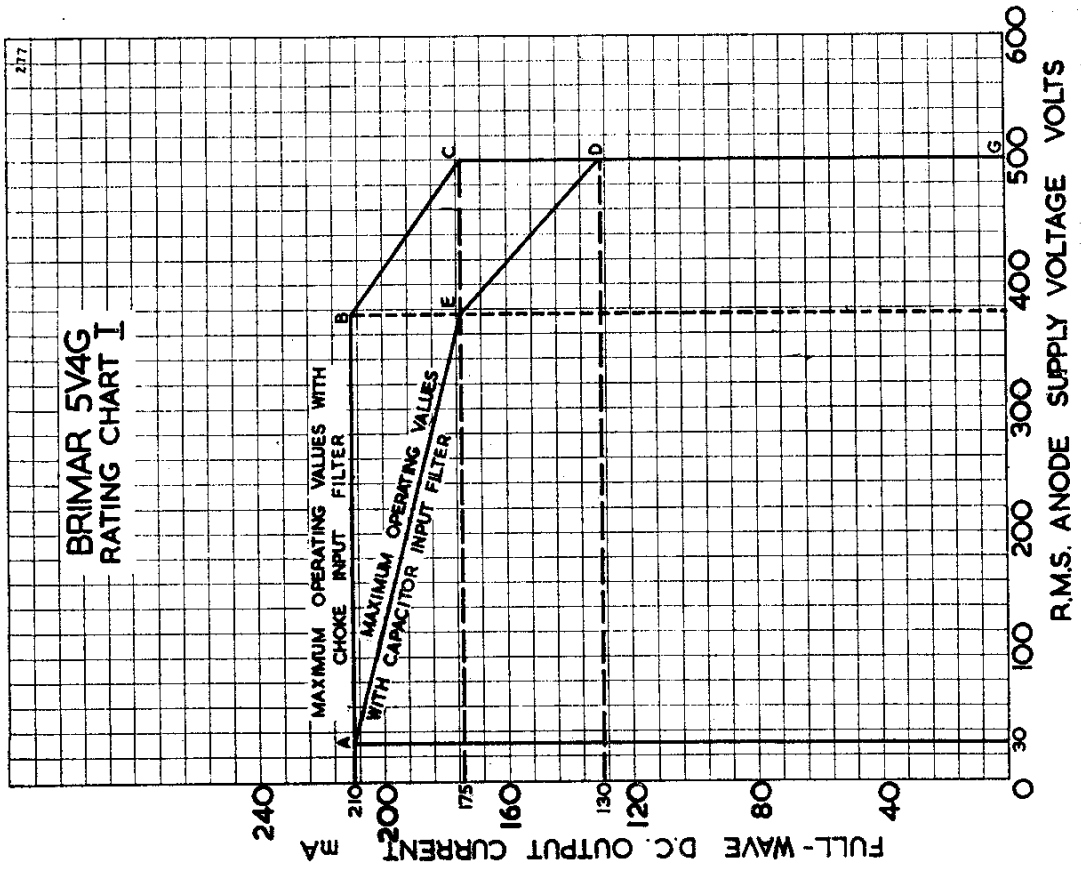
Peak Inverse Voltage	1,400 volts max.
Peak Current (each Anode)	525 mA max.
Peak Surge Current	1.75 amps. max.
Anode Supply Voltage	—see Rating Chart I
D.C. Output Current	—see Rating Chart I

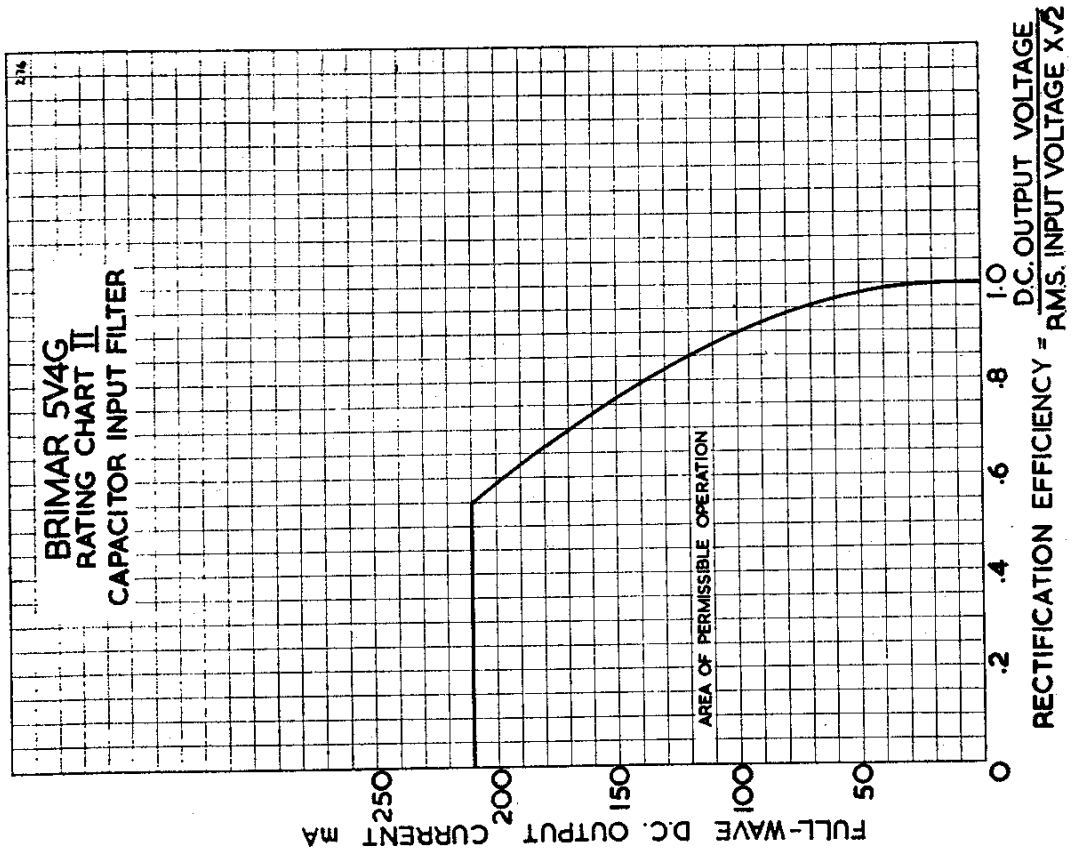
CHARACTERISTICS AS A FULL-WAVE RECTIFIER

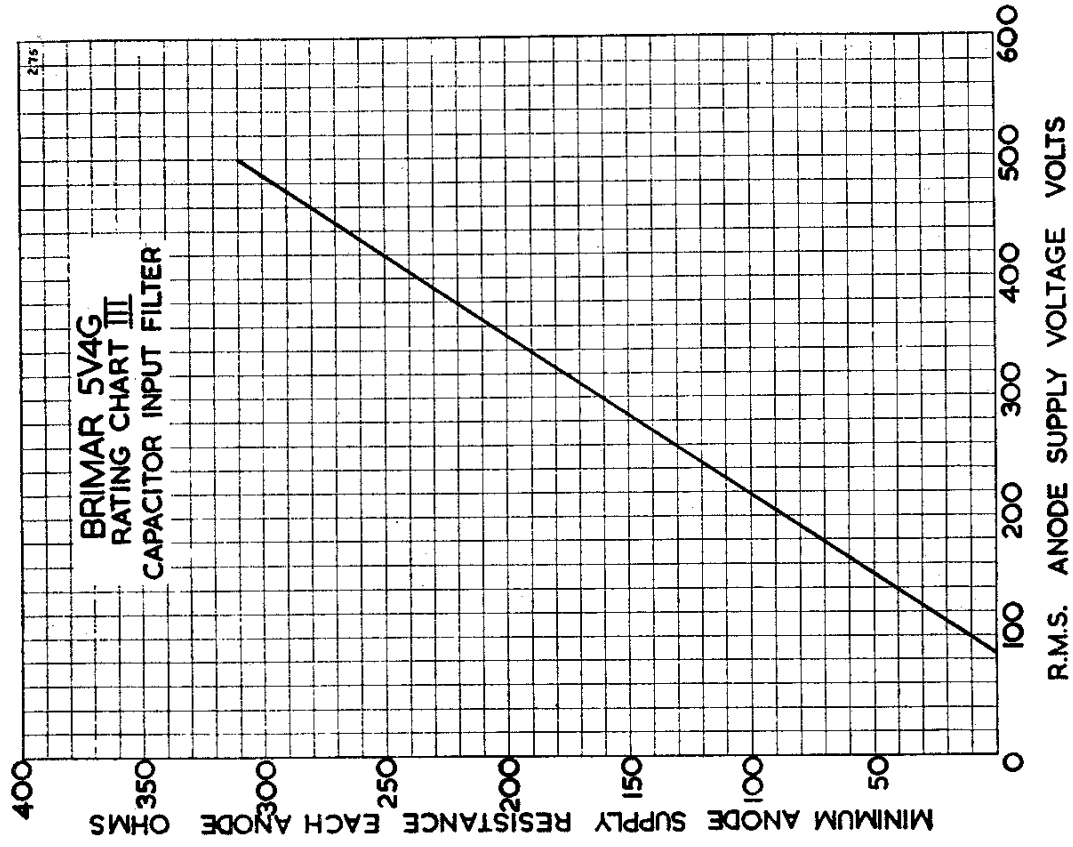
CAPACITOR INPUT		CHOKE INPUT	
R.M.S. Input per Anode ...	375 volts	R.M.S. Input per Anode ...	500 volts
Rectified Current	175 mA	Rectified Current	175 mA
D.C. Output Voltage... ...	360 volts	D.C. Output Voltage... ...	320 volts
Supply Impedance per Anode	250 Ω	Minimum Filter Input Choke†	3 Henries
Reservoir Capacitor	16 μF		

† *Limiting value at* 140 *mA. For operating currents less than* 140 *mA, refer to curve.*

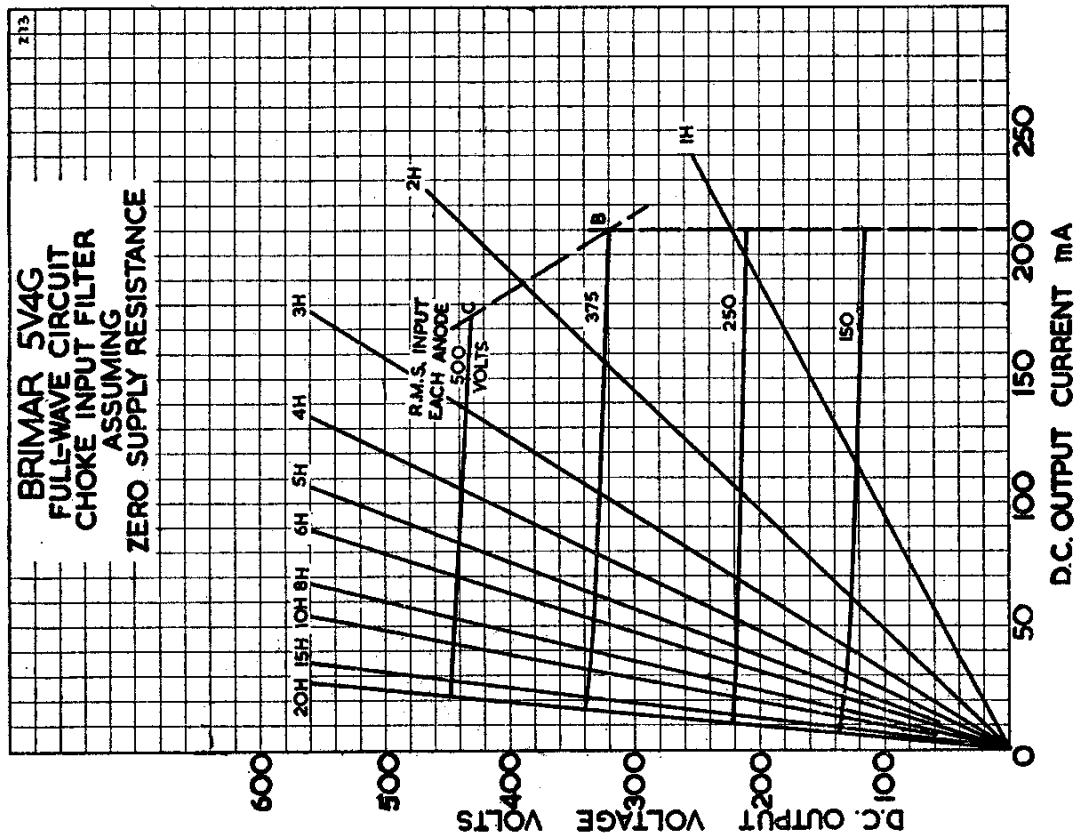
For notes on use of rating charts, refer to " Valve Ratings " section.

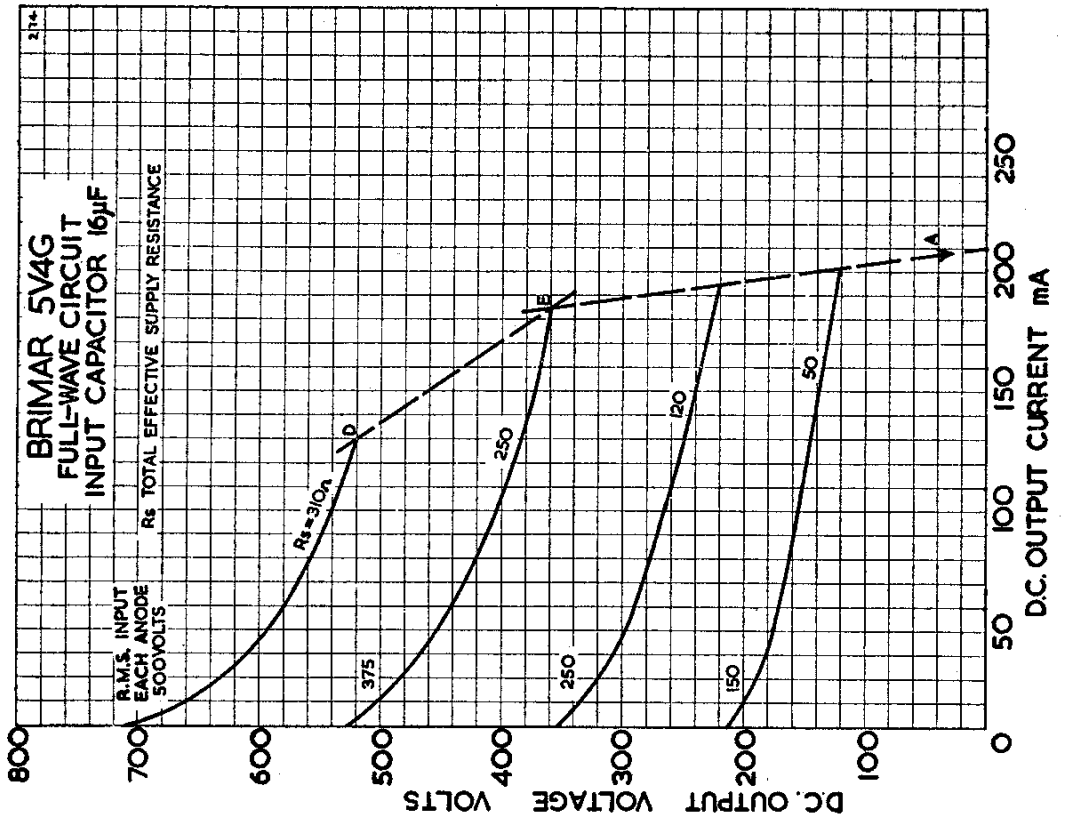



BRIMAR 5V4G
RATING CHART II
CAPACITOR INPUT FILTER
AREA OF PERMISSIBLE OPERATION
FULL-WAVE D.C. OUTPUT CURRENT mA
0
50
100
150
200
250
RECTIFICATION EFFICIENCY = D.C. OUTPUT VOLTAGE / R.M.S. INPUT VOLTAGE X √2
0
.2
.4
.6
.8
1.0

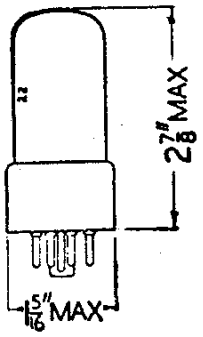

BRIMAR 5V4G
RATING CHART III
CAPACITOR INPUT FILTER
MINIMUM ANODE SUPPLY RESISTANCE EACH ANODE OHMS
400
350
300
250
200
150
100
50
0
R.M.S. ANODE SUPPLY VOLTAGE VOLTS
0
100
200
300
400
500
600

5V4G


BRIMAR 5V4G
FULL-WAVE CIRCUIT
CHOKE INPUT FILTER
ASSUMING
ZERO SUPPLY RESISTANCE
R.M.S. INPUT EACH ANODE 500 VOLTS
1H
2H
3H
4H
5H
6H
8H
10H
15H
20H
B
C
375
250
150
D.C. OUTPUT VOLTAGE VOLTS
D.C. OUTPUT CURRENT mA


BRIMAR 5V4G
FULL-WAVE CIRCUIT
INPUT CAPACITOR 16μF
Rs TOTAL EFFECTIVE SUPPLY RESISTANCE
R.M.S. INPUT EACH ANODE 500 VOLTS
Rs=3/0A
D
E
A
375
250
250
120
50
150
D.C. OUTPUT VOLTAGE VOLTS
D.C. OUTPUT CURRENT mA

5Y3GT

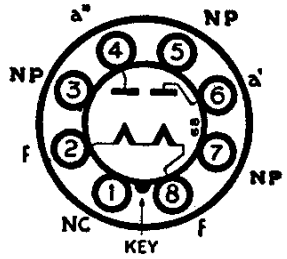


Replacement Type

TYPE 5Y3GT

(OCTAL BASE)

FULL-WAVE RECTIFIER



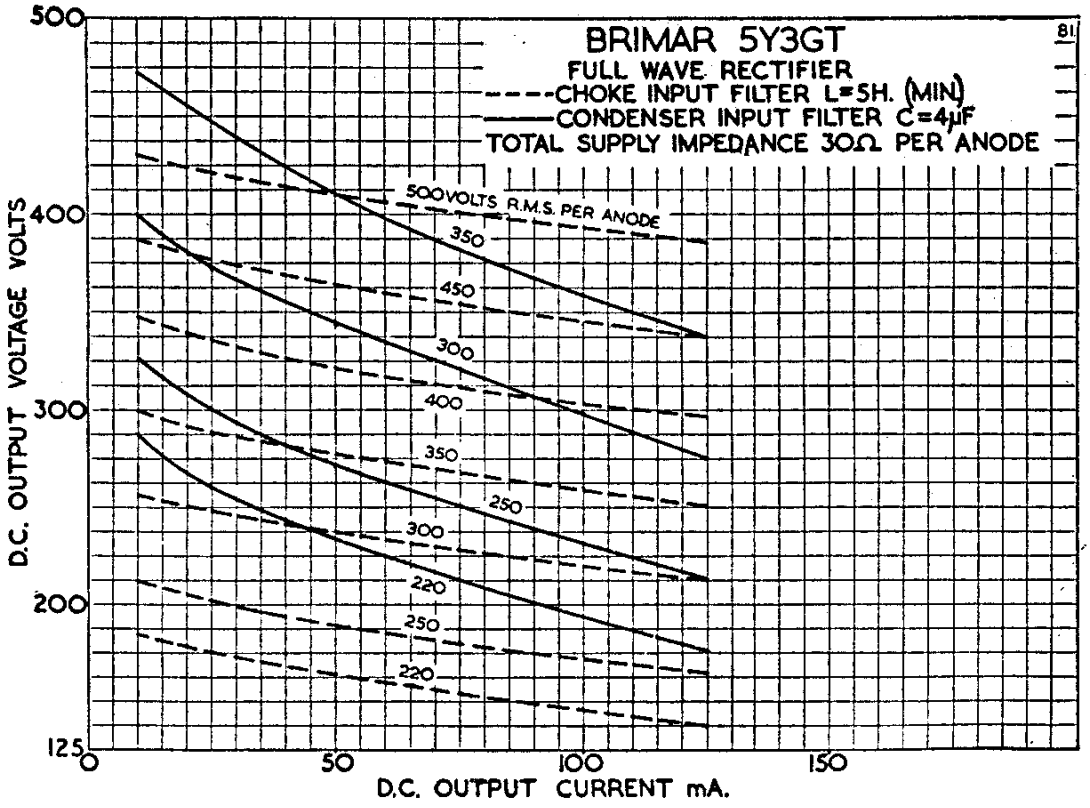
The BRIMAR type 5Y3GT is a directly heated full-wave rectifier for A.C. mains equipment of moderate power requirements.

RATINGS

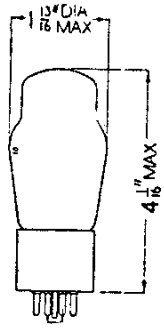
Filament Voltage	5.0 volts
Filament Current	2.0 amp.
Peak Inverse Voltage	1,400 volts max.
Peak Current (each Anode)	400 mA max.

OPERATION AS FULL-WAVE RECTIFIER

CONDENSER INPUT	
R.M.S. Input per Anode	350 volts max.
Supply Impedance per Anode...	30 ohms. min.
Rectified Current	125 mA max.
Reservoir Condenser	32 μF max.
CHOKE INPUT	
R.M.S. Input per Anode	500 volts max.
Input Choke Inductance	10 Henries min.
Rectified Current	125 mA max.

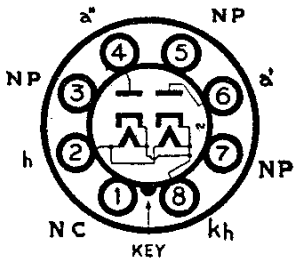


5Z4G



Current Equipment Type

TYPE 5Z4G
(OCTAL BASE)
FULL-WAVE RECTIFIER



Filament Voltage ... ... 5.0 volts Filament Current ... ... 2.0 amps.

RATINGS

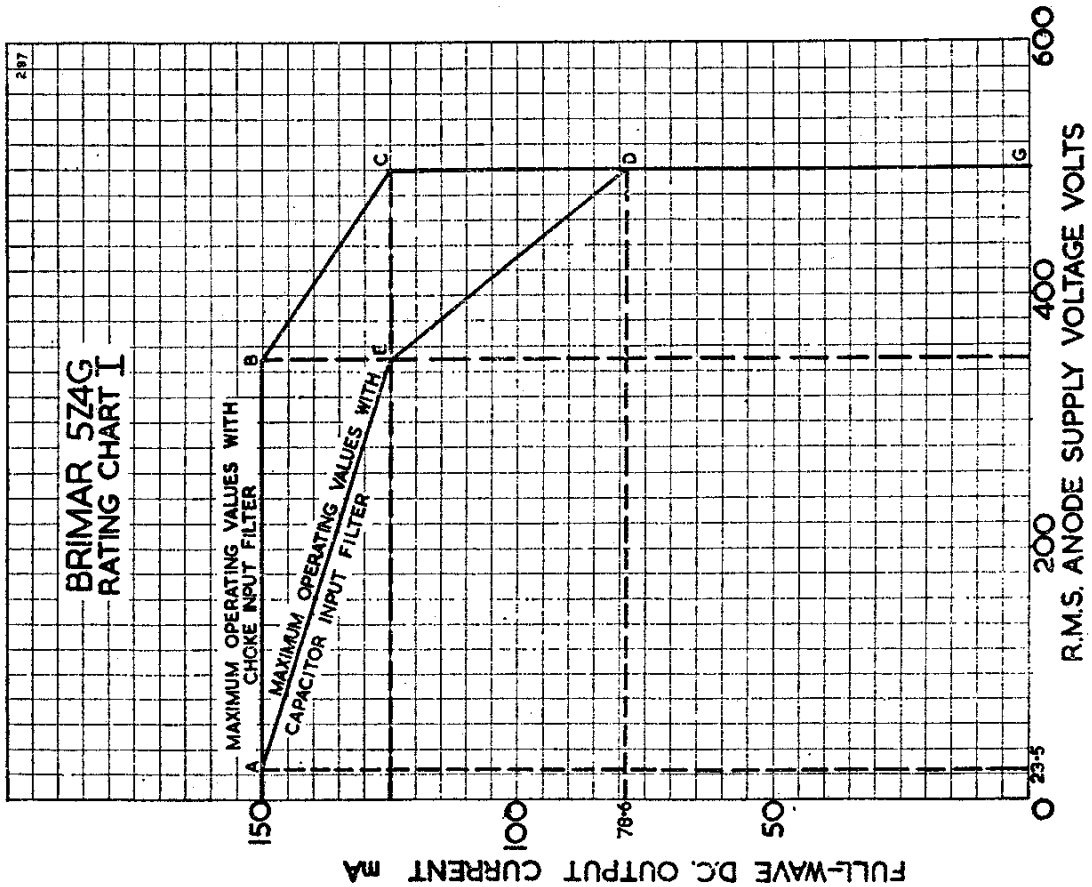
Peak Inverse Voltage	1,400 volts max.
Peak Current (each Anode)	375 mA max.
Peak Surge Current	1.25 amps. max.
Anode Supply Voltage	—see Rating Chart I
D.C. Output Current	—see Rating Chart I

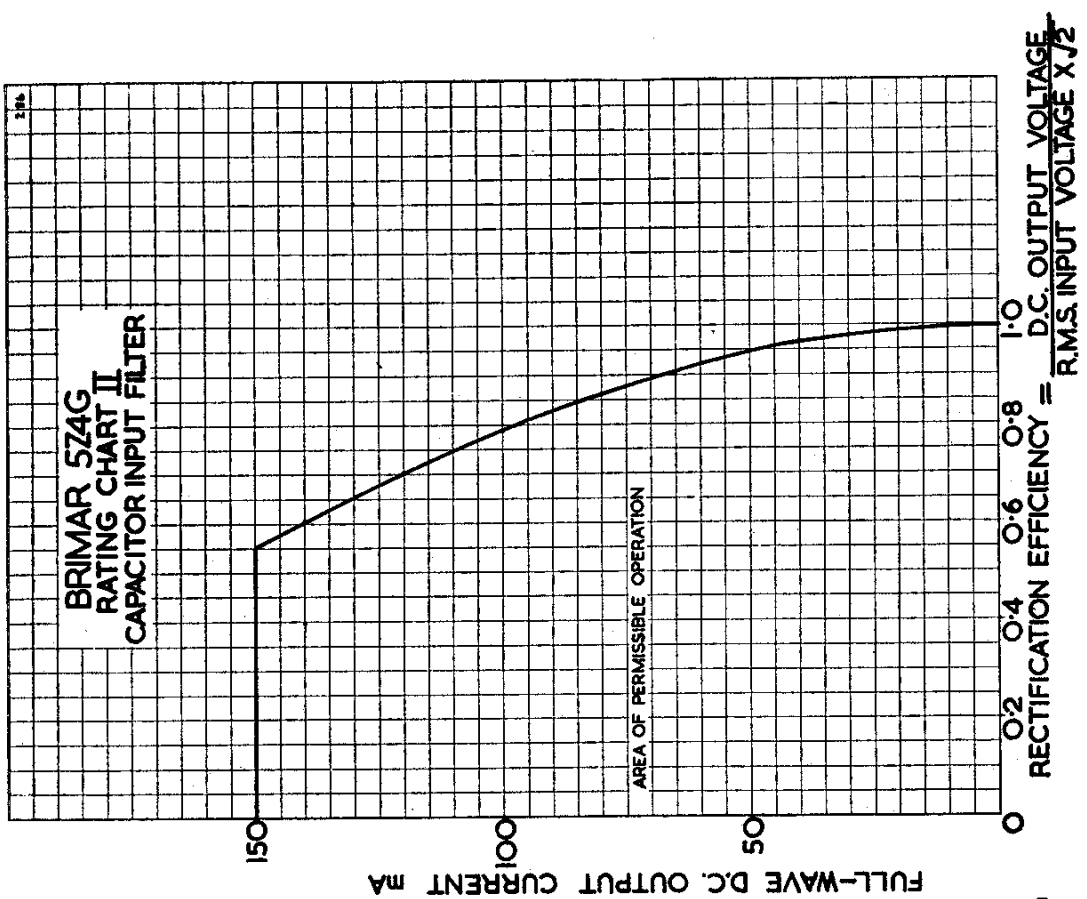
CHARACTERISTICS AS A FULL-WAVE RECTIFIER

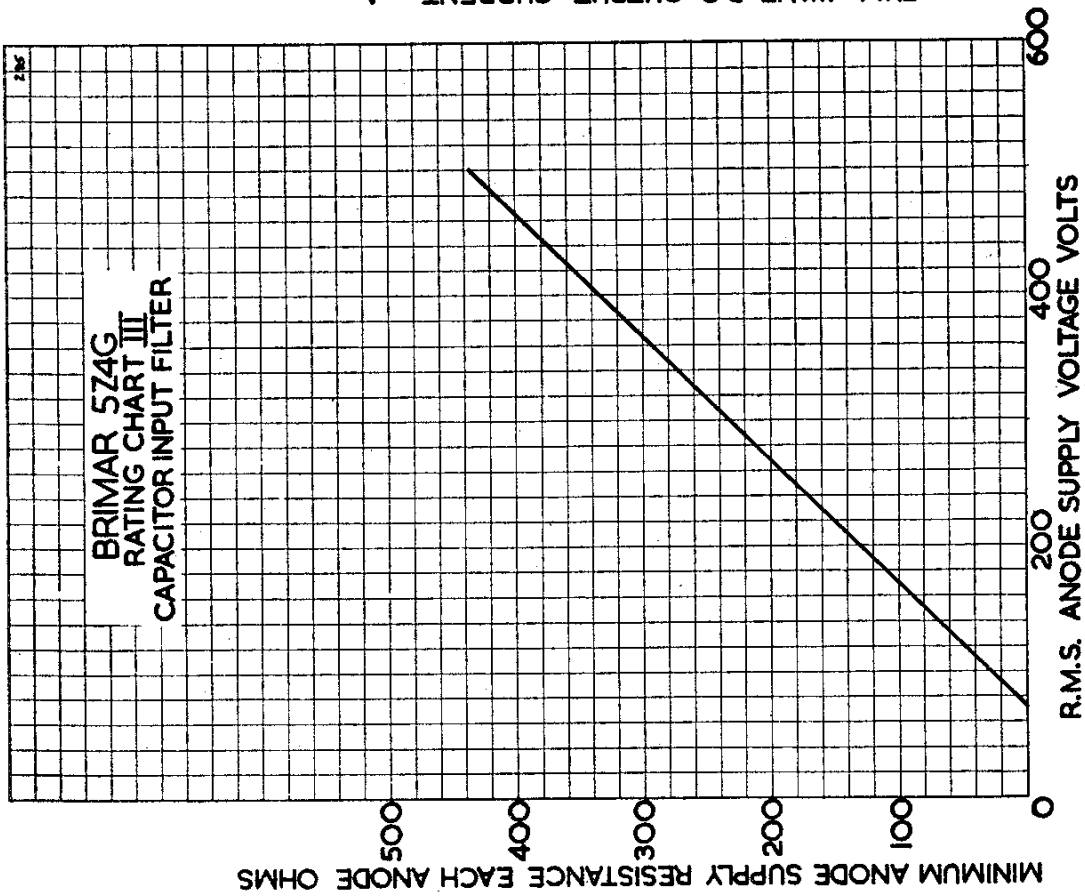
CAPACITOR INPUT		CHOKE INPUT	
R.M.S. Input per Anode ...	350 volts	R.M.S. Input per Anode ...	500 volts
Rectified Current	125 mA	Rectified Current	125 mA.
D.C. Output Voltage... ...	340 volts	D.C. Output Voltage... ...	435 volts
Supply Impedance per Anode	300 Ω	Minimum Filter Input Choke†	4 Henries
Reservoir Capacitor	16 μF		

† *Limiting value at 105 mA. For operating currents less than 105 mA, refer to curve.*

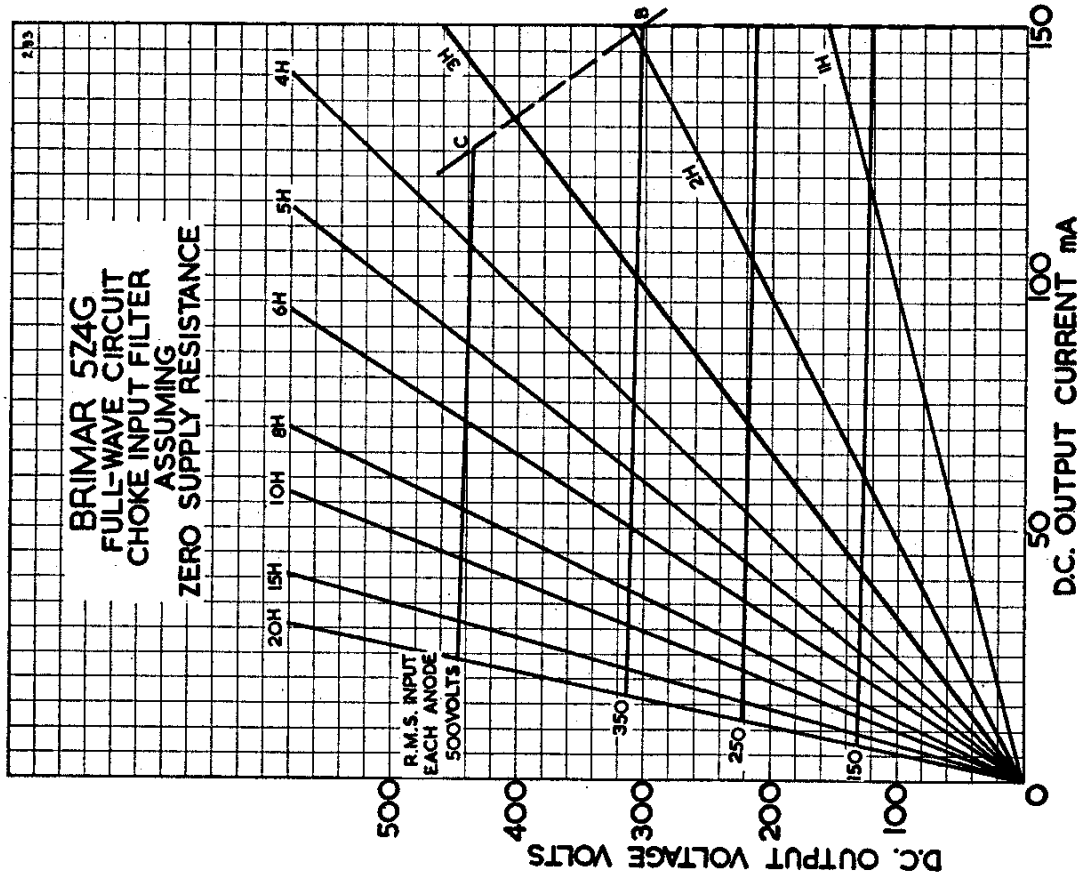
For notes on use of rating charts, refer to " Valve Ratings " section.

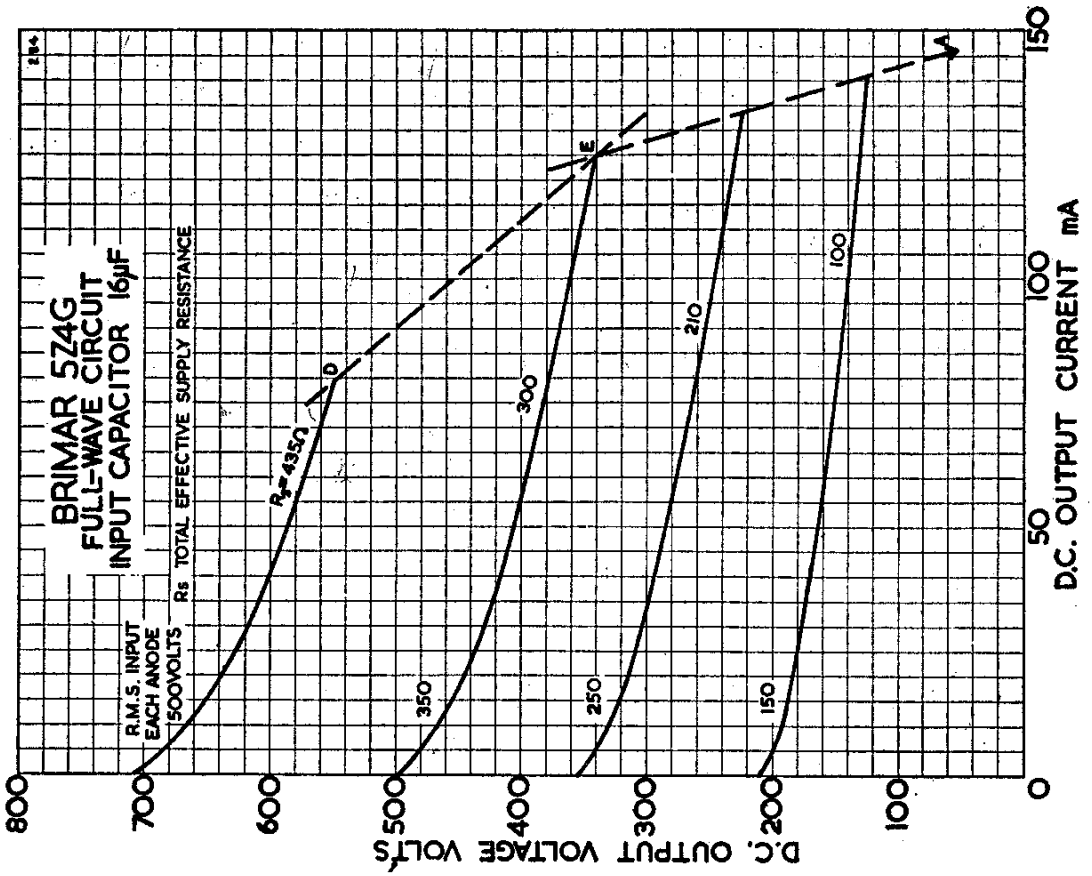



BRIMAR 5Z4G
RATING CHART II
CAPACITOR INPUT FILTER
AREA OF PERMISSIBLE OPERATION
FULL-WAVE D.C. OUTPUT CURRENT mA
150
100
50
0
0·2
0·4
0·6
0·8
1·0
RECTIFICATION EFFICIENCY = D.C. OUTPUT VOLTAGE / R.M.S. INPUT VOLTAGE X √2

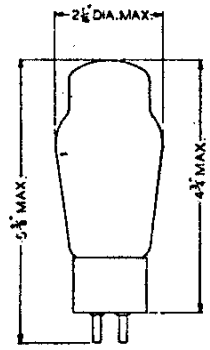

BRIMAR 5Z4G
RATING CHART III
CAPACITOR INPUT FILTER
MINIMUM ANODE SUPPLY RESISTANCE EACH ANODE OHMS
500
400
300
200
100
0
200
400
600
R.M.S. ANODE SUPPLY VOLTAGE VOLTS

5Z4G


BRIMAR 5Z4G
FULL-WAVE CIRCUIT
CHOKE INPUT FILTER
ASSUMING
ZERO SUPPLY RESISTANCE
R.M.S. INPUT
EACH ANODE
500VOLTS
1H
2H
4H
5H
6H
8H
10H
15H
20H
350
250
150
D.C. OUTPUT VOLTAGE VOLTS
D.C. OUTPUT CURRENT mA


BRIMAR 5Z4G
FULL-WAVE CIRCUIT
INPUT CAPACITOR 16μF
R.M.S. INPUT
EACH ANODE
500VOLTS
Rs TOTAL EFFECTIVE SUPPLY RESISTANCE
Rs=435Ω
350
300
250
210
150
100
D.C. OUTPUT VOLTAGE VOLTS
D.C. OUTPUT CURRENT mA

5Z3
6A7
6A7E

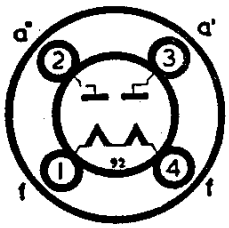


Obsolescent Type

TYPE 5Z3

(U.X. BASE)

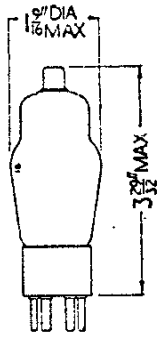
FULL-WAVE RECTIFIER



RATINGS

Filament Voltage	5.0 volts
Filament Current	3.0 amp. max.
Peak Inverse Voltage...	1,550 volts
Peak Current per Anode	675 mA max.

For characteristics refer to type 5U4G.



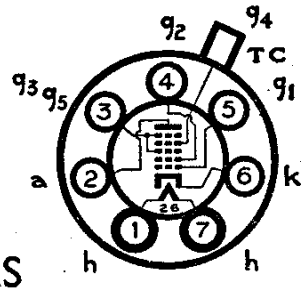
Replacement Types

TYPES 6A7, 6A7E

(U.X. BASE)

HEPTODE

FREQUENCY CHANGERS



CHARACTERISTICS

Heater Voltage	6.3 volts	Heater Current	0.3 amp.

INTER-ELECTRODE CAPACITANCES*

R.F. Input ...	8.5 pF	Control Grid (g_4) to Oscillator Grid (g_1) ...	0.15 pF
I.F. Output ...	9.0 pF	Control Grid to Anode	0.3 pF
Oscillator Input ...	7.0 pF	Control Grid to Oscillator Anode (g_2)	0.15 pF
Oscillator Output...	5.5 pF	Oscillator Grid to Oscillator Anode	1.0 pF

** With close fitting shield connected to cathode.*

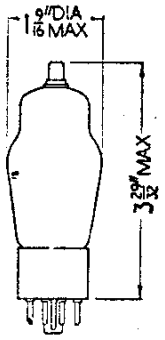
For further information refer to type 6A8G/GT

6A8G
6A8GT
6AB8

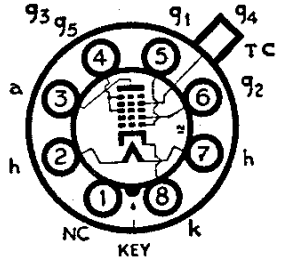
(see type ECL80)

Replacement Types

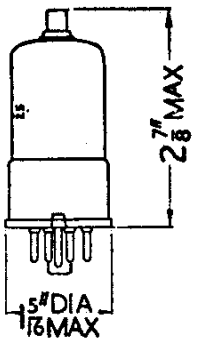
TYPES 6A8G, 6A8GT (OCTAL BASE)



6A8G



Note.—Type 6A8GT has Pin 1 connected to metal shell.



6A8GT

HEPTODE FREQUENCY CHANGERS

RATINGS

Heater Voltage	6.3 volts
Heater Current	0.3 amp.
Anode Voltage	300 volts max.
Anode Dissipation	1.0 watts max.
Screen (g_3, g_5) Voltage	100 volts max.
Screen Dissipation	0 3 watts max.
Oscillator Anode (g_2) Voltage	200 volts max.
Oscillator Anode Dissipation	0.75 watts max.
Total Cathode Current	14 mA max.

OPERATING CHARACTERISTICS

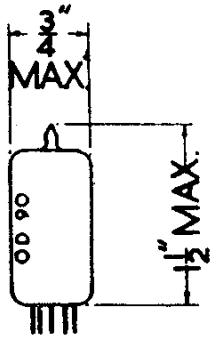
Anode Voltage	100	250 volts
Anode Current	1.1	3.5 mA
Screen Voltage	50	100 volts
Screen Current	1.3	2 7 mA
Oscillator Anode Supply Voltage	100	250 volts
Oscillator Anode Resistor	–	20,000 ohms
Oscillator Anode Current	2.0	4.0 mA
Control Grid (g_4) Voltage	–1.5	–3 volts
Auto Bias Resistor	300	300 ohms
Oscillator Grid (g_1) Resistor	50,000	50,000 ohms
Oscillator Grid Current	0.25	0.4 mA
Anode Impedance	0.6	0.36 meg.
Conversion Conductance	0.36	0.55 mA/V
Control Grid Voltage (For conversion of 0.005 mA/V).	–20	–35 volts

INTER-ELECTRODE CAPACITANCES*

R.F. Input (Control Grid to all other electrodes)	9.5 pF
I.F. Output (Anode to all other electrodes)	12.0 pF
Oscillator Input (Oscillator Grid to all except Oscillator Anode)	6.0 pF
Oscillator Output (Oscillator Anode to all except Oscillator Grid)	4.6 pF
Control Grid to Oscillator Grid	0.16 pF
Control Grid to Anode	0.26 pF
Control Grid to Oscillator Anode	0.19 pF
Oscillator Grid to Oscillator Anode	1.1 pF

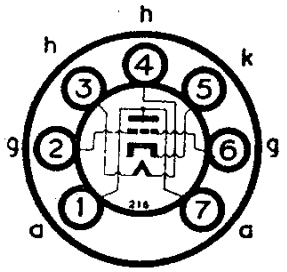
* *With close fitting shield connected to Cathode.*

6AF4A



Current Equipment Type

TYPE **6AF4A** MINIATURE U.H.F. OSCILLATOR TRIODE



B7G Base

The BRIMAR 6AF4A is intended for use as a U.H.F. oscillator valve up to 1000 Mc/s.

RATINGS

Heater Voltage	6.3 volts
Heater Current	0.225 amp.
Anode Voltage	150 volts max.
Anode Dissipation	2.25 watts max.
D.C. Grid Voltage	—50 volts max.
D.C. Grid Current	8 mA max.
Grid Circuit Resistance using Cathode Bias	500 KΩ max.
D.C. Cathode Current	28 mA max.
Peak Heater-Cathode Voltage—Heater negative	50 volts max.
Heater positive	50 volts max. *

** D.C. component 25 volts max.*

OPERATING CHARACTERISTICS

Anode Voltage	80	100 volts
Cathode Bias Resistor	150	150 Ω
Anode Current	16	20 mA
Mutual Conductance	6.6	7.5 mA/V
Anode Impedance	2.27	2.13 KΩ
Amplification Factor	15	16

TYPICAL CONDITIONS AS AN OSCILLATOR AT 950 Mc/s.

Anode Voltage	100 volts
Grid Resistance	10 KΩ
Anode Current	22 mA
Grid Current	400 μA
Power Output	160 mW

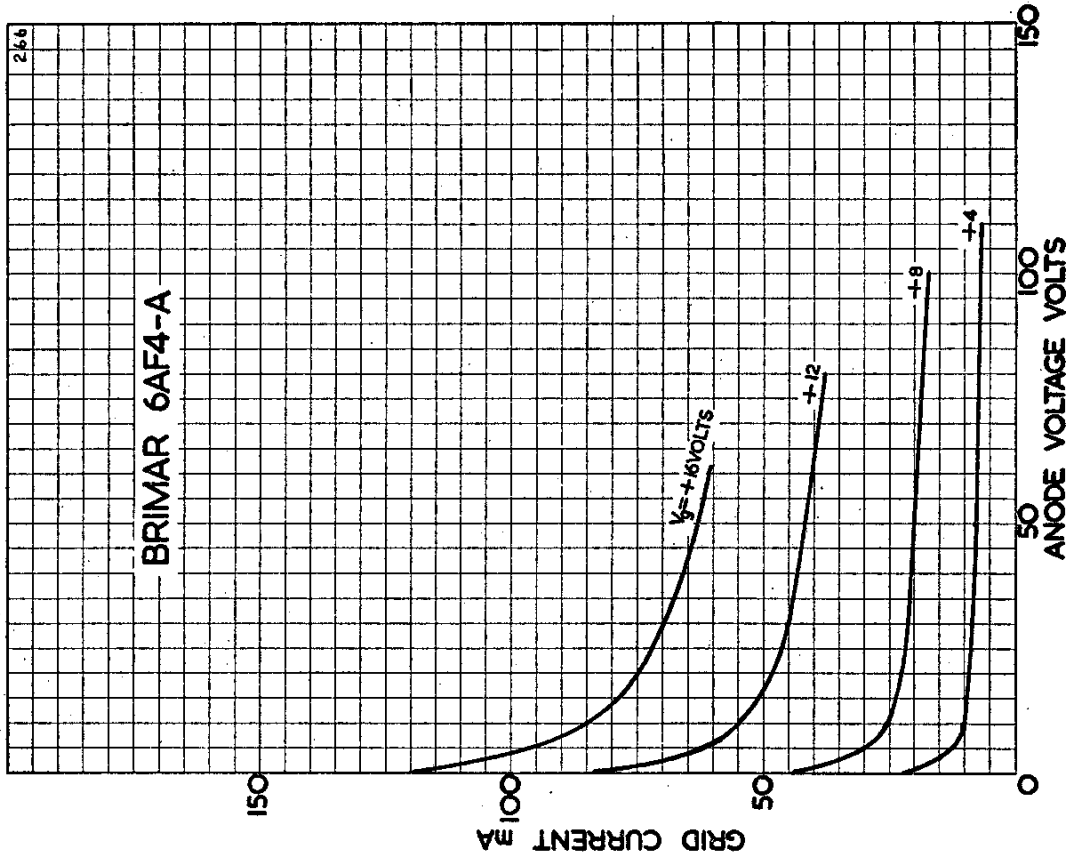
INTER-ELECTRODE CAPACITANCES*

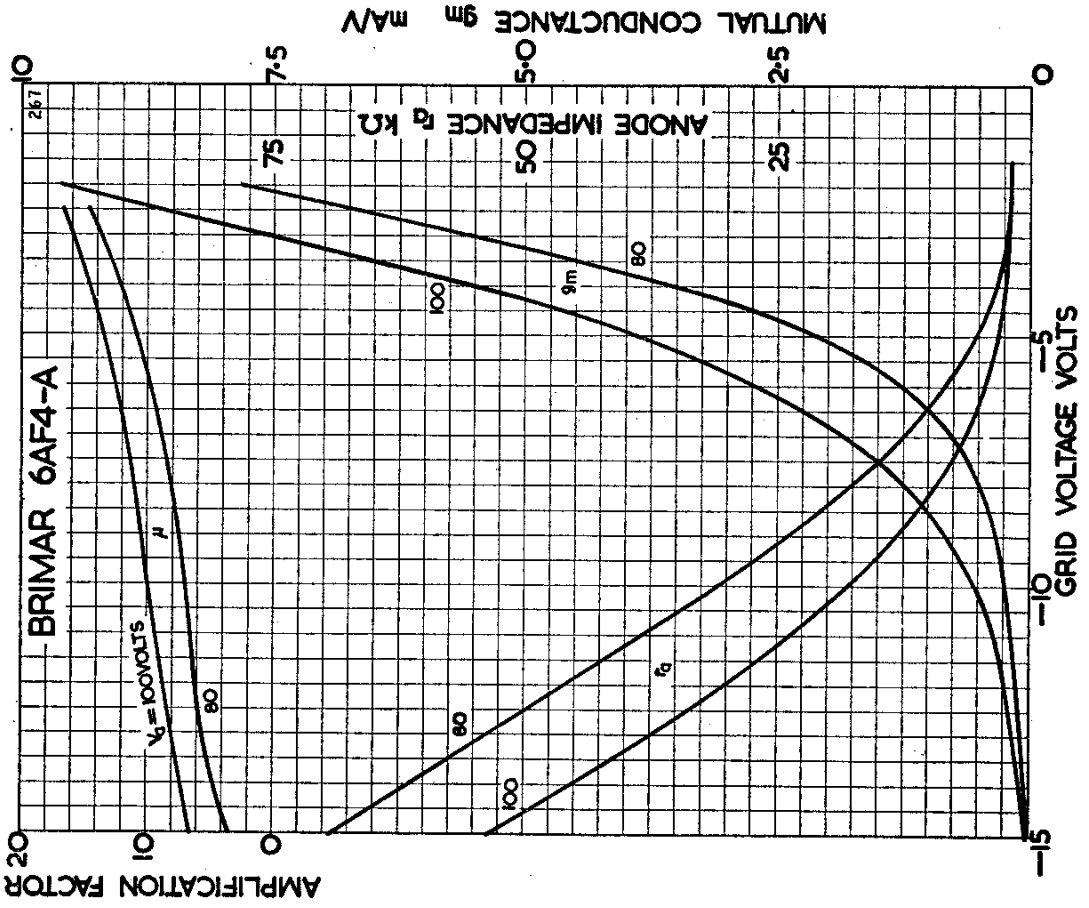
Input	2.2 pF
Output	0.45 pF
Grid to Anode	1.9 pF

** With no external shield.*

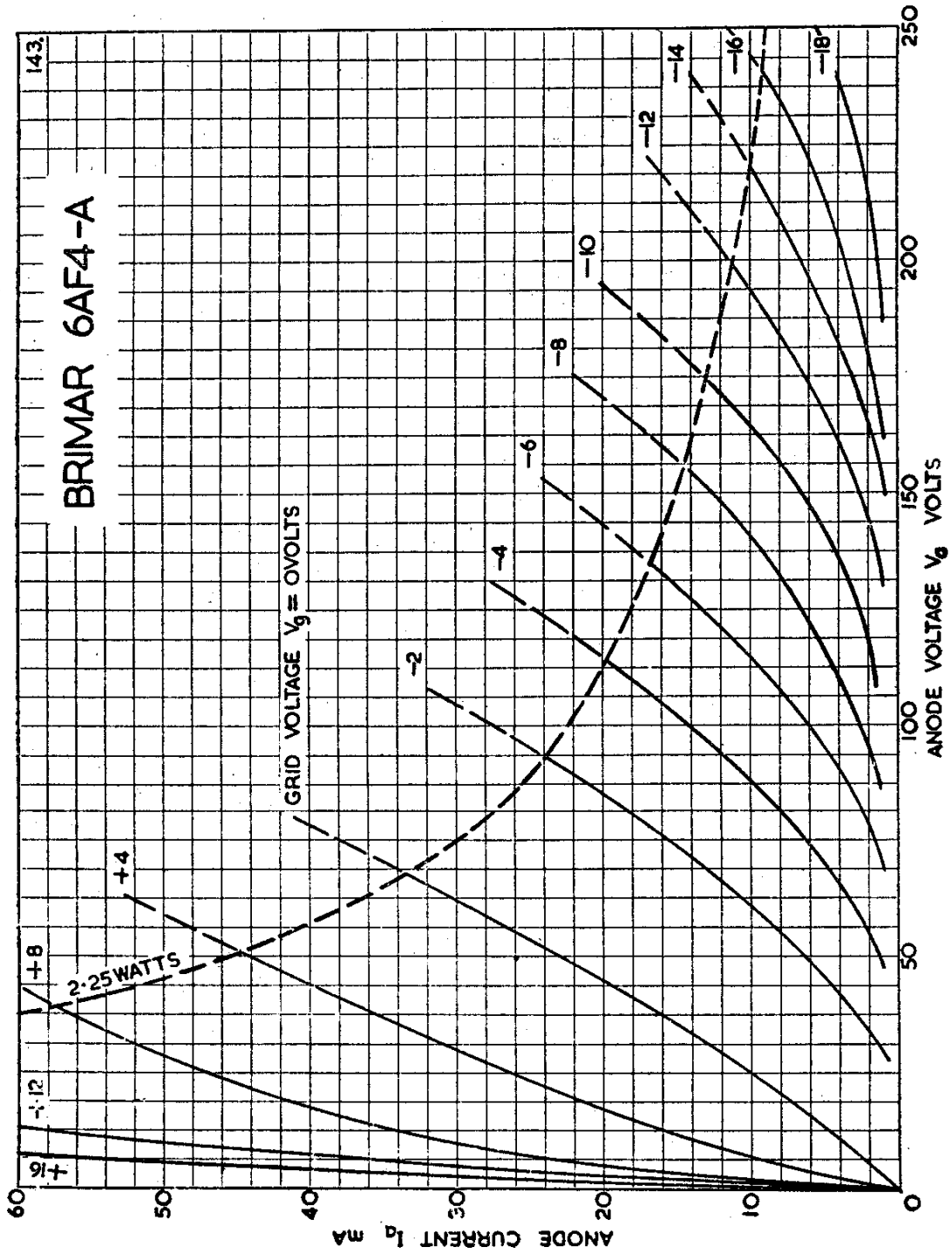
Type 6AF4A is a commercial equivalent to the CV5074.

6AF4A

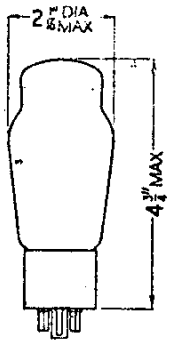

BRIMAR 6AF4-A
2666
GRID CURRENT mA
150
100
50
0
ANODE VOLTAGE VOLTS
150
100
50
0
+4
+8
+12
Vg=+16VOLTS


BRIMAR 6AF4-A
2667
MUTUAL CONDUCTANCE gm mA/V
10
7·5
5·0
2·5
0
ANODE IMPEDANCE ra kΩ
75
50
25
AMPLIFICATION FACTOR μ
20
10
0
GRID VOLTAGE VOLTS
-15
-10
-5
μ
gm
ra
80
100
Vg=100VOLTS

6AF4A

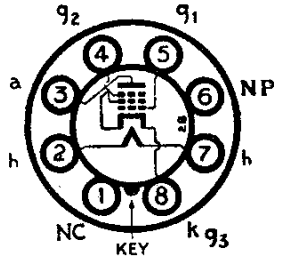

BRIMAR 6AF4-A
143.
GRID VOLTAGE V_g = OVOLTS
+4
+8
-.12
+16
2·25 WATTS
-2
-4
-6
-8
-10
-12
-14
-16
-18
ANODE CURRENT I_a mA
60
50
40
30
20
10
0
250
200
150
100
50
ANODE VOLTAGE V_a VOLTS

6AG6G
6AK5



Replacement Type

TYPE 6AG6G
(OCTAL BASE)
HIGH SLOPE
OUTPUT PENTODE



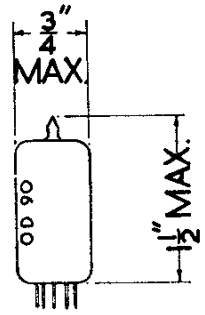
RATINGS

Heater Voltage	6.3 volts	Anode Dissipation	10 watts max.
Heater Current	1.2 amp.	Screen (g_2) Voltage	250 volts max.
Anode Voltage	250 volts max.	Screen Dissipation	2.5 watts max.

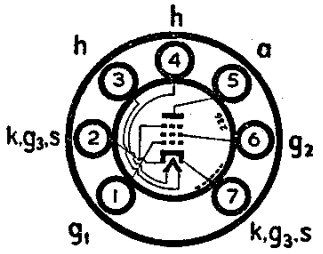
OPERATING CHARACTERISTICS

Anode Voltage	150	200	250	volts
Anode Current	30	31	32	mA
Screen Voltage	150	200	250	volts
Screen Current	5.5	6.0	6.0	mA
Control Grid (g_1) Voltage	—2	—4	—6	volts
Cathode Bias Resistor	60	100	150	ohms
Anode Impedance	40,000	50,000	60,000	ohms
Mutual Conductance	9	10	10	mA/V
Optimum Load	8,900	8,700	8,500	ohms
Power Output	1.3	2.5	3.75	watts

Replacement Type



TYPE 6AK5
MINIATURE
HIGH SLOPE
R.F. PENTODE



RATINGS

Heater Voltage	6.3 volts
Heater Current	0.175 amp.
Anode Voltage	180 volts max.
Anode Dissipation	1.7 watts max.
Screen (g_2) Voltage	90 volts max.
Screen Voltage ($Ig_2 = 0$)	180 volts max.
Screen Dissipation	0.5 watts max.
Peak Heater-Cathode Voltage	120 volts max.

OPERATING CHARACTERISTICS

Anode Voltage	120	180	volts
Anode Current	7.5	7.7	mA
Screen Voltage	120	120	volts
Screen Current	2.5	2.4	mA
Cathode Bias Resistor	180	180	ohms
Mutual Conductance	5.0	5.1	mA/V
Anode Impedance (approx.)	0.3	0.5	megohm.
Control Grid (g_1) Voltage for anode current of 10μA (approx.)	—8.5	—8.5	volts

INTER-ELECTRODE CAPACITANCES *

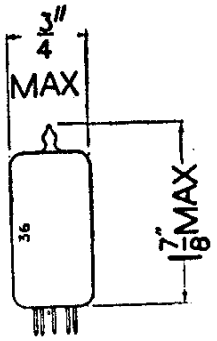
Input	4.0 pF
Output	2.1 pF
Control Grid to Anode	0.03 pF max.

** Measured without external shield.*

6AK6
6AK8

(see type EABC80)

Current Equipment Type

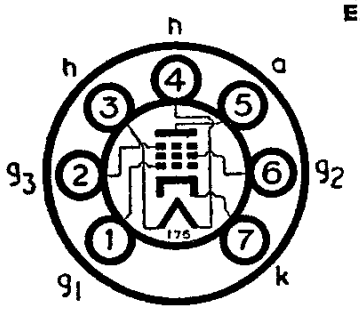


B7G Base

TYPE 6AK6

MINIATURE

POWER PENTODE



The BRIMAR type 6AK6 is a miniature output pentode with low heater consumption suitable for use in both AC and AC/DC equipment. It is particularly suitable where power economy and small physical size are of prime importance.

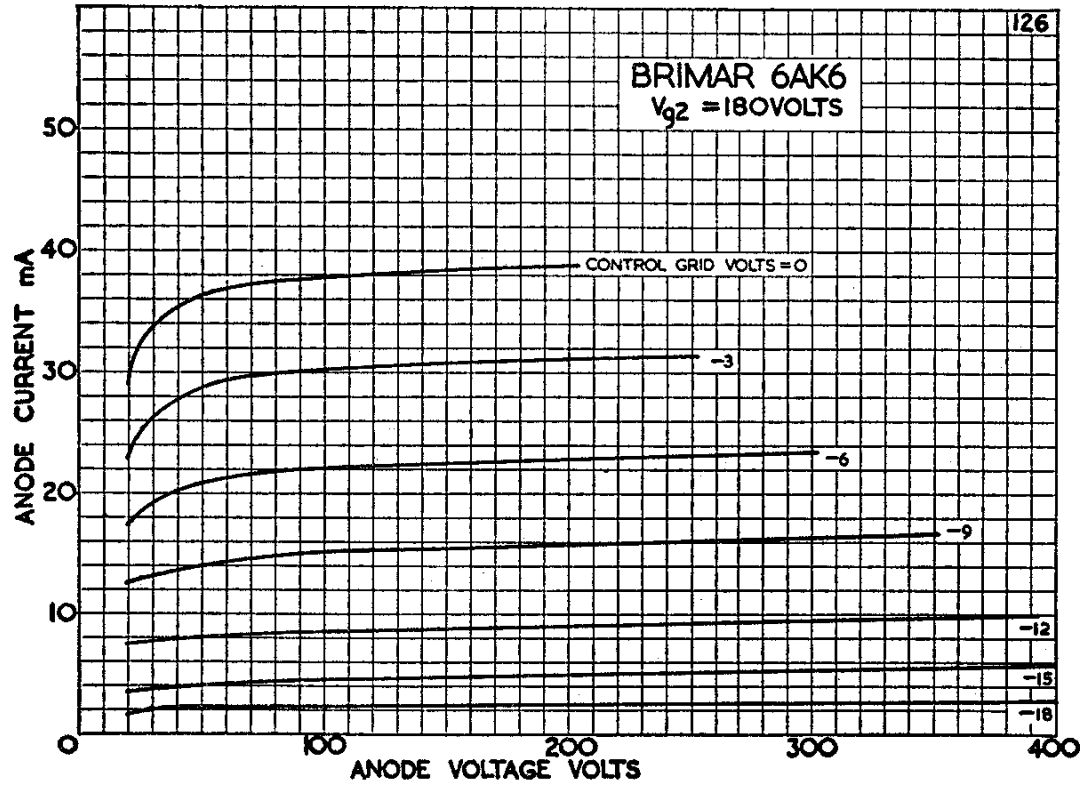
RATINGS

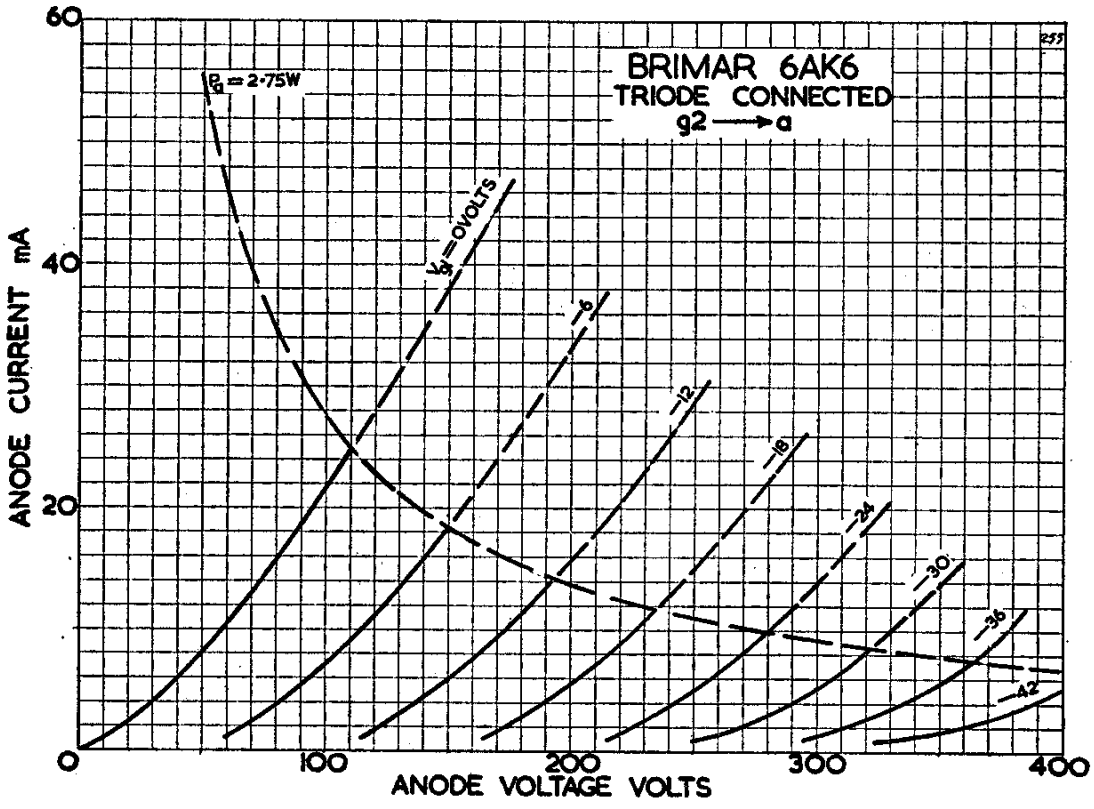
Heater Voltage	6.3 volts
Heater Current	0.15 amp.
Anode Voltage	275 volts max.
Anode Dissipation	2.75 watts max.
Screen (g_2) Voltage	250 volts max.
Screen Dissipation	0.75 watts max.
D.C. Cathode Current	21 mA max.

OPERATING CHARACTERISTICS (CLASS A)

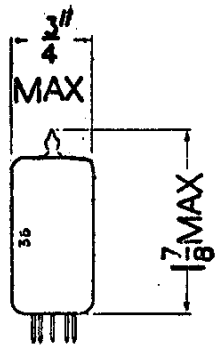
Anode Voltage	180 volts
Anode Current	15 mA
Screen Voltage	180 volts
Screen Current	2.5 mA
Control Grid (g_1) Voltage	—9 volts
Cathode Bias Resistor	520 ohms
Anode Impedance	200,000 ohms
Mutual Conductance	2.3 mA/V
Inner Amplification Factor ($\mu_{g1, g2}$)	10.5
Optimum Load	10,000 ohms
Power Output	1.1 watts
Harmonic Distortion	10 per cent.

6AK6


126
BRIMAR 6AK6
V_{g2} = 180VOLTS
CONTROL GRID VOLTS = 0
-3
-6
-9
-12
-15
-18
ANODE CURRENT mA
0
10
20
30
40
50
100
200
300
400
ANODE VOLTAGE VOLTS


253
BRIMAR 6AK6
TRIODE CONNECTED
g2 → a
P_a = 2·75W
V_g = 0VOLTS
-6
-12
-18
-24
-30
-36
-42
ANODE CURRENT mA
0
20
40
60
100
200
300
400
ANODE VOLTAGE VOLTS

6AL5

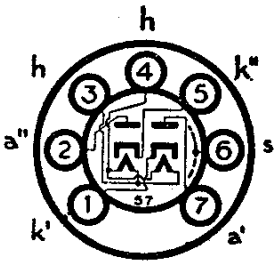


B7G Base

Current Equipment Type

TYPE 6AL5

MINIATURE DOUBLE DIODE



RATINGS

Heater Voltage	6.3 volts
Heater Current	0.3 amp.
Peak Inverse Voltage	420 volts max.
Peak Anode Current (each Anode)	54 mA max.
Resonant Frequency (each Section)	700 Mc/s approx.

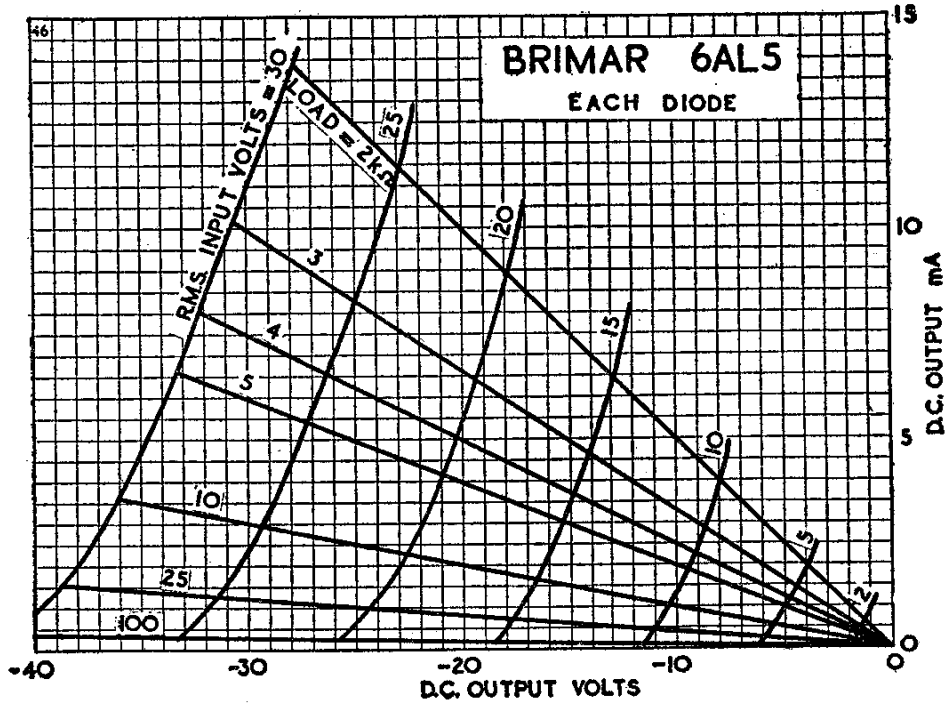
OPERATION AS HALF-WAVE RECTIFIER

R.M.S. Input per Anode	150 volts max.
Supply Impedance per Anode	300 ohms min.
Rectified Current per Anode	9 mA max.

INTER-ELECTRODE CAPACITANCES

Diode 1 to Cathode 1 and Heater	3.2 pF
Diode 2 to Cathode 2 and Heater	3.2 pF
Cathode 1 to Diode 1 and Heater	3.6 pF
Cathode 2 to Diode 2 and Heater	3.6 pF
Diode 1 to Diode 2	0.026 pF max.

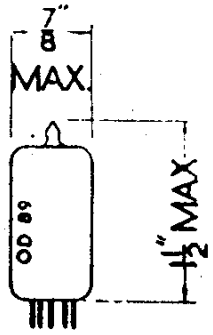
For additional curves refer to type 5726.



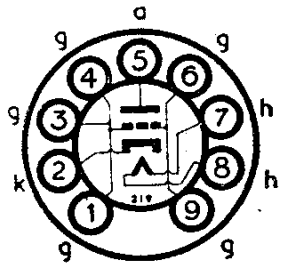
Type 6AL5 is a commercial equivalent to the CV140.

6AM4

Current Equipment Type



TYPE 6AM4
MINIATURE
GROUNDED GRID
AMPLIFIER TRIODE



The BRIMAR 6AM4 is a miniature B9A based triode suitable for grounded grid amplifier or mixer use in the frequency range 470 to 890 Mc/s.

RATINGS

Heater Voltage	6.3 volts
Heater Current	0.225 amp.
Anode Voltage	200 volts max.
Anode Dissipation	2.0 watts
Positive D.C. Grid Voltage	0 volts max
Heater-Cathode Potential—Heater Positive	80 volts max.
Heater Negative	80 volts max.*

* 250 *volts max. under cut-off conditions in cascode type circuits with direct coupled drive.*

OPERATING CHARACTERISTICS

Anode Voltage	200 volts
Cathode Bias Resistor	100 ohms
Anode Current	10 mA
Mutual Conductance	9.8 mA/V
Anode Impedance	8,700 ohms
Amplification Factor	85
Grid Voltage for $1_a = 10\mu A$	—6.5 volts

NOTE: Fixed bias operation is not recommended.

CHARACTERISTICS AS A MIXER†

Anode Voltage	125 volts
Cathode Bias Resistor	220 ohms
Peak Heterodyne Voltage	1.6 volts
Anode Current	3.7 mA
Conversion Conductance	2.55 mA/V

† *Based on low-frequency measurements. Optimum conditions at operating frequencies may be somewhat different.*

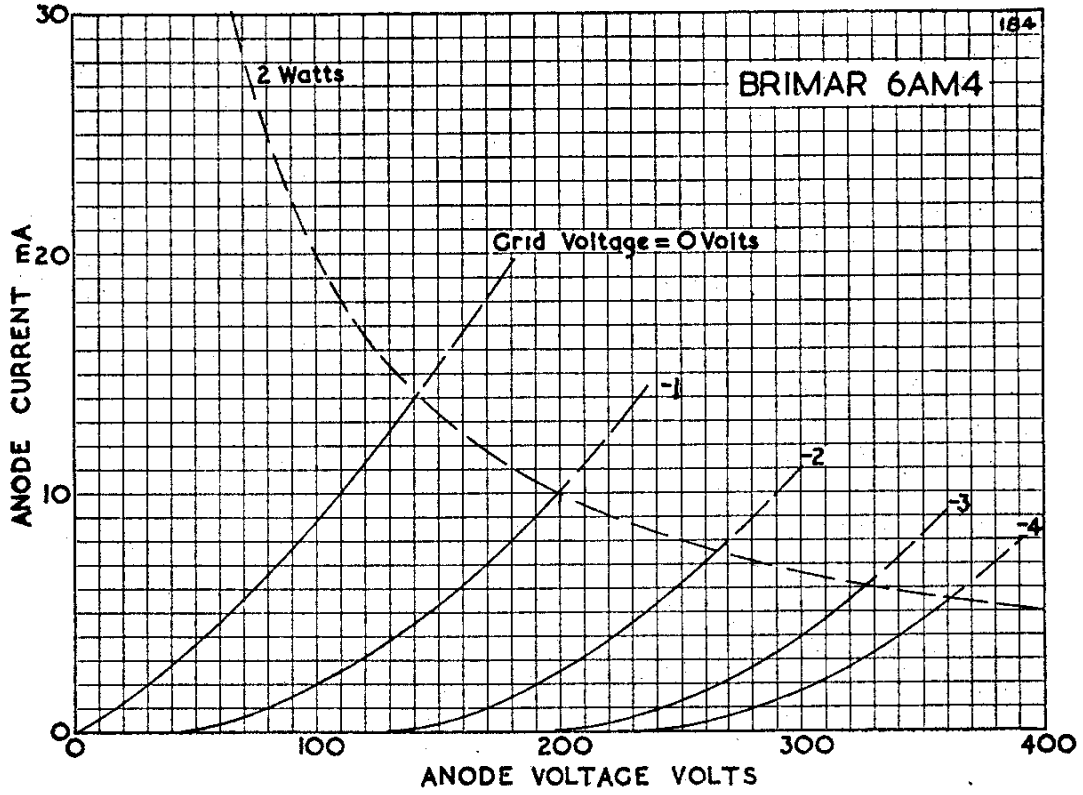
INTER-ELECTRODE CAPACITANCES

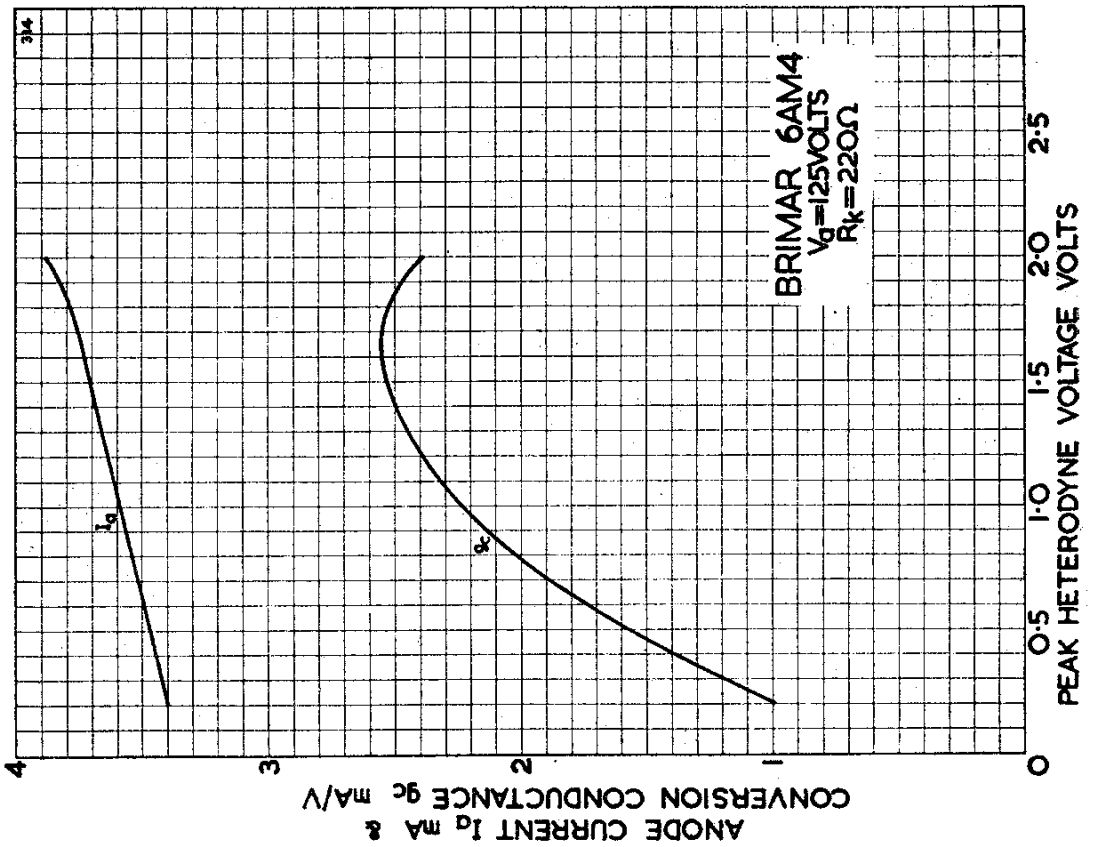
	With external screen *	Without external screen
Anode to Cathode	0.16	0.16 pF
Cathode to Grid plus Heater	4.6	4.4 pF
Anode to Grid plus Heater	2.8	2.4 pF
Heater to Cathode	1.8	1.8 pF

* *Connected to Grid.*

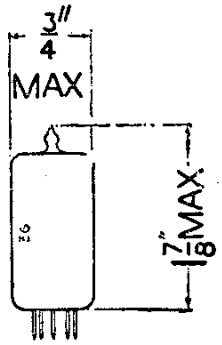
Type 6AM4 *is a commercial equivalent to the* CV5073.

6AM4


184
BRIMAR 6AM4
2 Watts
Grid Voltage = 0 Volts
-1
-2
-3
-4
ANODE CURRENT mA
30
20
10
0
0
100
200
300
400
ANODE VOLTAGE VOLTS


314
BRIMAR 6AM4
Vg=125VOLTS
Rk=220Ω
-g
g
4
3
2
1
0
0·5
1·0
1·5
2·0
2·5
PEAK HETERODYNE VOLTAGE VOLTS
CONVERSION CONDUCTANCE gc mA/V
ANODE CURRENT Ia mA

6AM5

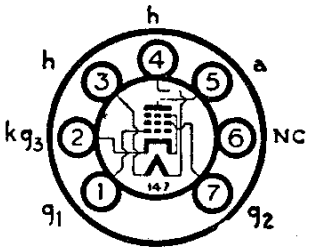


B7G Base

Replacement Type

TYPE 6AM5

POWER PENTODE



RATINGS

Heater Voltage	6.3 volts
Heater Current	0.2 amp.
Anode Voltage	250 volts max.
Anode Dissipation	4.0 watts max.
Screen (g_2) Voltage	250 volts max.
Screen Dissipation	0.60 watt max.
Heater to Cathode Potential	150 volts max.

OPERATING CHARACTERISTICS (CLASS "A")

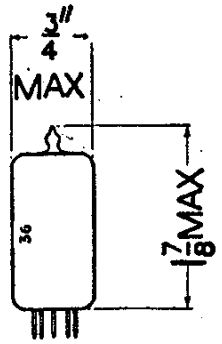
	Single Valve	2 Valves	
Anode Voltage	250	250	volts
Anode Current	16	22	mA
Screen Voltage	250	250	volts
Screen Current	2.4	3.2	mA
Control Grid (g_1) Voltage	—13.5	—15	volts
Cathode Bias Resistor	680	600	ohms
Anode Impedance	0.15	—	meg.
Mutual Conductance	2.6	—	mA/V
Inner Amplification Factor ($\mu_{g1, g2}$) ...	12	—	
Optimum Load	16,000	24,000	ohms
Power Output	1.4	4.0	watts
Harmonic Distortion	10	3.2	per cent.

INTER-ELECTRODE CAPACITANCES

Input	4.2 pF
Output	3.2 pF
Grid to Anode	0.5 pF max.

6AM6

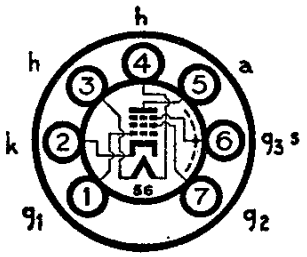
Current Equipment Type



B7G Base

TYPE 6AM6

MINIATURE HIGH SLOPE R.F. PENTODE



The BRIMAR 6AM6 is an indirectly heated high slope R.F. pentode suitable for a wide variety of applications. It may be used as an R.F., I.F. or video amplifier, as a limiter, or as a frequency changer at frequencies up to 100 Mc/s in conjunction with a suitable oscillator.

RATINGS

Heater Voltage	6.3 volts
Heater Current	0.3 amp.
Anode Voltage	275 volts max.
Anode Dissipation	2.5 watts max.
Screen (g_2) Voltage	275 volts max.
Screen Dissipation	0.8 watts max.
Heater to Cathode Potential	150 volts max.

OPERATING CHARACTERISTICS

[Suppressor Grid (g_3) connected to Cathode]

Anode Voltage	200	250	volts
Anode Current	9.0	10.0	mA
Screen Voltage	200	250	volts
Screen Current	2.25	2.6	mA
Control Grid (g_1) Voltage	–1.5	–2.0	volts
Cathode Bias Resistor	135	160	ohms
Anode Impedance (approx.)	0.8	1.0	meg.
Mutual Conductance	7.5	7.5	mA/V
Input Resistance at 45 Mc/s.	7,000	8,200	ohms
Control Grid Voltage (For Cathode Current cut-off)	–4.5	–5.5	volts
Working Input Capacity	10.4	10.1	pF
Change in Input Capacity (g_1 biased to cut-off)	2.3	2.0	pF
Inner Amplification Factor ($\mu_{g1, g2}$)	70	70	

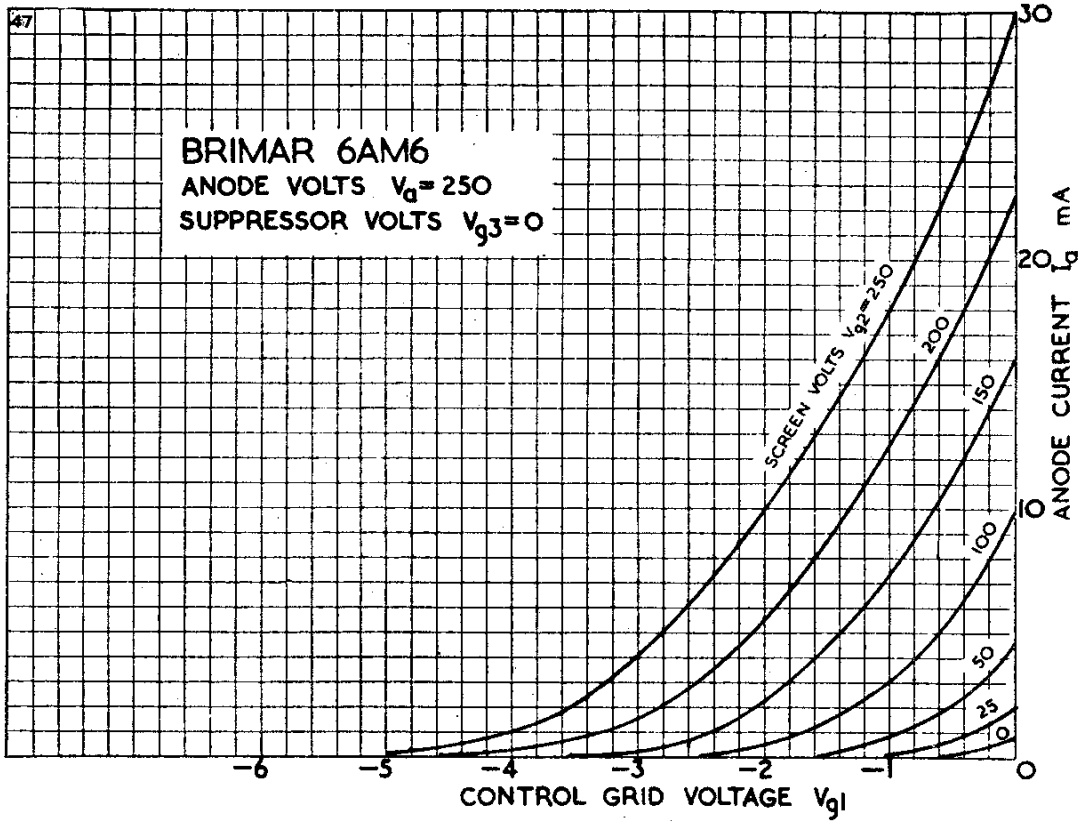
INTER-ELECTRODE CAPACITANCES *

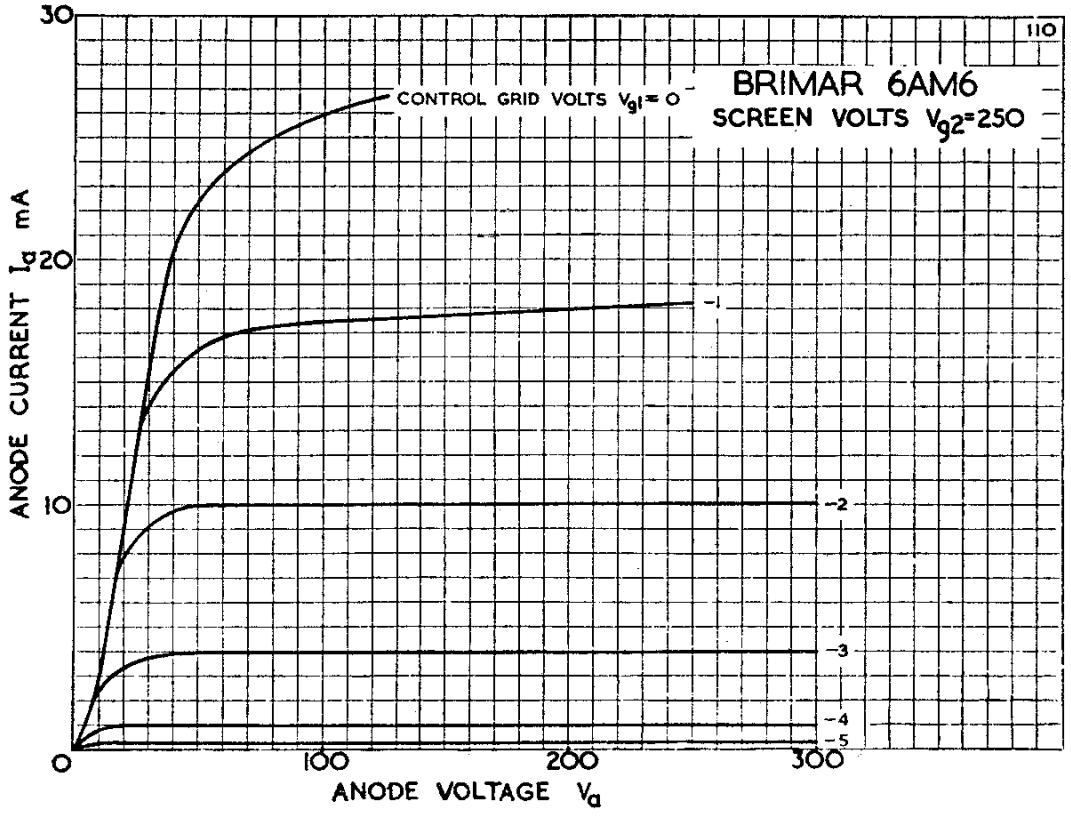
Input	7.5 pF
Output	3.2 pF
Control Grid to Anode	0.01 pF

** With close fitting shield connected to Cathode.*

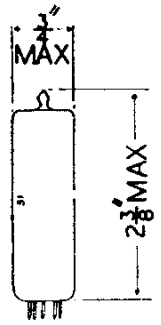
Type 6AM6 is a commercial equivalent of the CV138.

6AM6


47
BRIMAR 6AM6
ANODE VOLTS V_a=250
SUPPRESSOR VOLTS V_{g3}=0
SCREEN VOLTS V_{g2}=250
200
150
100
50
25
0
30
20
10
0
ANODE CURRENT I_a mA
−6
−5
−4
−3
−2
−1
0
CONTROL GRID VOLTAGE V_{g1}


110
BRIMAR 6AM6
SCREEN VOLTS V_{g2}=250
CONTROL GRID VOLTS V_{g1}=0
−1
−2
−3
−4
−5
30
20
10
0
ANODE CURRENT I_a mA
100
200
300
ANODE VOLTAGE V_a

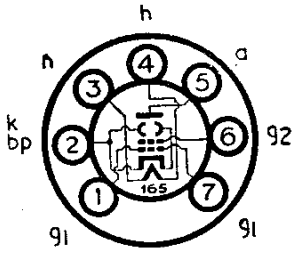
6AQ5
6AT6



B7G Base

Replacement Type

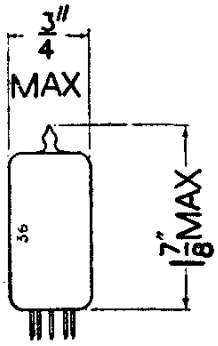
TYPE 6AQ5
MINIATURE
OUTPUT BEAM
TETRODE



Heater Voltage ... ... 6.3 volts Heater Current ... ... 0.45 amp.

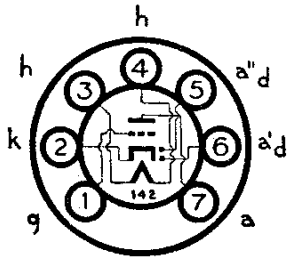
For further particulars refer to type 19AQ5

Current Equipment Type



B7G Base

TYPE 6AT6
MINIATURE
DOUBLE DIODE
TRIODE



RATINGS

Heater Voltage	6.3 volts
Heater Current	0.3 amp.
Anode Voltage	300 volts max.
Diode Current	1.0 mA max.

OPERATING CHARACTERISTICS

Anode Voltage	250 volts
Anode Current	1.0 mA
Grid Voltage ...	—3 volts
Anode Impedance	58,000 ohms
Mutual Conductance	1.2 mA/V
Amplification Factor...	70

OPERATION AS RESISTANCE COUPLED AMPLIFIER

Anode Supply Voltage ...	100	250	250 volts
Anode Load Resistor ...	0.5	0.25	0.25 meg.
Grid Resistor ...	1.0	1.0	1.0 meg.
Cathode Bias Resistor ...	9,000	3,000	0 ohms
Peak Output ...	16	43	40 volts
*Stage Gain ...	33	42	42
*Harmonic Distortion ...	2	1	5 per cent.

** Figures are for 12 volts peak output.*

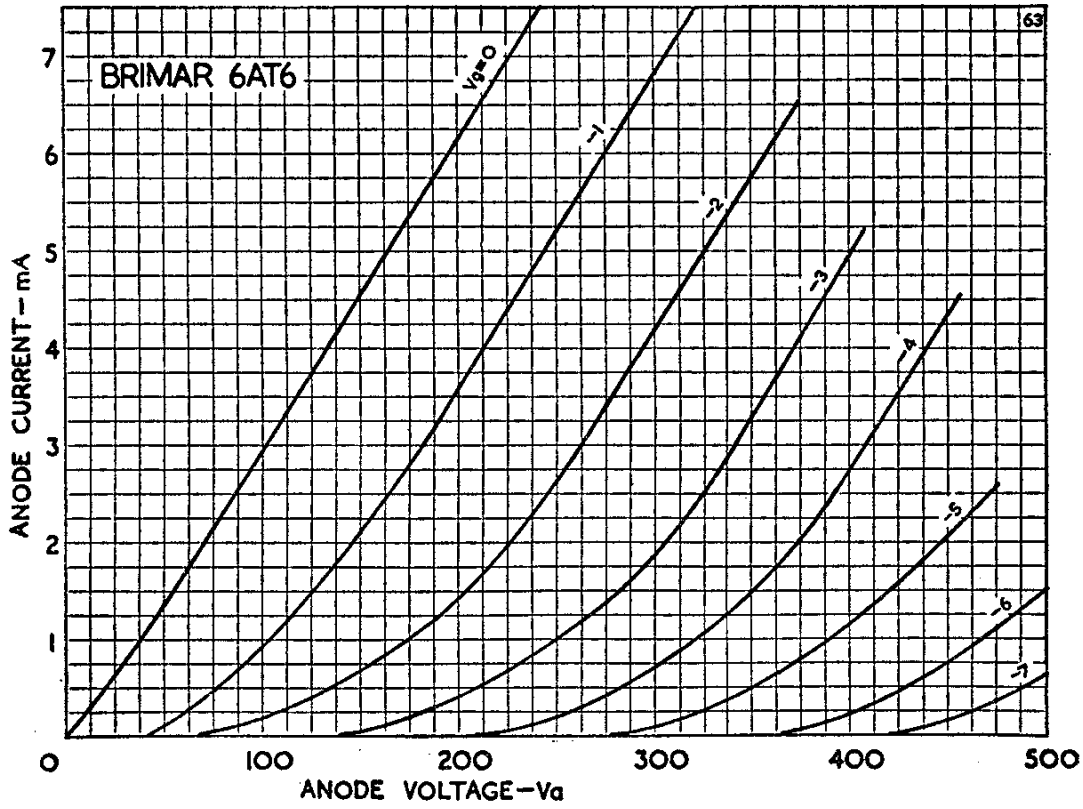
INTER-ELECTRODE CAPACITANCES *

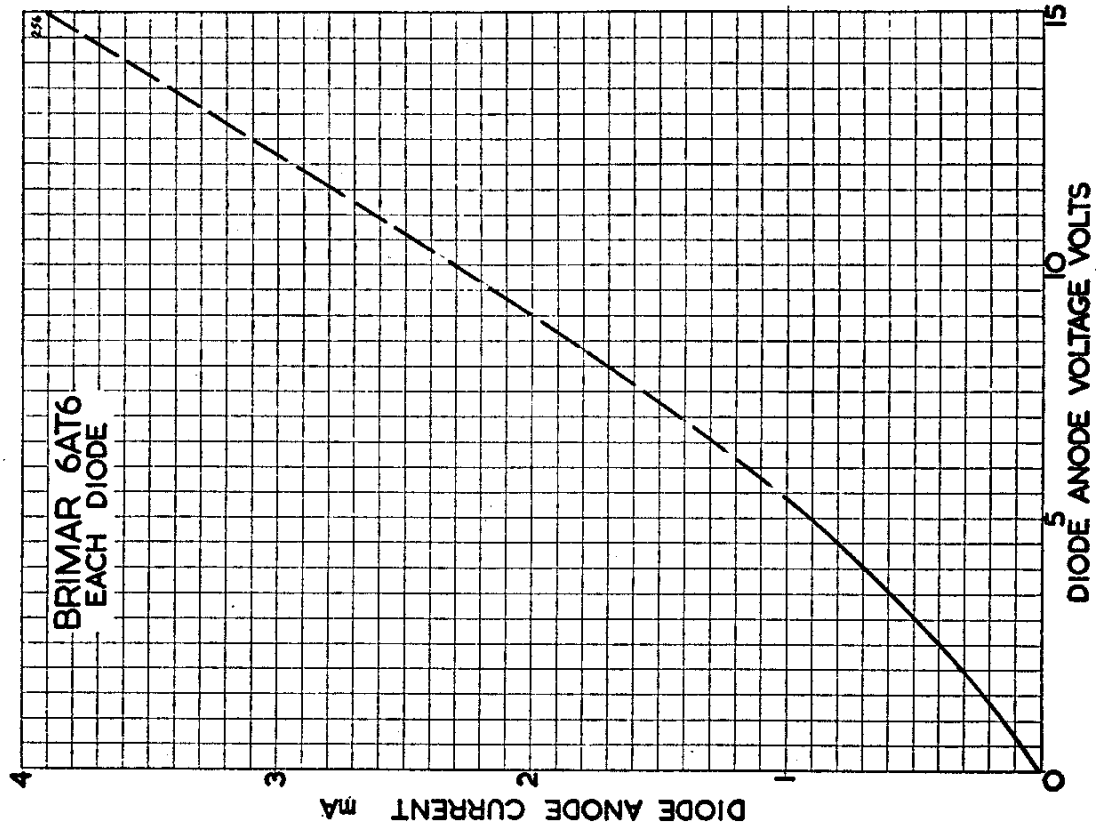
Grid to Cathode	2.3 pF
Anode to Cathode	1.1 pF
Grid to Anode	2.1 pF
Diode Anode (a''_d) to Grid	0.025 pF max.

** With no external shield.*

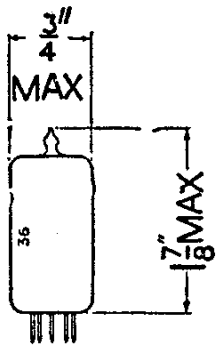
Type 6AT6 is a commercial equivalent of the CV452.

6AT6


BRIMAR 6AT6
63
Vg=0
-1
-2
-3
-4
-5
-6
-7
ANODE CURRENT – mA
0
1
2
3
4
5
6
7
100
200
300
400
500
ANODE VOLTAGE – Va


BRIMAR 6AT6
EACH DIODE
DIODE ANODE CURRENT mA
0
1
2
3
4
5
10
15
DIODE ANODE VOLTAGE VOLTS

6AU6



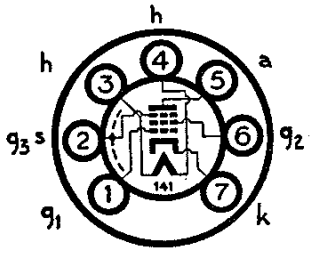
B7G Base

Current Equipment Type

TYPE 6AU6

HIGH SLOPE

R.F. PENTODE



Type 6AU6 is a sharp cut-off pentode suitable for use as R.F. or A.F. amplifier, limiter or sync. separator.

RATINGS

Heater Voltage	6.3 volts
Heater Current	0.3 amp.
Anode Voltage	300 volts max.
Anode Dissipation	3.0 watts max.
Screen (g_2) Supply Voltage	300 volts
Screen (g_2) Voltage	150 volts max.
Screen Dissipation	0.65 watts max.

OPERATING CHARACTERISTICS

[Suppressor Grid (g_3) connected to Cathode]

Anode Voltage	250	250	100	volts
Anode Current	10.8	7.6	5.2	mA
Screen Voltage	150	125	100	volts
Screen Current	4.3	3.0	2.0	mA
Control Grid (g_1) Voltage	—1	—1	—1	volts
Cathode Bias Resistor	68	100	140	ohms
Anode Impedance...	1.0	1.5	0.5	meg.
Mutual Conductance	5.2	4.4	3.9	mA/V
Inner Amplification Factor ($\mu_{g1, g2}$) ...	41	41	41	
Input Impedance (50 Mc/s)	3,500	—	—	ohms
Input Impedance (90 Mc/s)	900	—	—	ohms
Control Grid Voltage ... ... (For Anode Current Cut-off).	—6.2	—5.2	—4.2	volts

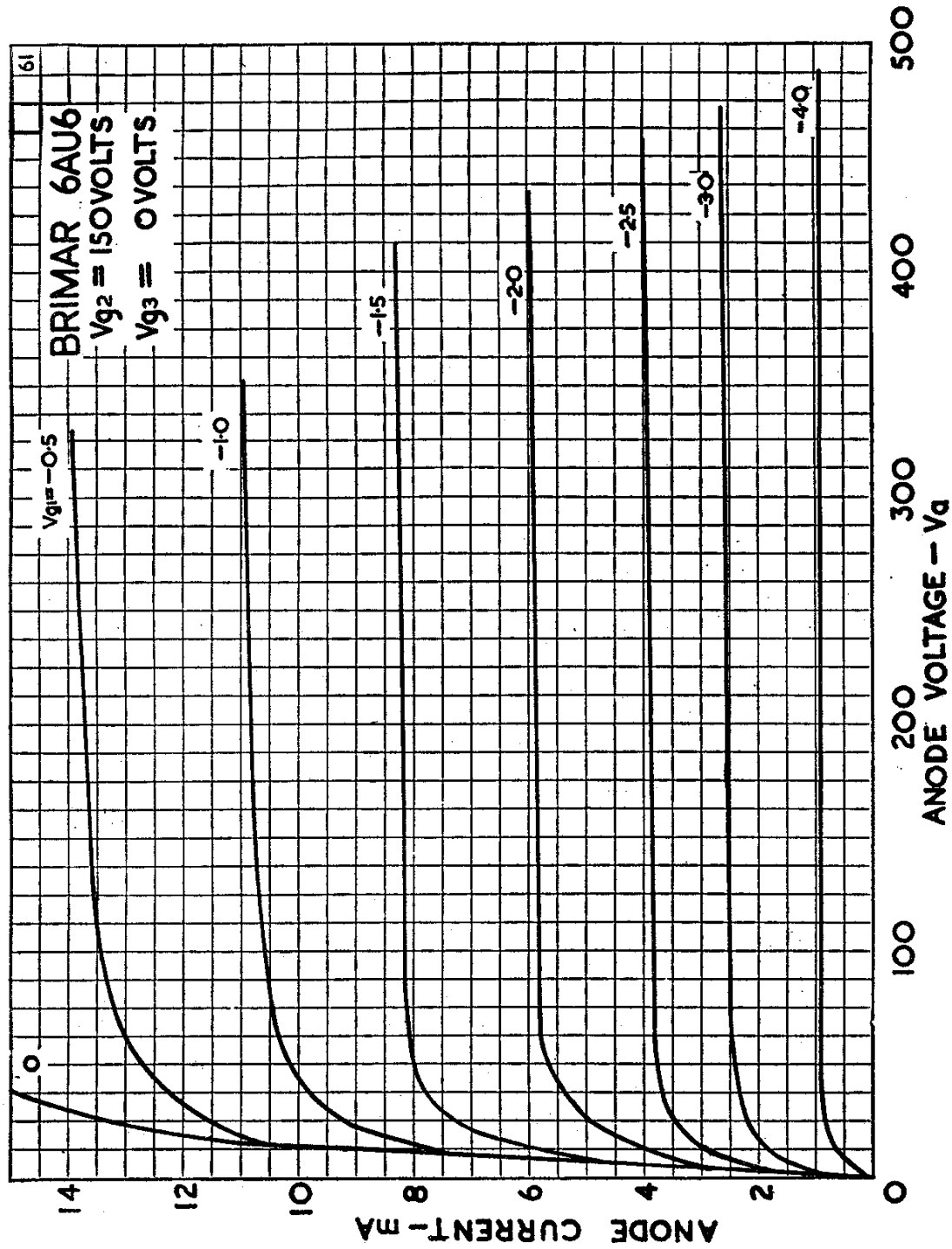
INTER-ELECTRODE CAPACITANCES *

Input	5.5	pF
Output	5.0	pF
Grid to Anode	0.0035	pF max.

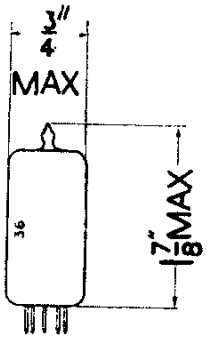
* *With no external shield.*

Type 6AU6 is a commercial equivalent to the CV2524.

6AU6

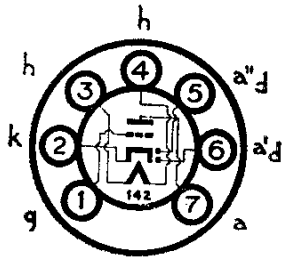

BRIMAR 6AU6
Vg2 = 150VOLTS
Vg3 = 0VOLTS
Vg1=-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-4.0
0
ANODE CURRENT - mA
14
12
10
8
6
4
2
0
100
200
300
400
500
ANODE VOLTAGE - Va

6AV6
6B4G



Replacement Type

TYPE **6AV6**
DOUBLE DIODE TRIODE



RATINGS

Heater Voltage	6.3 volts
Heater Current	0.3 amps.
Anode Voltage	300 volts max.
Anode Dissipation	1 watt max.
Diode Anode Current	1 mA max.

OPERATING CHARACTERISTICS (Triode Section)

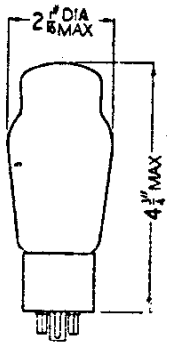
Anode Voltage	100	250	volts
Grid Voltage	—1	—2	volts
Anode Current	0.5	1.2	mA
Mutual Conductance	1.25	1.6	mA/V
Amplification Factor	100	100	
Anode Resistance	80	62.5	kilohms

OPERATION AS AN R.C. COUPLED AMPLIFIER

Anode Supply Voltage	100	250	volts
Anode Resistor	220	220	kilohms
Cathode Resistor	7.5	3.3	kilohms
Gain	45	62	
Peak Output Voltage	10	50	volts

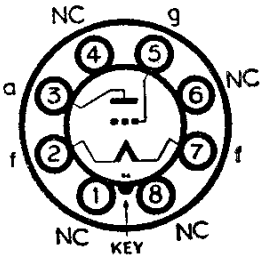
INTER-ELECTRODE CAPACITANCES

Triode Input	2.3 pF
Triode Output	1.1 pF
Triode Grid to Triode Anode	2.1 pF
Diode Anode to Grid	0.025 pF max.



Obsolescent Type

TYPE **6B4G**
(OCTAL BASE) POWER TRIODE



CHARACTERISTICS

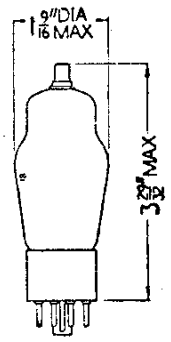
Filament Voltage ... ... 6.3 volts Filament Current ... ... 1.0 amp

For further characteristics refer to type 2A3

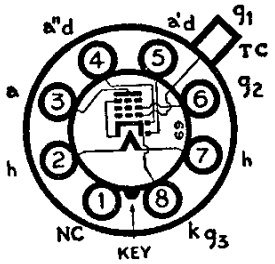
6B8G
6B8GT

Replacement Types

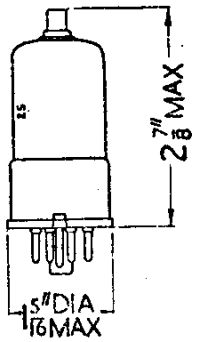
TYPES 6B8G, 6B8GT
(OCTAL BASE)



6B8G.



Note.—Type 6B8GT has Pin 1 connected to metal shell.



6B8GT.

DOUBLE DIODE PENTODES

RATINGS

Heater Voltage	6.3	volts
Heater Current	0.3	amp.
Anode Voltage	300	volts max.
Anode Dissipation	2.25	watts max.
Screen (g_2) Voltage	125	volts max.
Screen Dissipation	0.3	watts max.
Control Grid Resistor	1.0	meg. max.

OPERATING CHARACTERISTICS

Anode Voltage	100	180	250	250	volts
Anode Current	5.8	3.4	6.0	9.0	mA
Screen Voltage	100	75	100	125	volts
Screen Current	1.7	0.9	1.5	2.3	mA
Control Grid (g_1) Voltage	−3	−3	−3	−3	volts
Cathode Bias Resistor	400	700	400	250	ohms
Anode Impedance	0.3	1.0	0.8	0.6	meg.
Mutual Conductance	0.95	0.84	1.0	1.12	mA/V
Control Grid Cut-off Voltage	−17	−13	−17	−21	volts

OPERATION AS RESISTANCE COUPLED AMPLIFIER

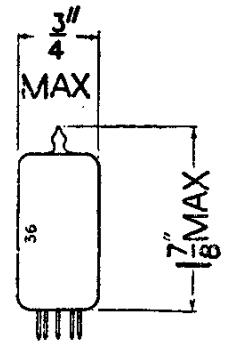
Anode and Screen Supply Voltage	90	180	300	volts
Anode Load Resistor	0.25	0.25	0.25	meg.
Screen Series Resistor	1.2	1.2	1.2	meg.
Cathode Bias Resistor	3,500	2,000	1,600	ohms
Peak Output	33	55	100	volts
Voltage Gain	55	70	80	

INTER-ELECTRODE CAPACITANCES*

	6B8G	6B8GT	
Input	3.6	4.5	pF
Output	9.5	10.0	pF
Control Grid to Anode	0.01	0.005	pF max.

* *With close fitting shield connected to cathode.*

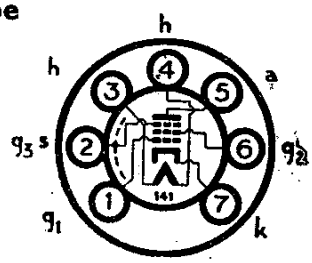
6BA6



B7G Base

Current Equipment Type

TYPE 6BA6
HIGH SLOPE
VARI-MU
R.F. PENTODE



RATINGS

Heater Voltage	6.3	volts
Heater Current	0.3	amp.
Anode Voltage	300	volts max.
Anode Dissipation	3.0	watts max.
Screen (g_2) Supply Voltage	300	volts max.
Screen Voltage	125	volts max.
Screen Dissipation	0.6	watt max.

OPERATING CHARACTERISTICS

[Suppressor Grid (g_3) connected to Cathode]

Anode Voltage	100	250	250	volts
Anode Current	10.8	11.0	11.0	mA
Screen Voltage	100	100	—	volts
Series Screen Resistor	—	—	33,000	ohms
Screen Current	4.4	4.2	4.2	mA
Control Grid (g_1) Voltage	-1	-1	-1	volts
Cathode Bias Resistor	68	68	68	ohms
Anode Impedance	0.25	1.5	1.5	meg.
Mutual Conductance	4.3	4.4	4.4	mA/V
Input Impedance (45 Mc/s)	4,500	4,500	4,500	ohms
Input Impedance (90 Mc/s)	900	900	900	ohms
Control Grid Voltage	-21	-21	-51	volts

(For Mutual Conductance of 0.005 mA/V).

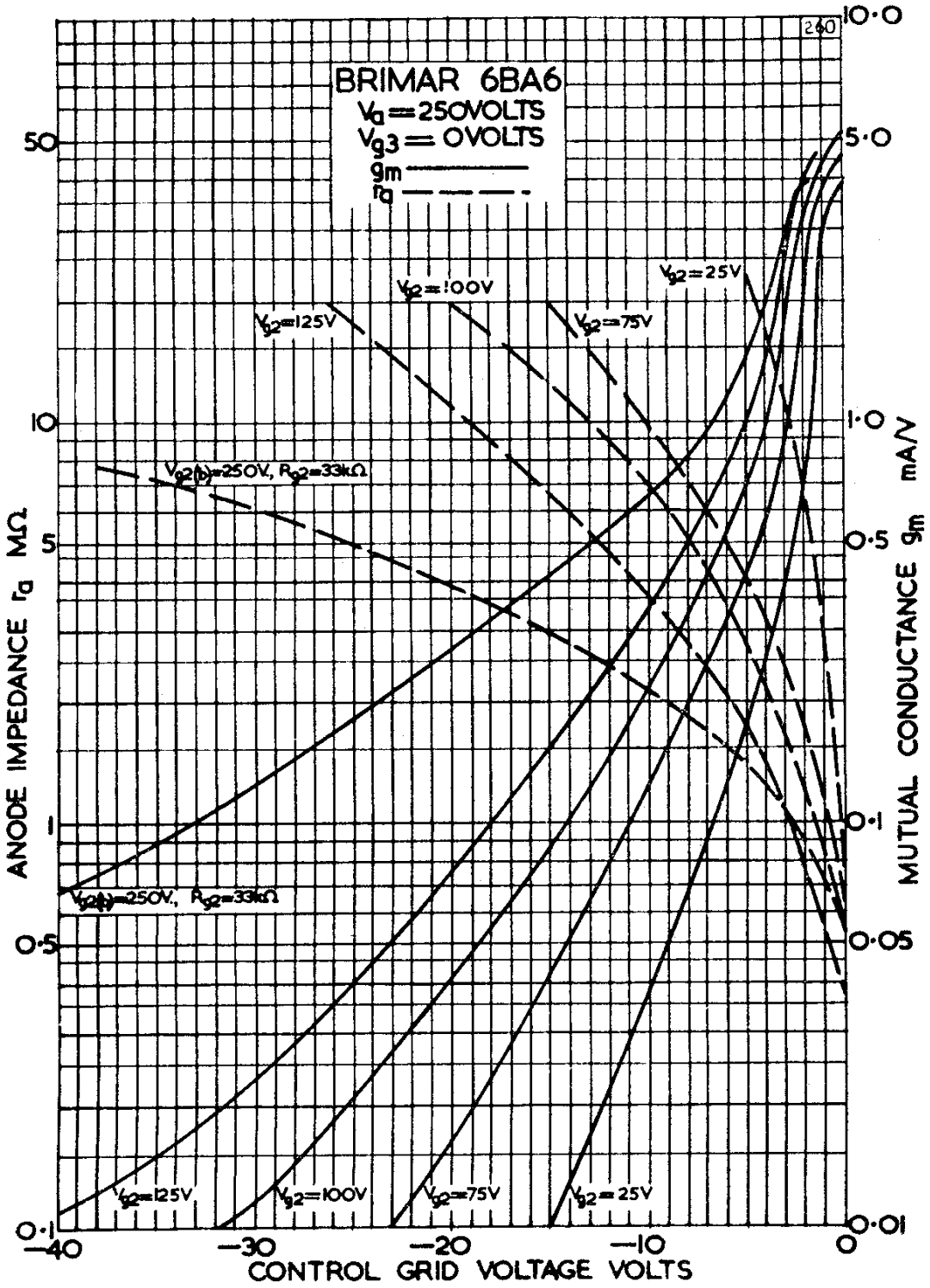
INTER-ELECTRODE CAPACITANCES *

Input	5.5	pF
Output	5.0	pF
Grid to Anode	0.0035	pF max.

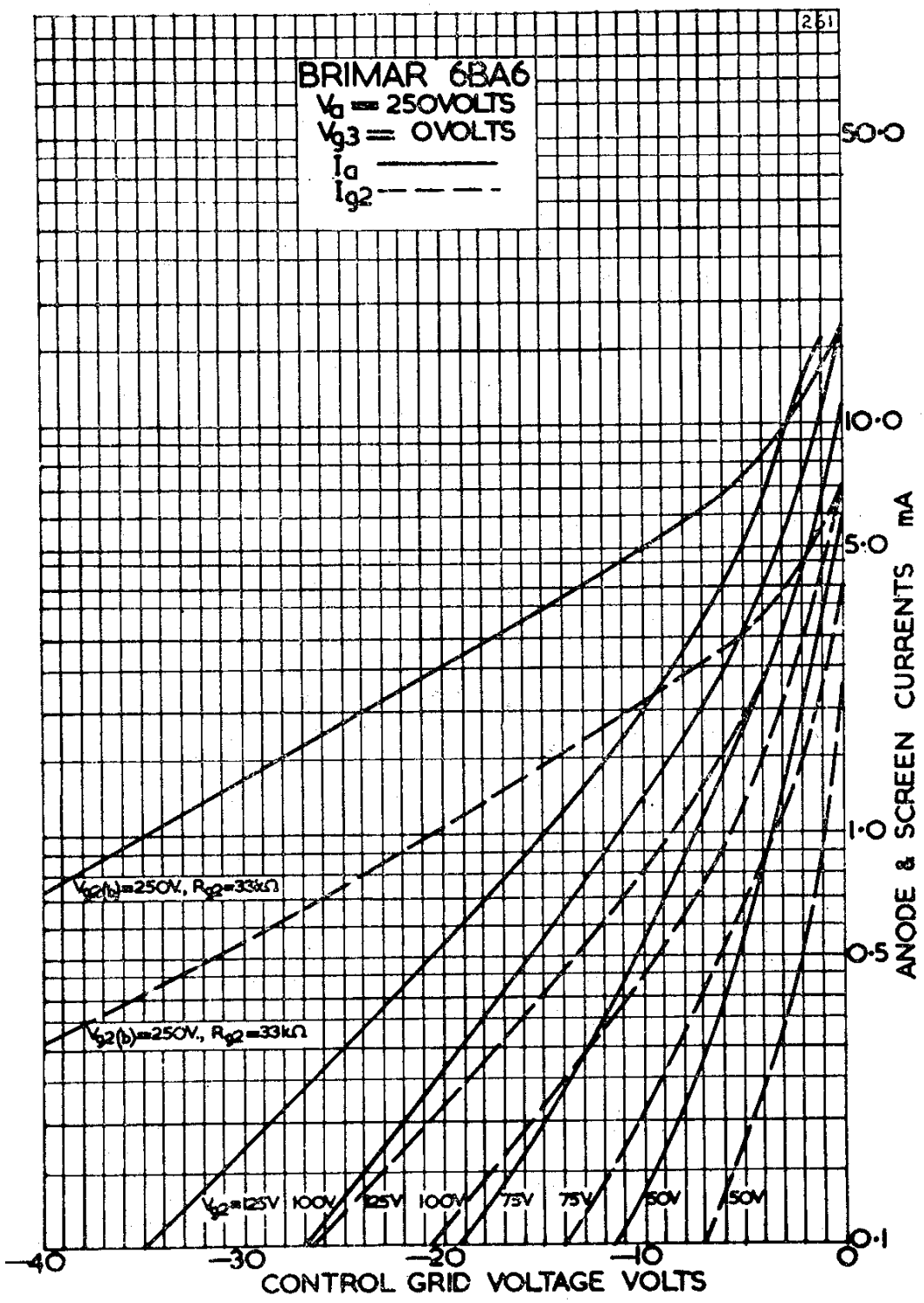
** With no external shield.*

Type 6BA6 is a commercial equivalent of the CV454.

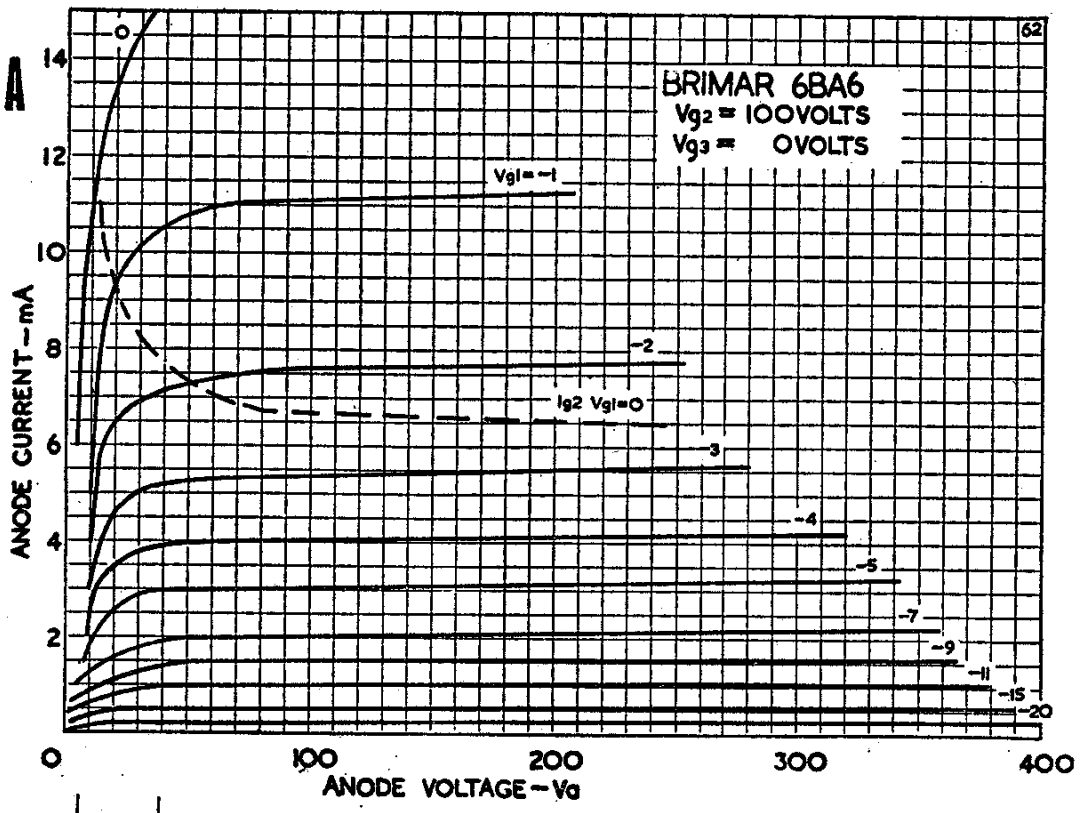
6BA6

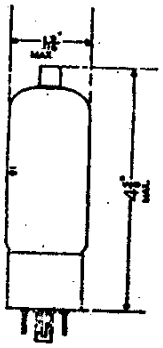

260
BRIMAR 6BA6
Va = 250VOLTS
Vg3 = 0VOLTS
gm
ra
Vg2=125V
Vg2=100V
Vg2=75V
Vg2=25V
Vg2(b)=250V, Rg2=33kΩ
Vg2(a)=250V, Rg2=33kΩ
ANODE IMPEDANCE ra MΩ
MUTUAL CONDUCTANCE gm mA/V
CONTROL GRID VOLTAGE VOLTS
50
10
5
1
0·5
0·1
10·0
5·0
1·0
0·5
0·1
0·05
0·01
−40
−30
−20
−10
0

6BA6


BRIMAR 6BA6
Vb = 250VOLTS
Vg3 = OVOLTS
Ia
Ig2
251
Vg2(b)=250V., Rg2=33kΩ
Vg2(b)=250V., Rg2=33kΩ
Vg2=125V
100V
125V
100V
75V
75V
50V
50V
50·0
10·0
5·0
1·0
0·5
0·1
ANODE & SCREEN CURRENTS mA
−40
−30
−20
−10
0
CONTROL GRID VOLTAGE VOLTS

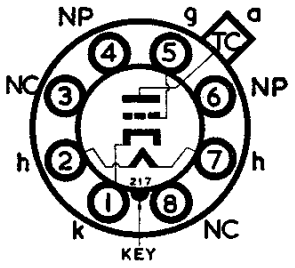
6BA6
6BD4A





Obsolescent Type

TYPE 6BD4A
E.H.T. VOLTAGE SHUNT REGULATOR



RATINGS

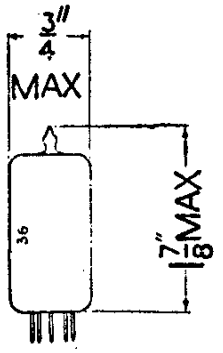
Heater Voltage	6.3 volts	Anode Dissipation	25 watts max.
Heater Current	0.6 amp.	Negative D.C. Grid Voltage	—125 volts max.
Anode Voltage	27 kilovolts max.	Heater-Cathode Voltage ...	180 volts max.
Anode Current	1.5 mA max.		

TYPICAL OPERATING CONDITIONS

Unregulated Supply Voltage	29.8 kilovolts
Source Impedance	8 megohms
Cathode Reference Voltage	500 volts
Source Impedance	1 Kilohm
D.C. Output Voltage, load current 0 mA	20 kilovolts
D.C. Output Voltage, load current 1 mA	19·7 kilovolts

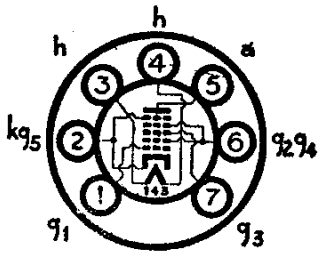
Free air circulation is necessary to ensure adequate cooling of the envelope. The use of anode voltages above 16 kV may produce X-rays, and prolonged exposure to the radiation may be dangerous to health. In such cases adequate shielding of the valve to reduce the radiation is essential.

Current Equipment Type **6BE6**



B7G Base

TYPE 6BE6 MINIATURE HEPTODE FREQUENCY CHANGER



Owing to its specialized structure, type 6BE6 may be employed as a self-oscillating frequency changer at frequencies exceeding 60 Mc/s, with excellent frequency stability.

RATINGS

Heater Voltage	6.3 volts
Heater Current	0.3 amp.
Anode Voltage	300 volts max.
Anode Dissipation	1.0 watt max.
Screen (g_2, g_4) Voltage	100 volts max.
Screen Dissipation	1.0 watt max.
Total Cathode Current	14 mA max.

OPERATING CHARACTERISTICS (SEPARATE EXCITATION)

Anode Voltage	250 volts
Anode Current	3.0 mA
Screen Voltage	100 volts
Screen Current	7.1 mA
Control Grid (g_3) Voltage	–1.5 volts
Anode Impedance	1.0 meg.
Oscillator Grid (g_1) Current	0.5 mA
Oscillator Grid Resistor	20,000 ohms
Oscillator Mutual Conductance	7.25 mA/V
Conversion Conductance	0.475mA/V†
Control Grid Voltage	–30 volts

(For Conversion Conductance of 0.005 mA/V).

† *When used with self excitation this value depends on the position of the cathode tap up the coil.*

INTER-ELECTRODE CAPACITANCES *

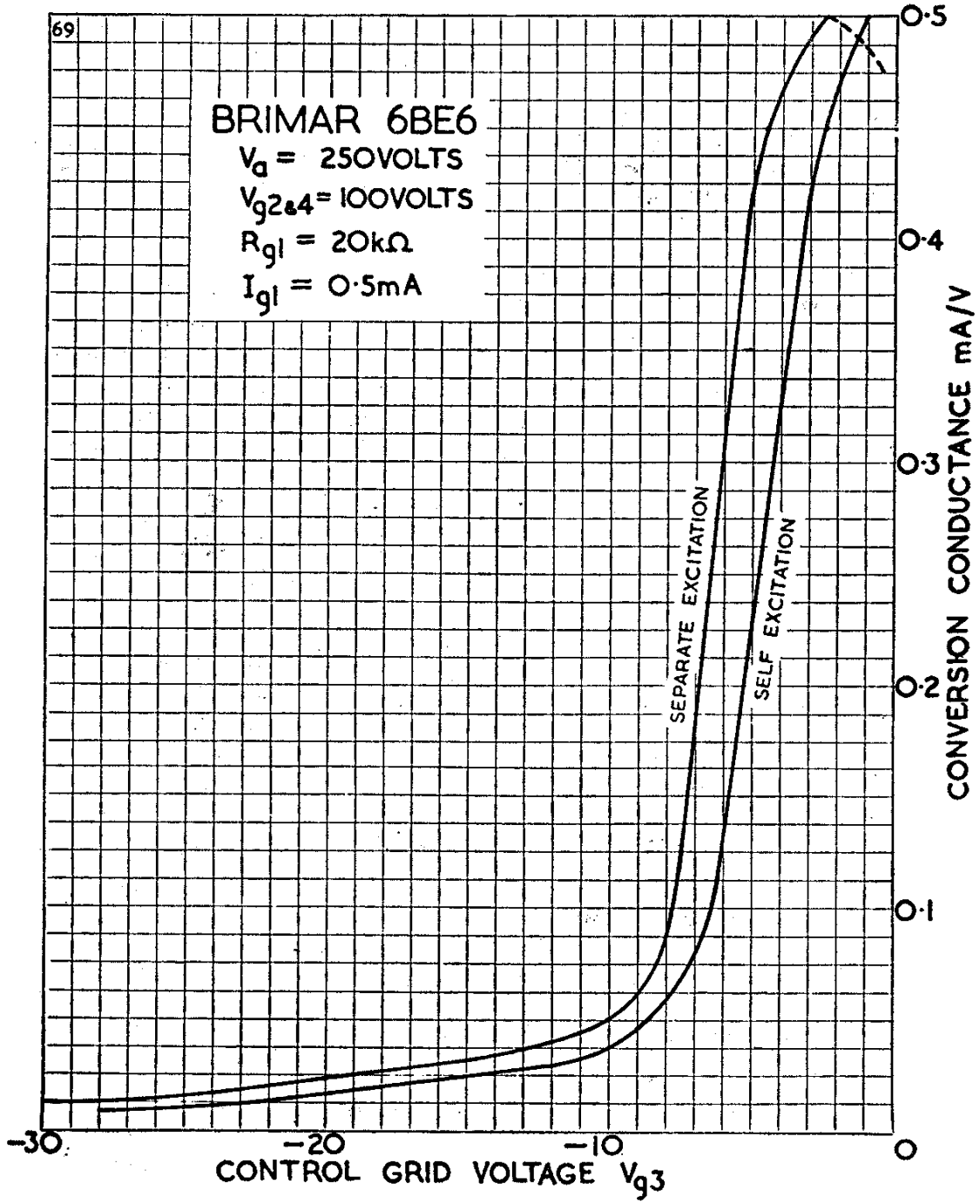
R.F. Input	7.2 pF
I.F. Output	8.6 pF
Oscillator Input	5.5 pF
Control Grid to Anode	0.3 pF max.

* *Measured with no external shield.*

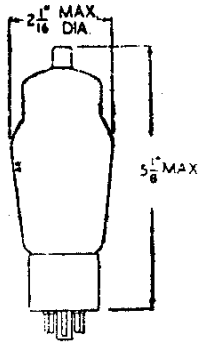
Note : The characteristics shown with separate excitation approximate closely to those obtained with self excitation and zero bias.

Type 6BE6 is a commercial equivalent of the CV453.

6BE6

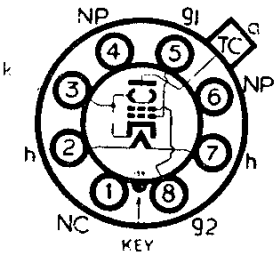

69
BRIMAR 6BE6
V_a = 250VOLTS
$V_{g2\&4}$ = 100VOLTS
R_{g1} = 20kΩ
I_{g1} = 0·5mA
SEPARATE EXCITATION
SELF EXCITATION
0·5
0·4
0·3
0·2
0·1
0
CONVERSION CONDUCTANCE mA/V
−30
−20
−10
CONTROL GRID VOLTAGE V_{g3}

6BG6G



Replacement Type

TYPE **6BG6G** (OCTAL BASE) LINE TIME BASE OUTPUT VALVE



RATINGS

Heater Voltage	6.3 volts
Heater Current	0.9 amp.
Direct Anode Voltage	700 volts max.
Positive Surge Anode Voltage	6,000 volts max.*
Direct Anode Current	100 mA max.
Anode Dissipation	20 watts max.
Direct Screen (g_2) Voltage	350 volts max.
Screen Dissipation	3.2 watts max.
Direct Control Grid (g_1) Voltage	–50 volts max.
Negative Surge Control Grid Voltage	–400 volts max.*
Control Grid to Cathode Resistance	1.0 meg. max.
Heater to Cathode Potential	250 volts max.
Peak Cathode Current	300 mA. max.

CHARACTERISTICS

Anode Voltage	300 volts
Anode Current	60 mA
Screen Voltage	250 volts
Screen Current	4 mA
Control Grid Voltage	–18 volts
Mutual Conductance	6.0 mA/V
Anode Impedance	30,000 ohms
Inner Amplification Factor ($\mu_{g1,g2}$)	8

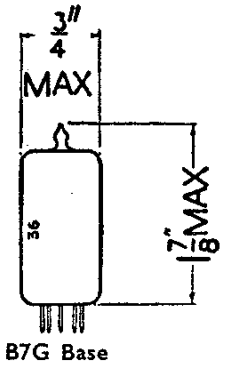
INTER-ELECTRODE CAPACITANCES

Input	11 pF
Output	6.5 pF
Grid to Anode	0.5 pF max.

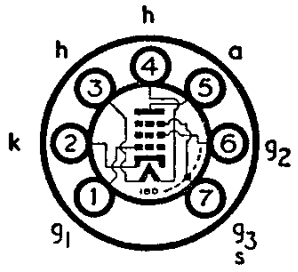
** The duty cycle must not exceed 15 per cent of the scanning cycle and its duration must be limited to 15 microseconds.*

6BH6

Current Equipment Type



TYPE **6BH6**
MINIATURE
HIGH SLOPE
R.F. PENTODE



The BRIMAR 6BH6 is a medium slope, sharp cut-off R.F. pentode designed for use in car radio and mobile equipment where economy of heater current is important.

RATINGS

Heater Voltage	6.3 volts
Heater Current	0.15 amp.
Anode Voltage	300 volts max.
Anode Dissipation	3.0 watts max.
Screen (g_2) Voltage	150 volts max.
Screen Dissipation	0.5 watt max.

OPERATING CHARACTERISTICS
(Suppressor Grid (g_3) connected to Cathode)

Anode Voltage	100	250	250	volts
Anode Current	3.6	7.4	7.4	mA
Screen Voltage	100	150	—	volts
Series Screen Resistor	—	—	33	kΩ
Screen Current	1.4	2.9	2.9	mA
Control Grid (g_1) Voltage	—1	—1	—1	volts
Cathode Bias Resistor	200	100	100	ohms
Anode Impedance	0.7	1.4	1.4	MΩ
Mutual Conductance	3.4	4.6	4.6	mA/V
Input Impedance at 50 Mc/s	—	6,000	6,000	ohms
Input Impedance at 90 Mc/s	—	3,000	3,000	ohms
Control Grid Voltage for Ia = 10μA	—5	—7.7	—	volts

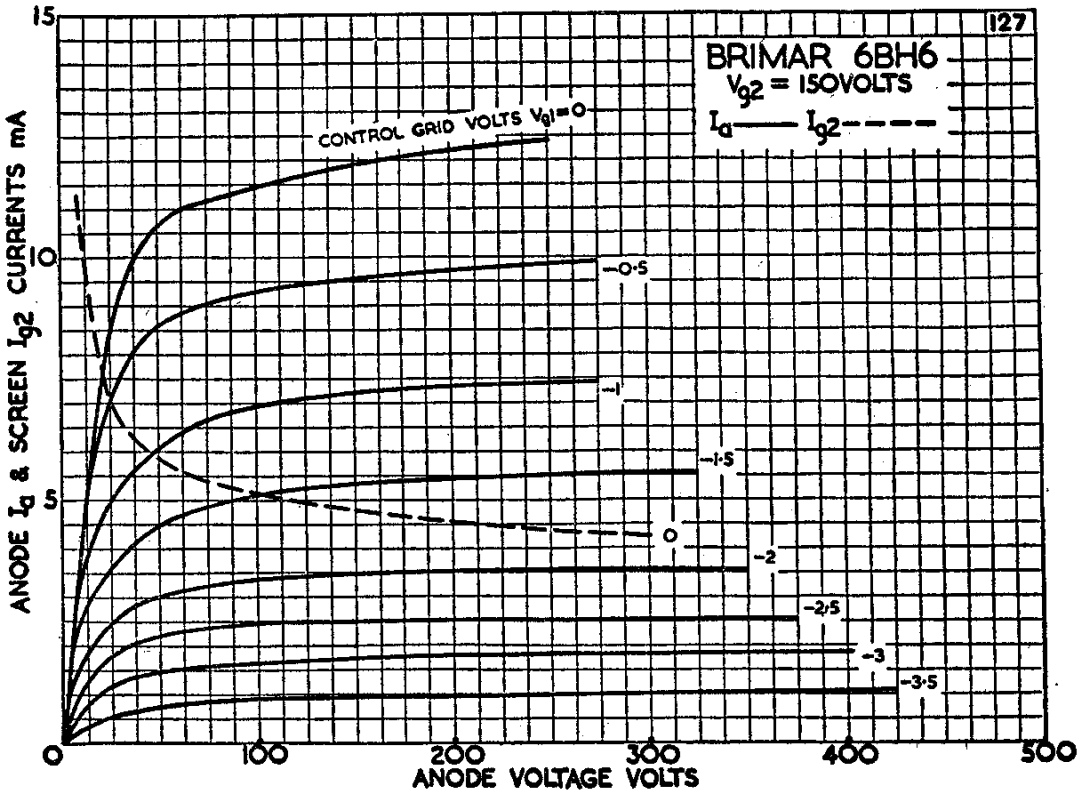
INTER-ELECTRODE CAPACITANCES *

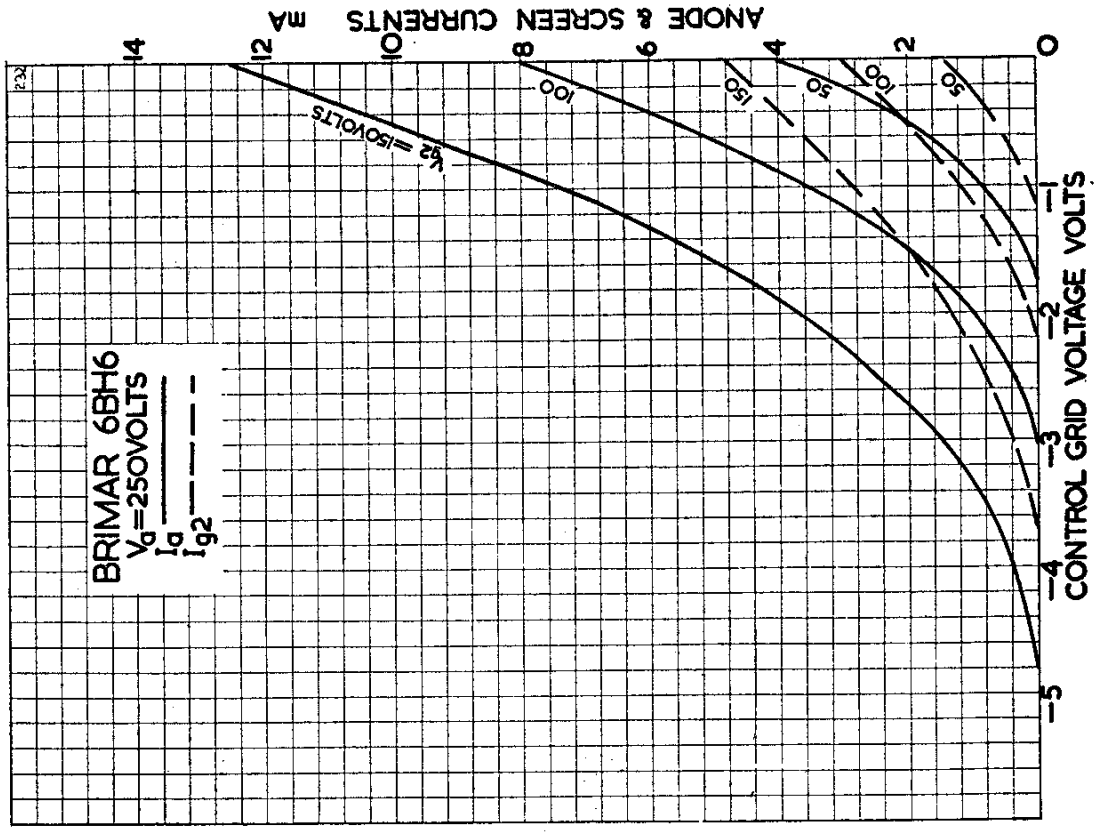
Input	5.4 pF
Output	4.4 pF
Grid to Anode	0.0035 pF max.

* *With no external shield.*

Type 6BH6 *is a commercial equivalent to the* CV3908.

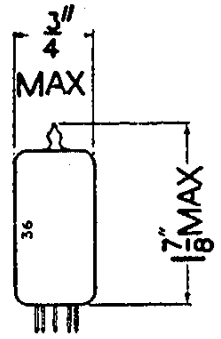
6BH6


127
BRIMAR 6BH6
V_{g2} = 150VOLTS
I_a —— I_{g2} - - -
CONTROL GRID VOLTS V_{g1}=0
-0·5
-1
-1·5
0
-2
-2·5
-3
-3·5
ANODE I_a & SCREEN I_{g2} CURRENTS mA
ANODE VOLTAGE VOLTS
0
5
10
15
100
200
300
400
500


ANODE & SCREEN CURRENTS mA
V_{g2} =150VOLTS
100
150
50
100
50
BRIMAR 6BH6
V_a=250VOLTS
I_a
I_{g2}
CONTROL GRID VOLTAGE VOLTS
-1
-2
-3
-4
-5
0
2
4
6
8
10
12
14

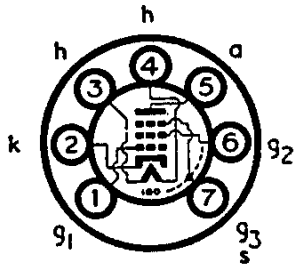
6BJ6

Current Equipment Type



B7G Base

TYPE 6BJ6
MINIATURE
VARI-MU
R.F. PENTODE



The BRIMAR 6BJ6 is a medium slope variable-mu R.F. pentode designed for use in domestic radio equipment. It is particularly useful for car radio and mobile equipment where economy of heater current is important.

RATINGS

Heater Voltage	6.3 volts
Heater Current	0.15 amp.
Anode Voltage	300 volts max.
Anode Dissipation	3.0 watts max.
Screen (g_2) Voltage	125 volts max.
Screen Dissipation	0.6 watts max.

OPERATING CHARACTERISTICS
(Suppressor Grid (g_3) connected to Cathode)

Anode Voltage	100	250	250	volts
Anode Current	9.0	9.2	9.2	mA
Screen Voltage	100	100	—	volts
Series Screen Resistor	—	—	47	kΩ
Screen Current	3.5	3.3	3.3	mA
Control Grid (g_1) Voltage	—1	—1	—1	volts
Cathode Bias Resistor	82	82	82	ohms
Anode Impedance	0.25	1.3	1.3	MΩ
Mutual Conductance	3.65	3.80	3.80	mA/V
Input Impedance at 50 Mc/s	—	7,500	7,500	ohms
Input Impedance at 90 Mc/s	—	4,200	4,200	ohms
Control Grid Voltage (for gm 0.015 mA/V)	—20	—20	—	volts

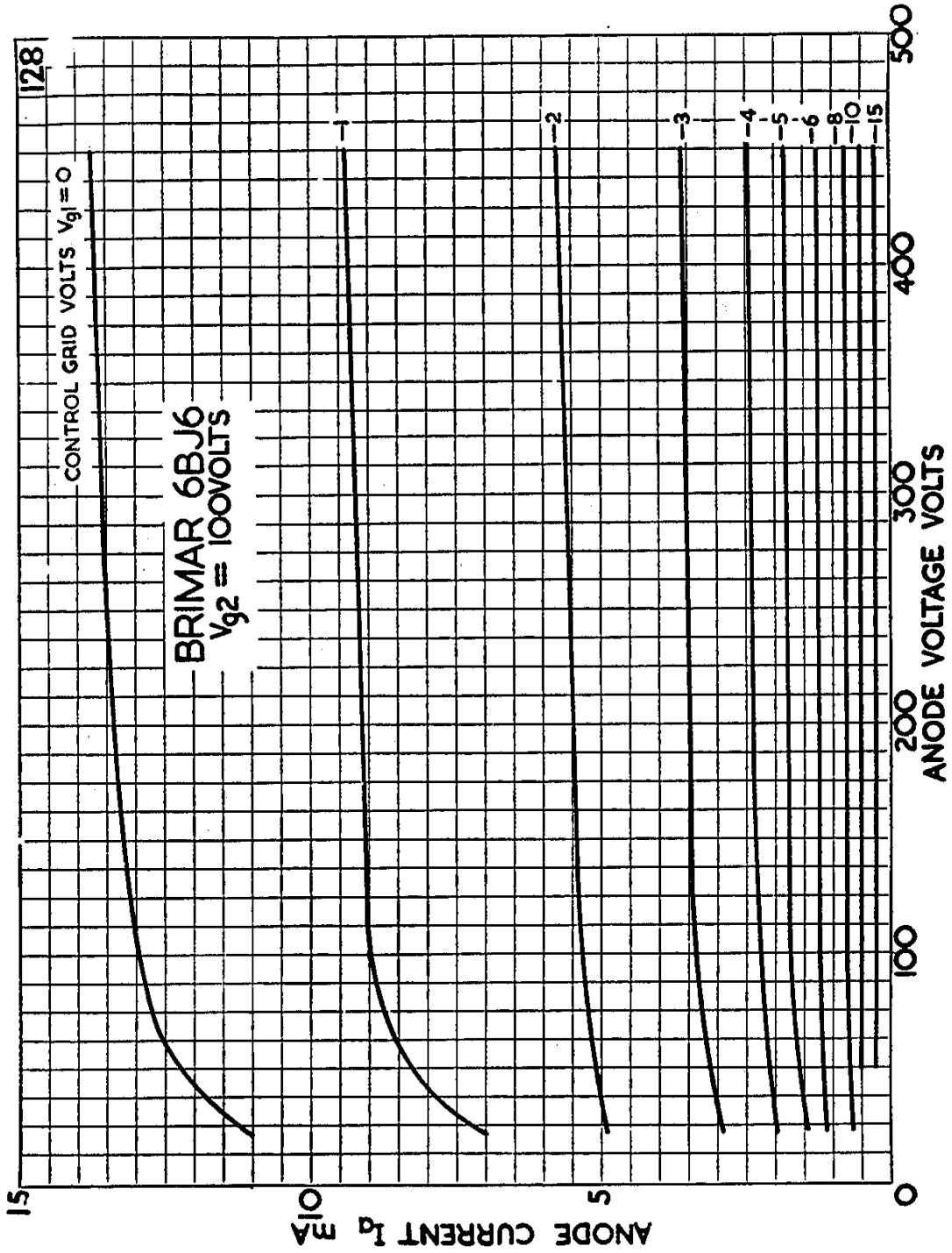
INTER-ELECTRODE CAPACITANCES *

Input	4.5 pF
Output	5.5 pF
Grid to Anode	0.0035 pF max.

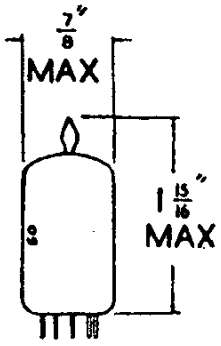
* *With no external shield.*

Type 6BJ6 is a commercial equivalent to the CV3909.

6BJ6


128
CONTROL GRID VOLTS V_{g1} = 0
-1
-2
-3
-4
-5
-6
-8
-10
-15
BRIMAR 6BJ6
V_{g2} = 100VOLTS
500
400
300
200
100
0
ANODE VOLTAGE VOLTS
15
10
5
0
ANODE CURRENT I_a mA

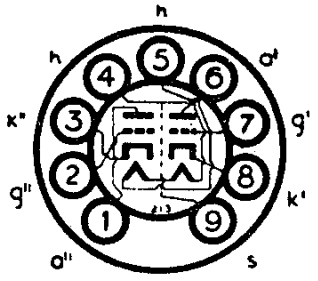
6BQ7A



B9A (Noval) Base

Current Equipment Type

TYPE 6BQ7A MINIATURE HIGH SLOPE DOUBLE TRIODE



The BRIMAR 6BQ7A consists of two separate high slope triode units designed for use mainly in VHF cascode amplifiers, but since the internal screen is brought out to a separate base pin the two triode sections may be used independently or in push-pull.

RATINGS

Heater Voltage	6.3 volts
Heater Current	0.4 amp.
Anode Voltage ($I_a = 0$)	300 volts max.
Anode Voltage	250 volts max.
Anode Dissipation (per section)	2 watts max.
Cathode Current (per section)	20 mA max.
Heater-Cathode Voltage, Heater negative with respect to Cathode	200 volts max.†
Heater-Cathode Voltage, Heater positive with respect to Cathode	200 volts max.
Grid circuit resistance (using cathode bias)	500 k ohms max.

† *Under cut-off conditions in cascode circuits this may be 300 V.*

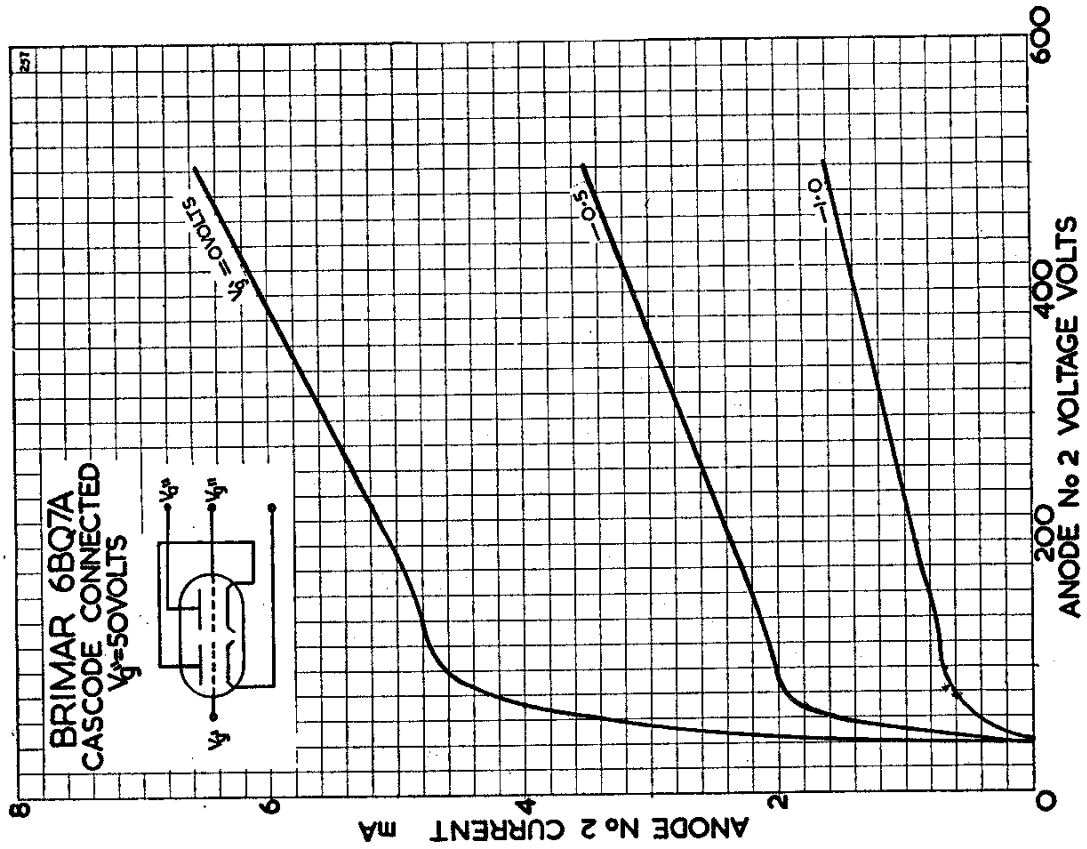
OPERATING CHARACTERISTICS

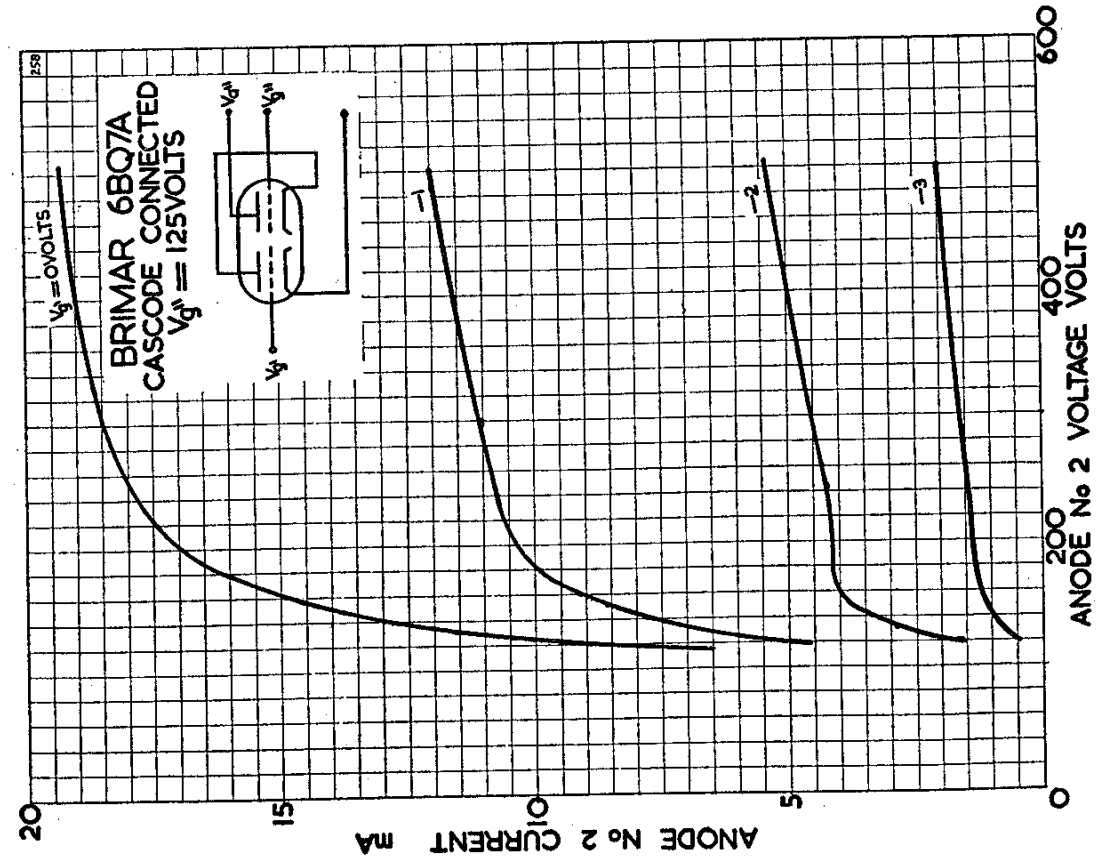
Anode Voltage	150 volts
Cathode Bias Resistor	220 ohms
Anode Current	9 mA
Mutual Conductance	6.4 mA/V
Amplification Factor	39
Anode Resistance	6,100 ohms
Control Grid Voltage for $I_a = 10\ \mu A$	−10 volts

INTER-ELECTRODE CAPACITANCES *

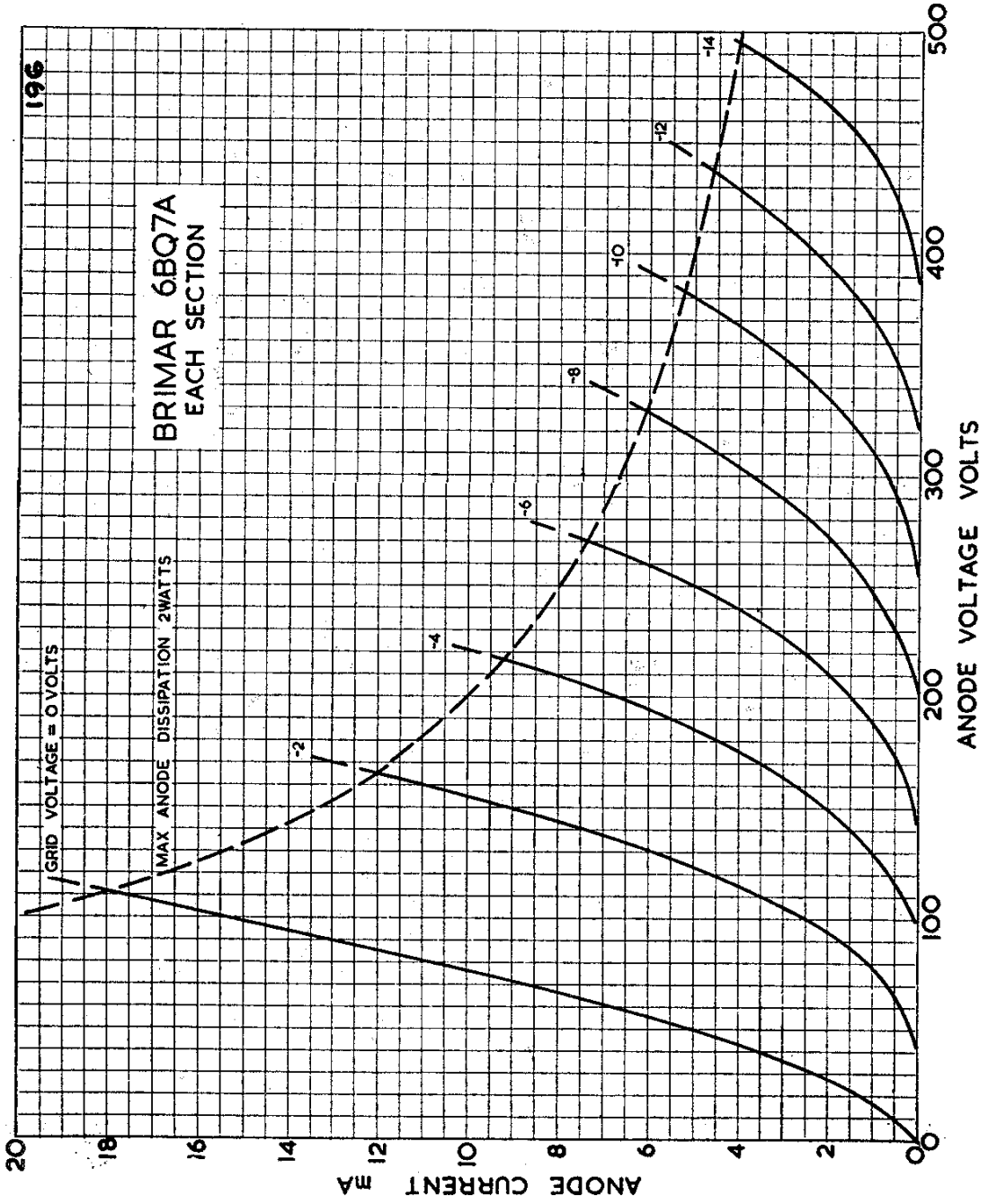
	Triode 1		Triode 2
Grid to Anode	1.15		1.15 pF
Input	2.85		— pF
Input (grounded Grid)	—		4.95 pF
Output	1.35		— pF
Output (grounded Grid)	—		2.27 pF
Anode to Cathode	0.15		0.15 pF max.
Heater to Cathode	2.65		2.70 pF
Anode ′ to Anode ″		0.010	pF max.
Anode ″ to Anode ′ plus Grid ′		0.024	pF max.

* *Measured with external shield.*

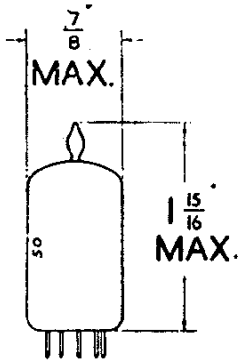

BRIMAR 6BQ7A
CASCODE CONNECTED
Vg=50VOLTS
Vg=0VOLTS
-0·5
-1·0
ANODE No 2 CURRENT mA
ANODE No 2 VOLTAGE VOLTS
0
2
4
6
8
200
400
600


BRIMAR 6BQ7A
CASCODE CONNECTED
Vg"= 125VOLTS
Vg=0VOLTS
-1
-2
-3
ANODE No 2 CURRENT mA
ANODE No 2 VOLTAGE VOLTS
0
5
10
15
20
200
400
600

6BQ7A


BRIMAR 6BQ7A
EACH SECTION
MAX ANODE DISSIPATION 2WATTS
GRID VOLTAGE = 0 VOLTS
-2
-4
-6
-8
-10
-12
-14
ANODE CURRENT mA
ANODE VOLTAGE VOLTS
0
2
4
6
8
10
12
14
16
18
20
100
200
300
400
500

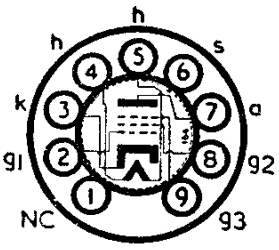
6BR7



B9A (Noval) Base

Current Equipment Type

TYPE **6BR7**
MINIATURE
LOW MICROPHONY
AMPLIFIER PENTODE



The BRIMAR type 6BR7 has been specially designed for use in the early stages of high gain A.F. amplifiers. Its thorough screening and rigid construction ensure low microphony and greatly reduced hum compared with existing types.

RATINGS

Heater Voltage	6.3 volts
Heater Current	0.15 amp.
Anode Voltage	300 volts max.
Anode Dissipation	0.75 watt max.
Screen (g_2) Voltage	125 volts max.
Screen Dissipation	0.3 watt max.

OPERATING CHARACTERISTICS

(g_3 connected to Cathode)

Anode Voltage	100	250	volts
Anode Current	2.0	2.1	mA
Screen Voltage	100	100	volts
Screen Current	0.7	0.6	mA
Control Grid (g_1) Voltage	−3	−3	volts
Anode Impedance	1.5	2.3	meg.
Mutual Conductance	1.1	1.25	mA/V

OPERATION AS RESISTANCE COUPLED AMPLIFIER

Anode and Screen Supply Voltage	100	200	300	volts
Anode Load Resistor	0.25	0.25	0.25	meg.
Screen Series Resistor	1.0	1.0	1.2	meg.
Cathode Bias Resistor	2,500	1,500	1,200	ohms
Peak Output	35	70	100	volts
Voltage gain	90	120	140	—

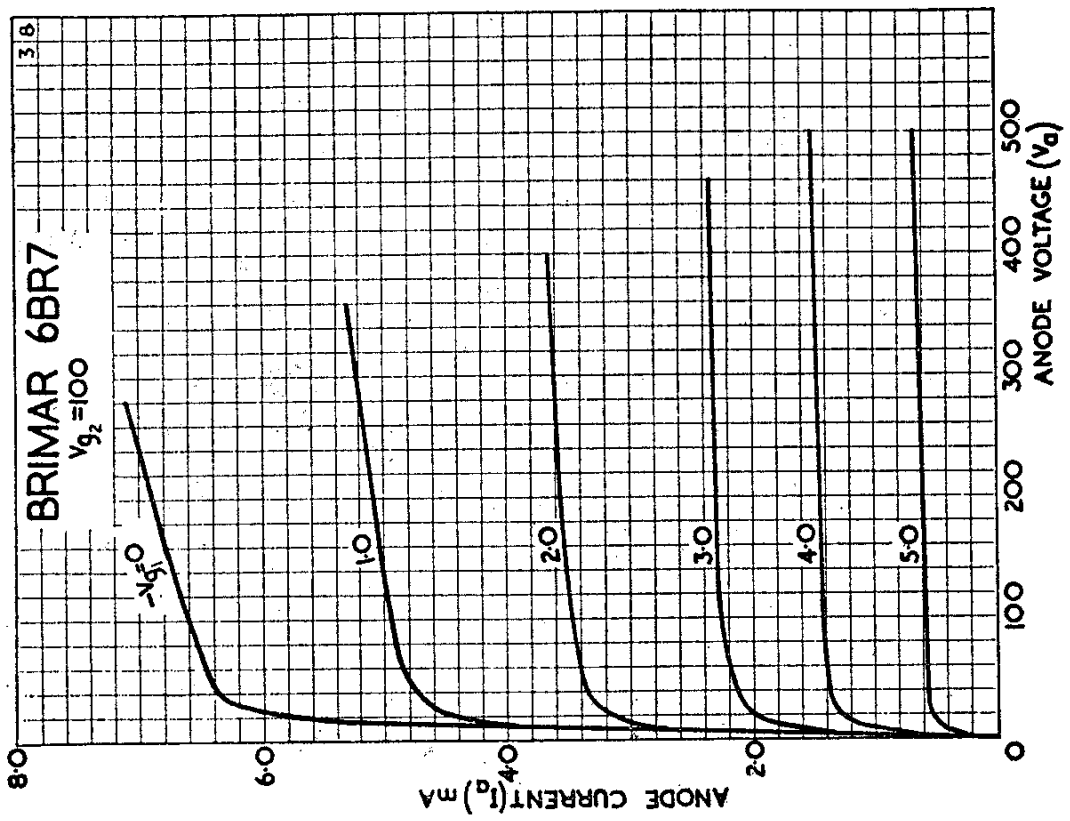
INTER-ELECTRODE CAPACITANCES

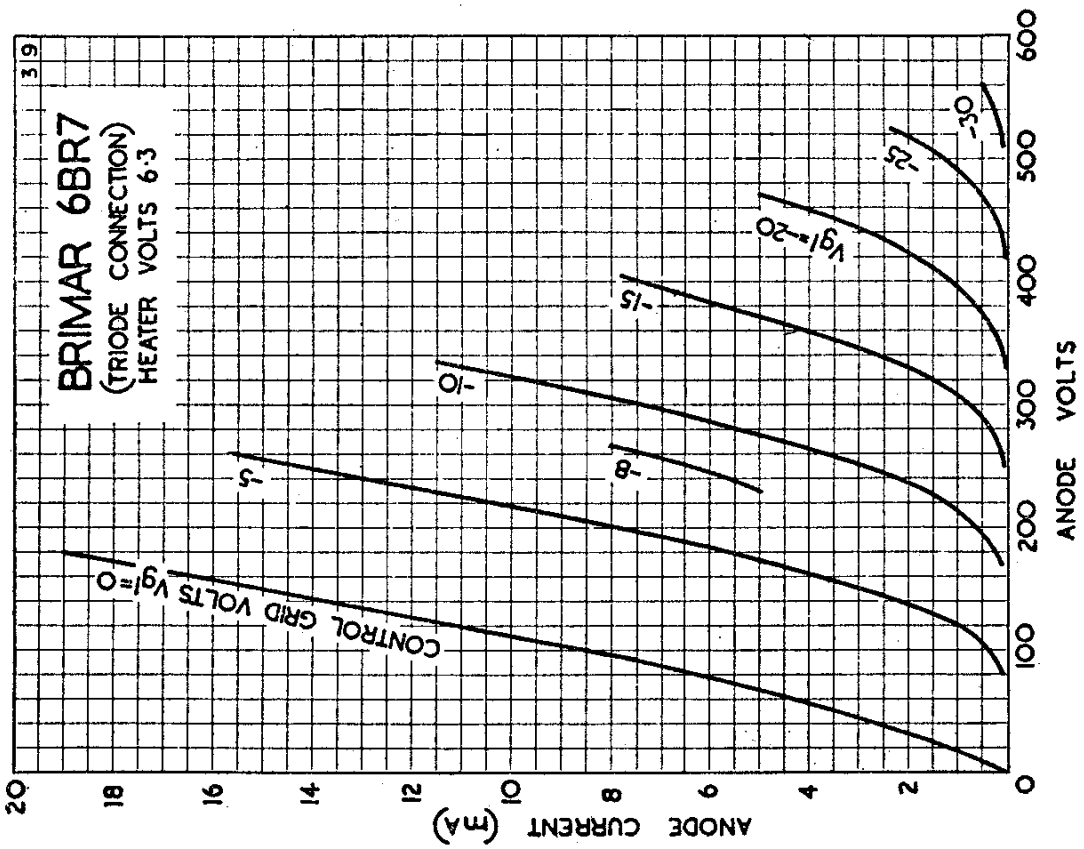
Input	4.0 pF
Output	4.0 pF
Control Grid to Anode	0.01 pF max.

When connected as a triode (g_3 to Cathode, g_2 to Anode), type 6BR7 has similar characteristics to those of type 6C5G.

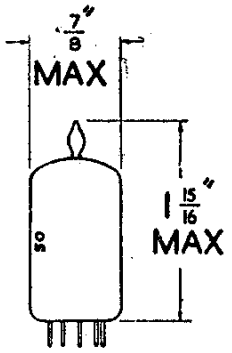
Type 6BR7 *is a commercial equivalent of the* CV2135.

6BR7


3·8
BRIMAR 6BR7
V_{g_2}=100
$-V_{g_1}$=0
1·0
2·0
3·0
4·0
5·0
8·0
6·0
4·0
2·0
0
100
200
300
400
500
ANODE CURRENT (I_a) mA
ANODE VOLTAGE (V_a)

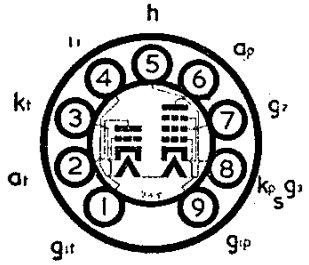

3·9
BRIMAR 6BR7
(TRIODE CONNECTION)
HEATER VOLTS 6·3
CONTROL GRID VOLTS Vg1=0
-5
-8
-10
-15
Vg1=-20
-25
-30
20
18
16
14
12
10
8
6
4
2
0
100
200
300
400
500
600
ANODE CURRENT (mA)
ANODE VOLTS

6BR8



Current Equipment Type

TYPE 6BR8
MINIATURE
TRIODE
PENTODE



B9A Base

The BRIMAR 6BR8 consists of a high slope pentode and a medium-mu triode mounted in a single noval envelope. The two sections have separate cathodes, and the isolation between sections is such that the valve may be used in a variety of high-gain A.F. applications where the two stages are connected in cascade.

Heater Voltage	6.3 volts
Heater Current...	0.45 amp.

RATINGS

	Triode	*Pentode*
Heater-Cathode Potential (cathode positive)		220 volts max.
Heater-Cathode Potential (cathode negative)		90 volts max.
Anode Voltage (Ia = 0)	550	550 volts max.
Anode Voltage	300	300 volts max.
Screen Voltage	—	300 volts max.
Anode Dissipation	2.7	2.8 watts max.
Screen Dissipation	—	0.5 watts max.
Cathode Current	20	20 mA max.
Grid Resistance	1	1 M Ω max.

CHARACTERISTICS

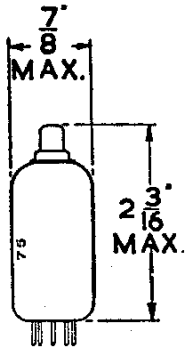
	Triode		*Pentode*
Anode Voltage	150	100	250 volts
Screen Voltage	—	—	110 volts
Cathode Bias Resistor	56	2700	68 Ω
Anode Current	18	1.26	10 mA
Screen Current	—	—	3.5 mA
Mutual Conductance	8.5	1.2	5.2 mA/V
Anode Impedance	5	20	400 k Ω
Amplification Factor	40	25	—

TYPICAL OPERATION AS AN R.C. COUPLED AMPLIFIER

	Triode		*Pentode*
Anode Supply Voltage	200	250	250 volts
Anode Load Resistor	47	220	470 k Ω
Series Screen Resistor	—	—	2.7 M Ω
Grid Resistor of Following Valve ...	0.22	1.0	1.0 M Ω
Cathode Resistor	2.0	3.9	2.2 k Ω
Voltage Gain (approx.)	19	22	245

For characteristic curves refer to type PCF82.

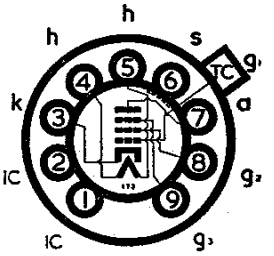
6BS7



B9A (Noval) Base

Current Equipment Type

TYPE 6BS7
MINIATURE
LOW MICROPHONY
AMPLIFIER PENTODE



The BRIMAR type 6BS7 is suitable for use in the early stages of high gain A.F. amplifiers. Its rigid construction ensures low microphony and its thorough screening, with the added feature of a top grid connection remote from heater connections, ensures a low hum level.

Properly used, the BRIMAR 6BS7 will operate satisfactorily at input levels as low as 10μ volts on its grid.

RATINGS

Heater Voltage	6.3 volts
Heater Current	0.15 amp.
Anode Voltage	300 volts max.
Anode Dissipation	0.75 watt max.
Screen (g_2) Voltage	125 volts max.
Screen Dissipation	0.3 watt max.

OPERATING CHARACTERISTICS
(g_3 connected to Cathode)

Anode Voltage	100	250	volts
Anode Current	2.0	2.1	mA
Screen Voltage	100	100	volts
Screen Current	0.7	0.6	mA
Control Grid (g_1) Voltage	—3	—3	volts
Anode Impedance	1.5	2.3	meg.
Mutual Conductance	1.1	1.25	mA/V

OPERATION AS RESISTANCE COUPLED AMPLIFIER

Anode and Screen Supply Voltage	100	200	300	volts
Anode Load Resistor	0.25	0.25	0.25	meg.
Screen Series Resistor	1.0	1.0	1.2	meg.
Cathode Bias Resistor	2,500	1,500	1,200	ohms
Peak Output	35	70	100	volts
Voltage gain	90	120	140	

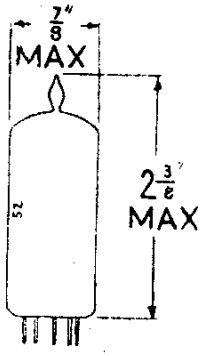
INTER-ELECTRODE CAPACITANCES

Input	4.0 pF	
Output	4.0 pF	
Control Grid to Anode	0.01 pF	max.

For characteristic curves refer to type 6BR7.

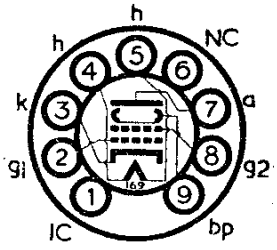
Type 6BS7 *is a commercial equivalent to the* CV5086.

6BW6



Current Equipment Type

TYPE **6BW6** MINIATURE OUTPUT BEAM TETRODE



The BRIMAR type 6BW6 is a B9A (Noval) based output beam tetrode, the characteristics and ratings of which are identical to those of the 6V6G/GT. It is suitable for R.F. application up to frequencies of the order of 150 Mc/s.

Heater Voltage ...	6.3 volts
Heater Current	0.45 amp.

RATINGS

Anode Voltage ...	315 volts max.
Anode Dissipation	12 watts max.
Screen Voltage ...	285 volts max.
Screen Dissipation	2.0 watts max.
Hot Spot Bulb Temperature ...	250° C. max.
D.C. Cathode Current	65 mA max.

OPERATING CHARACTERISTICS

	Single Valve Class A		Push-Pull Class AB1 (2 valves)	
Anode Voltage ...	180	250	285	volts
Anode Current (Zero Signal)...	29	47	70	mA
Anode Current (Max. Signal) ...	—	—	78.5	mA
Screen Voltage ...	180	250	285	volts
Screen Current (Zero Signal)...	3.0	5	4.0	mA
Screen Current (Max. Signal)...	—	—	10	mA
Cathode Bias Resistor ...	250	240	260	ohms
Anode Impedance ...	58000	52000	—	ohms
Mutual Conductance ...	3.7	4.1	—	mA/V
Optimum Load ...	5500	5000	8000	ohms
Power Output ...	1.7	5.5	12	watts
Harmonic Distortion ...	7.5	8	1	per cent.

OPERATION AS A TRIODE (Anode and Screen Strapped) CLASS A PUSH-PULL (2 valves)

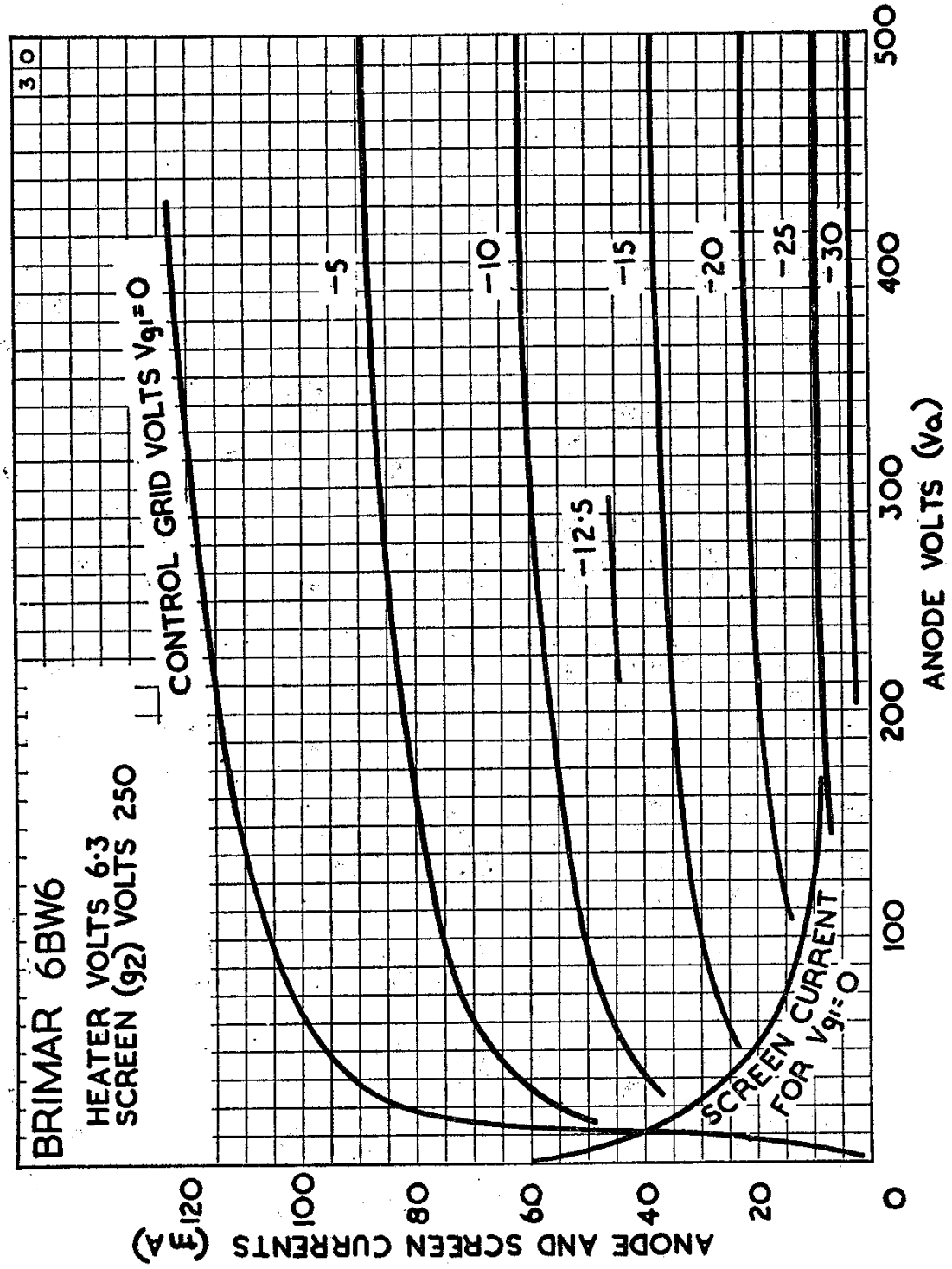
Anode Voltage ...	250	285	volts
Grid Voltage ...	—13.5	—19	volts
Cathode Bias Resistor ...	150	240	ohms
Anode Current (no signal) ...	90	78	mA
Optimum Load (anode to anode) ...	4000	4500	ohms
Power Output ...	1.7	3.1	watts
Harmonic Distortion ...	0.4	0.5	per cent.

INTER-ELECTRODE CAPACITANCES

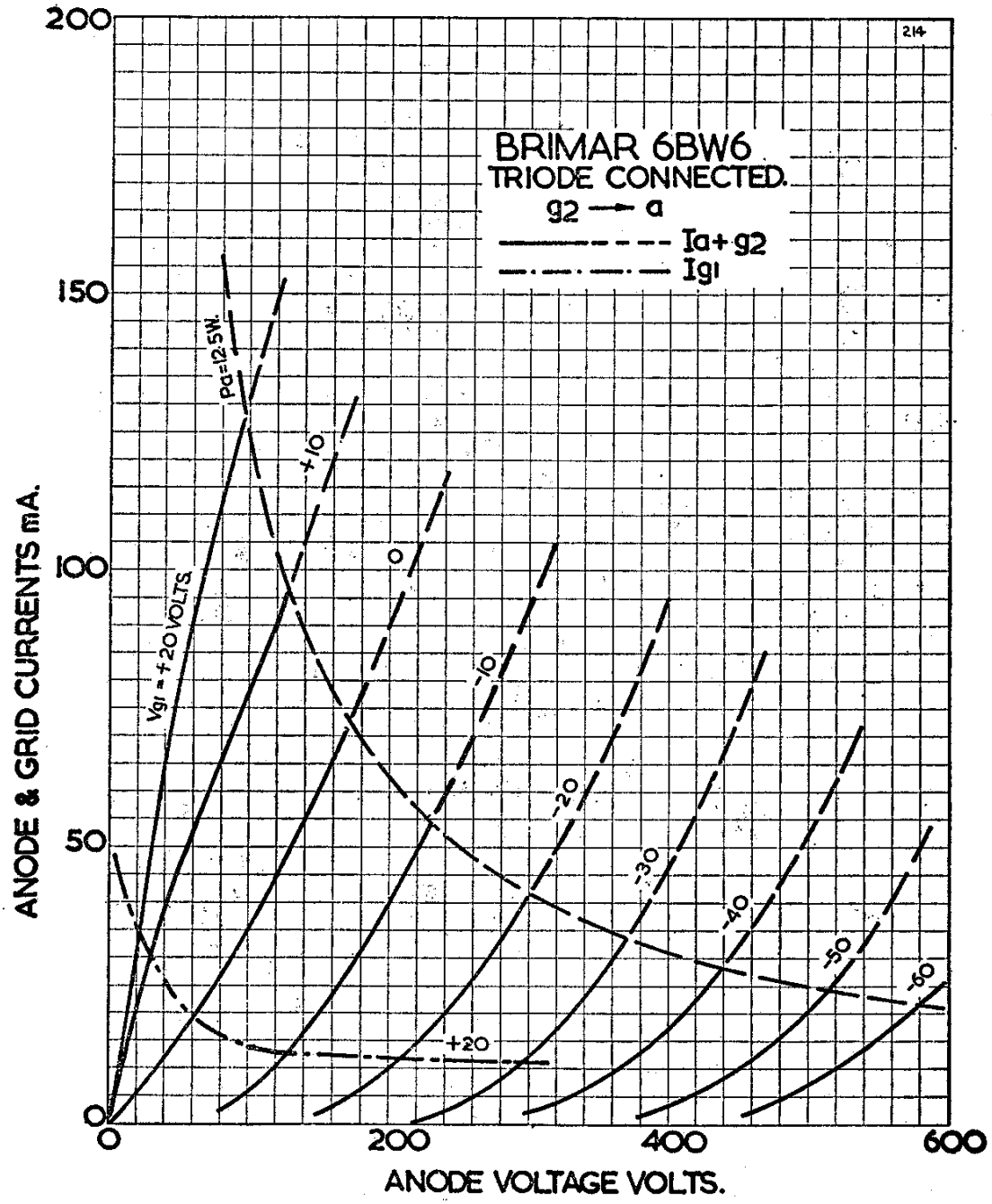
Input ...	8.5 pF
Output ...	7.5 pF
Grid to Anode ...	0.6 pF

Type 6BW6 is a commercial equivalent of the CV2136.

6BW6

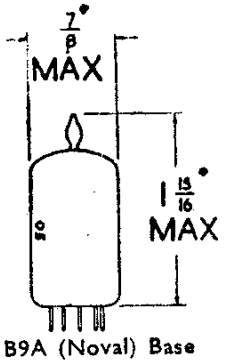

BRIMAR 6BW6
HEATER VOLTS 6·3
SCREEN (g2) VOLTS 250
CONTROL GRID VOLTS Vg1=0
-5
-10
-12·5
-15
-20
-25
-30
SCREEN CURRENT FOR Vg1=0
ANODE VOLTS (Va)
0
100
200
300
400
500
ANODE AND SCREEN CURRENTS (mA)
0
20
40
60
80
100
120

6BW6

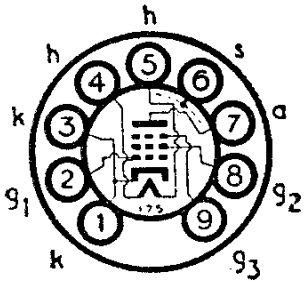

214
BRIMAR 6BW6
TRIODE CONNECTED.
g2 → a
Ia+g2
Ig1
Pa=12.5W.
Vg1 = +20 VOLTS.
+10
0
-10
-20
-30
-40
-50
-60
+20
200
150
100
50
0
0
200
400
600
ANODE & GRID CURRENTS mA.
ANODE VOLTAGE VOLTS.

6BW7

Current Equipment Type



TYPE **6BW7**
MINIATURE
HIGH SLOPE
R.F. PENTODE



The BRIMAR 6BW7 is a high slope R.F. pentode designed for use in the R.F. Frequency Changer, I.F. and Video stages of television receivers. The valve features high mutual conductance together with a high R.F. input impedance, achieved by the use of two cathode connections. Type 6BW7 will operate from a 180 or 250 volt H.T. rail, making it suitable for both AC/DC and AC operated receivers.

RATINGS

Heater Voltage	6.3 volts
Heater Current	0.3 amp.
Anode Voltage	275 volts max.
Anode Dissipation	2.75 watts max.
Screen (g_2) Voltage	275 volts max.
Screen Dissipation	1.2 watts max.

OPERATING CONDITIONS

(Suppressor Grid (g_3) connected to Cathode)

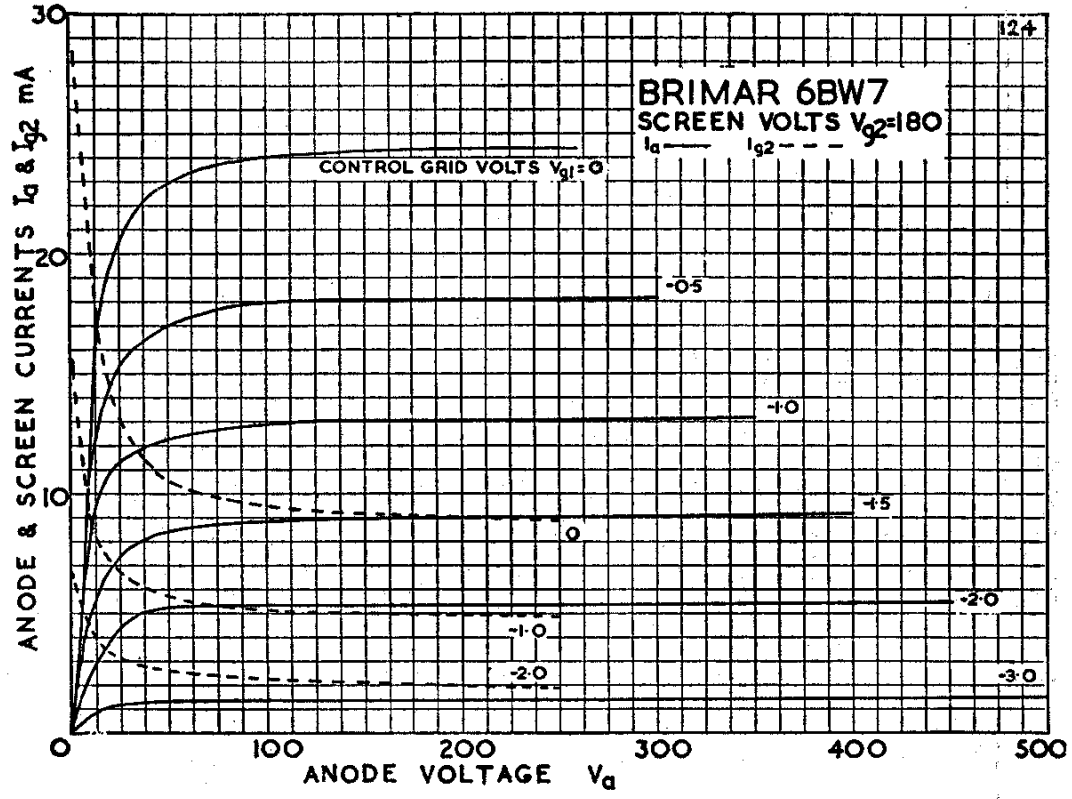
Anode Voltage	180	250 volts
Anode Current	9.5	9.5 mA
Screen Voltage	180	250 volts
Screen Current	3.5	3.5 mA
Cathode Bias Resistor	100	180 ohms
Mutual Conductance	9.3	8.5 mA/V
Anode Impedance	0.6	0.75 meg.
Input Impedance at 50 Mc/s.	14,000	16,000 ohms
Inner Amplification Factor ($\mu_{g1, g2}$)	70	70
Control Grid (g_1) Voltage for anode current cut-off	—7	—8 volts

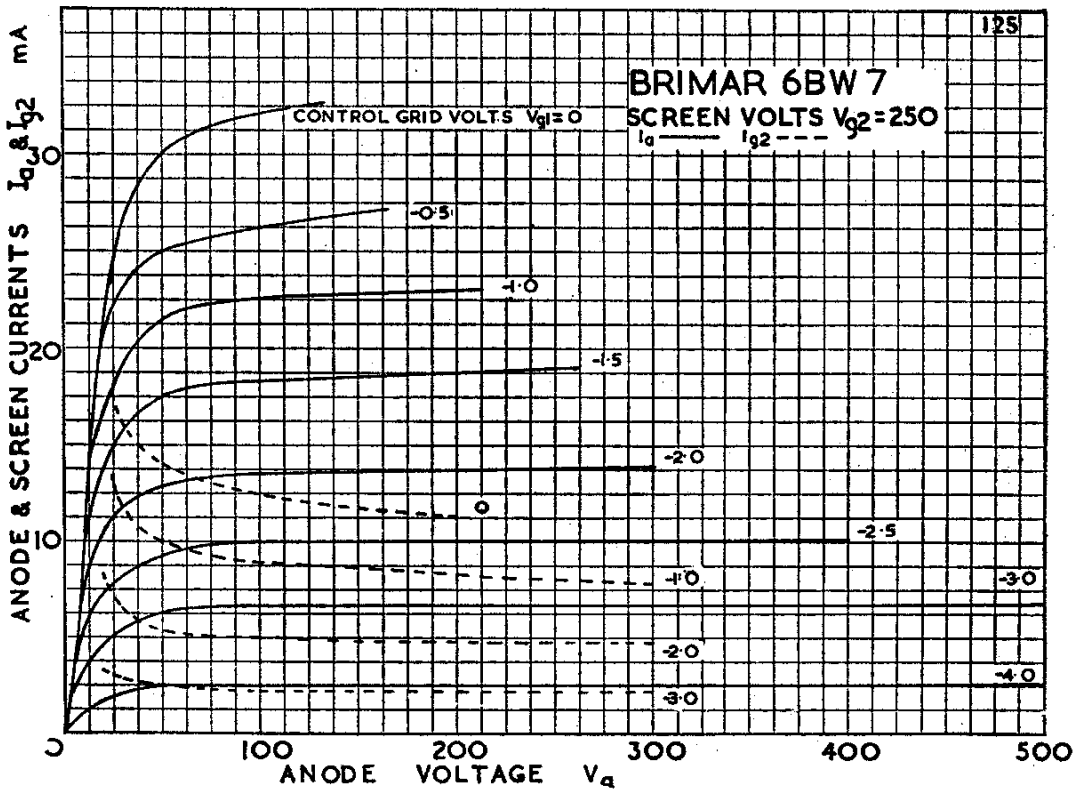
INTER-ELECTRODE CAPACITANCES *

Input	9.5 pF
Output	3.5 pF
Control Grid to Anode	0.01 pF max.

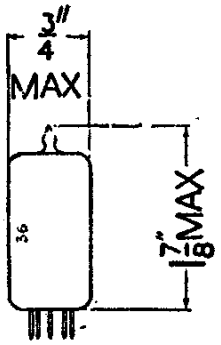
** With no external shield.*

6BW7


124
BRIMAR 6BW7
SCREEN VOLTS V_{g2}=180
I_a —— I_{g2} - - -
CONTROL GRID VOLTS V_{g1}=0
-0·5
-1·0
-1·5
-2·0
-3·0
ANODE & SCREEN CURRENTS I_a & I_{g2} mA
ANODE VOLTAGE V_a
0
10
20
30
100
200
300
400
500


125
BRIMAR 6BW7
SCREEN VOLTS V_{g2}=250
I_a —— I_{g2} - - -
CONTROL GRID VOLTS V_{g1}=0
-0·5
-1·0
-1·5
-2·0
-2·5
-3·0
-4·0
ANODE & SCREEN CURRENTS I_a & I_{g2} mA
ANODE VOLTAGE V_a
0
10
20
30
100
200
300
400
500

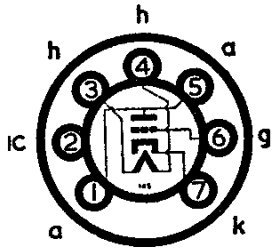
6BX6
(see type EF80)
6C4
6C5G
6C6



B7G Base

Replacement Type

TYPE 6C4
MINIATURE H.F. POWER TRIODE



RATINGS

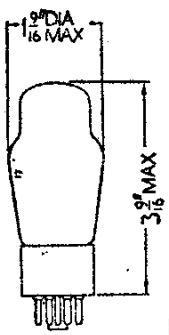
Heater Voltage	6.3 volts	Anode Current	25 mA max.
Heater Current	0.15 amp.	Anode Dissipation	3.5 watts max.
Anode Voltage	300 volts max.	Grid Current	8.0 mA max.

OPERATING CHARACTERISTICS

Class A				Class C Telegraphy	
Anode Voltage	100	250	volts	Anode Voltage	300 volts
Anode Current	11.8	10.5	mA	Anode Current	25 mA
Grid Voltage	0	—8.5	volts	Grid Voltage	—27 volts
Anode Impedance	6,250	7,700	ohms	Grid Current (D.C.)	7.0 mA
Mutual Conductance	3.1	2.2	mA/V	Input Power	0.35 watt
Amplification Factor	19	17		Output Power	5.5 watts *

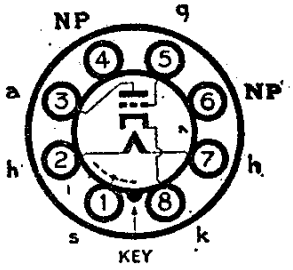
* *Approximately 2.5 watts at 150 Mc/s.*

For characteristic curves refer to type 12AU7.



Obsolescent Type

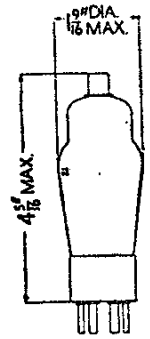
TYPE 6C5G
(OCTAL BASE) GENERAL PURPOSE TRIODE



RATINGS

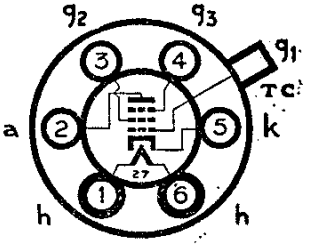
Heater Voltage	6.3 volts	Anode Voltage	250 volts
Heater Current	0.3 amp.	Anode Current	8.0 mA
Anode Voltage	300 volts max.	Control Grid Voltage	—8 volts
Anode Dissipation	2.5 watts max.	Mutual Conductance	2.0 mA/V
		Amplification Factor	20

OPERATING CHARACTERISTICS



Obsolescent Type

TYPE 6C6
(U.X. BASE) R.F. PENTODE

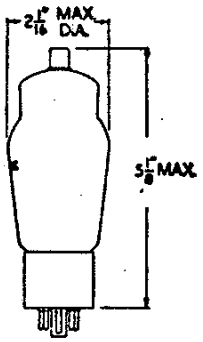


CHARACTERISTICS

Heater Voltage	6.3 volts	Screen Current	0.5 mA
Heater Current	0.3 amp.	Control Grid (g_1) Voltage	—3 volts
Anode Voltage	250 volts	Anode Impedance	1.0 meg.
Anode Current	2.0 mA	Mutual Conductance	1.2 mA/V
Screen (g_2) Voltage	100 volts	Cut-off Voltage	—7 volts

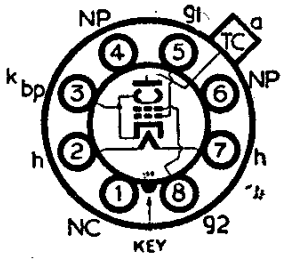
For further information on characteristics refer to type 6J7G.

6CD6G
6D6



Current Equipment Type

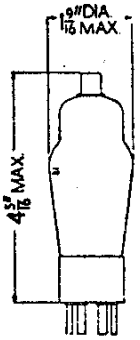
TYPE **6CD6G** (OCTAL BASE) LINE TIME BASE OUTPUT VALVE



The BRIMAR 6CD6G is designed for television line time base output service, and is capable of scanning wide angle cathode ray tubes when supplied from relatively low H.T. rails. It features high anode current at low anode voltage, and a high ratio of anode to screen current.

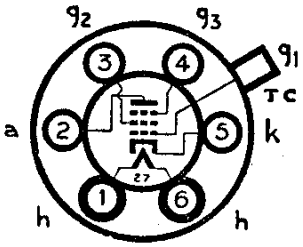
Heater Voltage		6.3 volts
Heater Current...		2.5 amps.

For further information see type 50CD6G.



Obsolescent Type

TYPE **6D6** (U.X. BASE) VARI-MU R.F. PENTODE

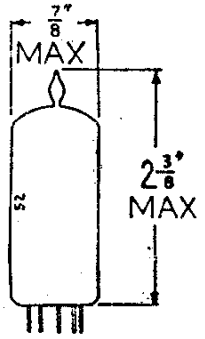


CHARACTERISTICS

Heater Voltage	... ...	6.3 volts	Screen Current	... ...	2.0 mA
Heater Current	... ...	0.3 amp.	Control Grid (g_1) Voltage	...	-3 volts
Anode Voltage	... ...	250 volts	Anode Impedance	... ...	0.8 meg.
Anode Current	... ...	8.2 mA	Mutual Conductance	... ...	1.6 mA/V
Screen (g_2) Voltage	... ...	100 volts	Cut-off Voltage	... ...	-50 volts

For further information on characteristics refer to type 6U7G.

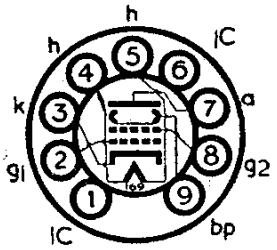
6CH6



B9A (Noval) Base

Current Equipment Type

TYPE 6CH6 MINIATURE VIDEO OUTPUT PENTODE



The BRIMAR type 6CH6 is a miniature high slope pentode suitable for video amplification where more power is required than is obtainable from normal R.F. pentodes. Its high anode dissipation and current rating make it suitable for working into loads of low impedance and high self capacity.

RATINGS

Heater Voltage	6.3 volts
Heater Current	0.75 amp.
Anode Voltage	275 volts max.
Screen (g_2) Voltage	275 volts max.
Anode Dissipation	12 watts max.
Screen Dissipation	2.5 watts max.
D.C. Cathode Current	60 mA max.
Max. Peak Cathode Current (absolute)	1.5 amps.*
Max. Control Grid Circuit Resistance	0.1 meg.†

** The duration of current flow must not exceed 2μ secs. and must not be greater than 5 per cent of the duty cycle.*

† This value may be increased to 220,000 ohms if autobias is employed.

OPERATING CHARACTERISTICS

Anode Voltage	250 volts
Anode Current	40 mA
Screen Voltage	250 volts
Screen Current	6 mA
Control Grid Voltage (V_{g1})	-4.5 volts
Mutual Conductance	11 mA/V
Anode Impedance	50,000 ohms
Inner Amplification Factor ($\mu_{g1, g2}$)	26

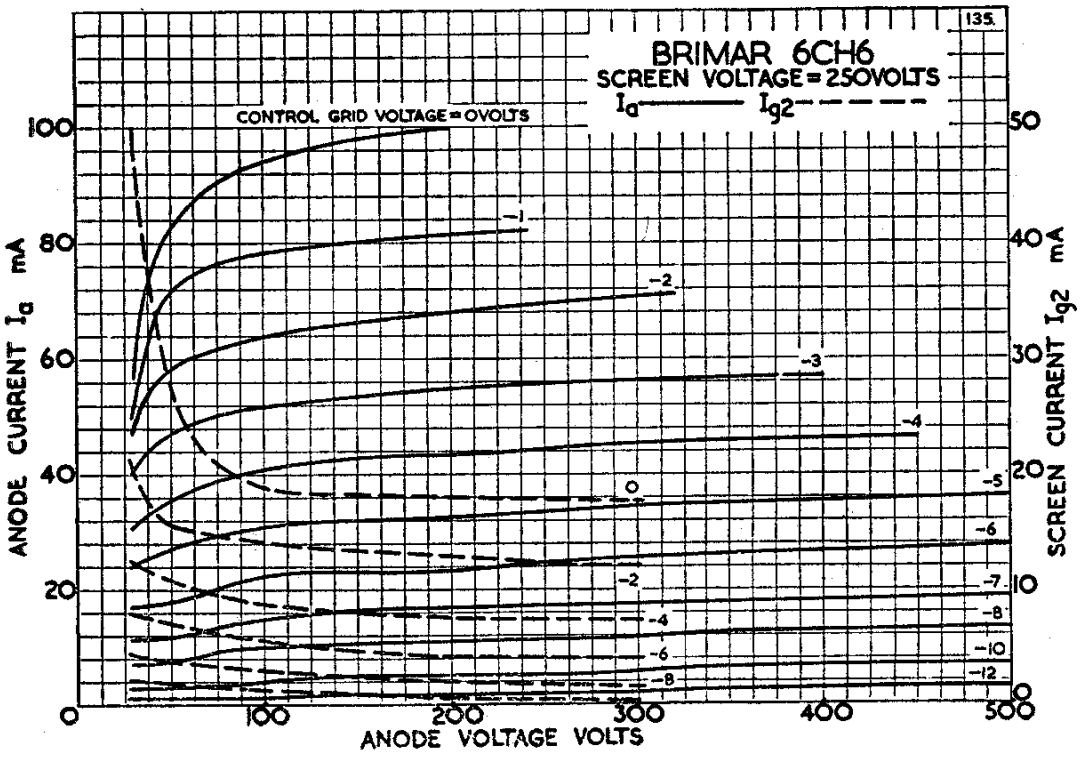
INTER-ELECTRODE CAPACITANCES **

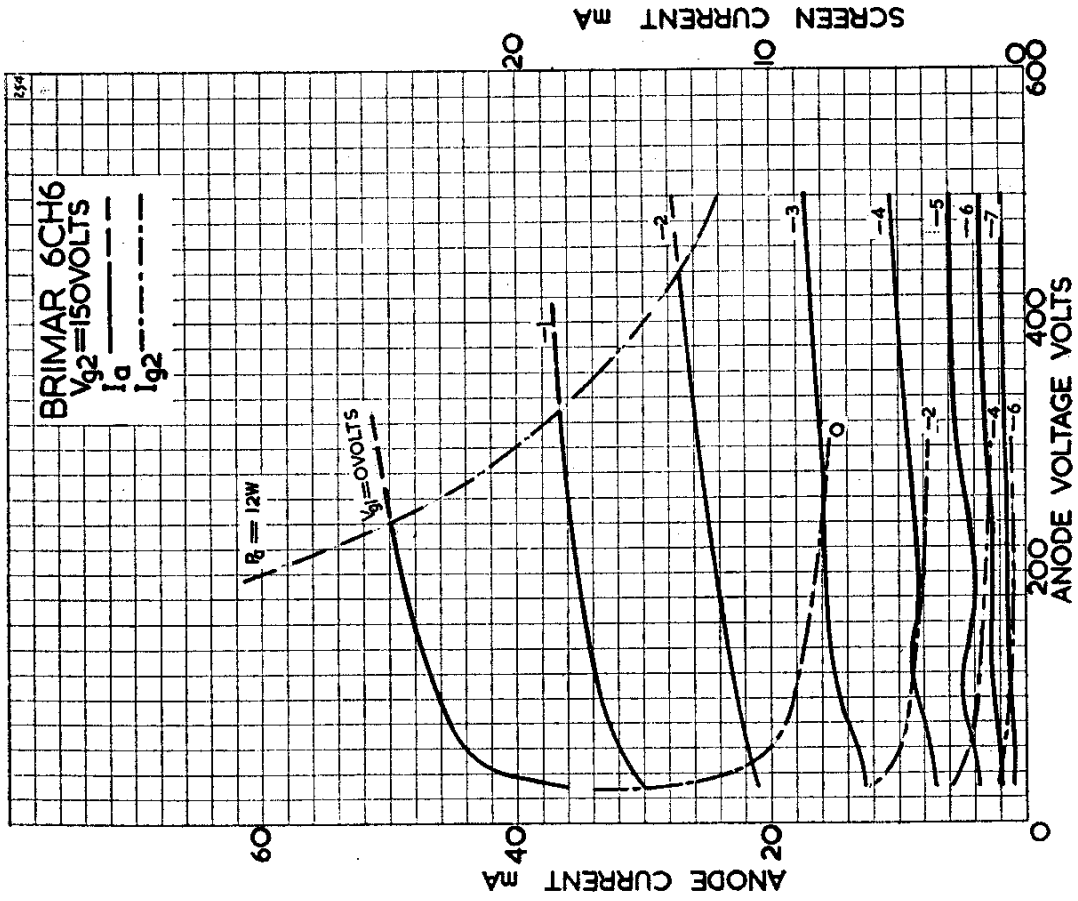
Input (C_{in})	14 pF
Output (C_{out})	5 pF
Grid to Anode ($C_{a, g1}$)	0.25 pF

*** No external shield.*

Type 6CH6 is a commercial equivalent of the CV2127.

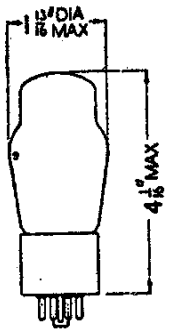
6CH6


135
BRIMAR 6CH6
SCREEN VOLTAGE = 250VOLTS
Ia ——— Ig2 - - - - -
CONTROL GRID VOLTAGE = 0VOLTS
ANODE CURRENT Ia mA
SCREEN CURRENT Ig2 mA
ANODE VOLTAGE VOLTS
0
20
40
60
80
100
10
30
50
100
200
300
400
500
1
-2
-3
-4
0
-5
-6
-2
-7
-4
-8
-6
-10
-8
-12

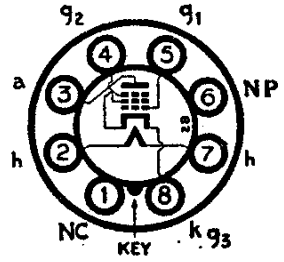

254
BRIMAR 6CH6
Vg2 = 150VOLTS
Ia ———
Ig2 - - - - -
Rg = 12W
Vg1 = 0VOLTS
SCREEN CURRENT mA
ANODE CURRENT mA
ANODE VOLTAGE VOLTS
0
20
40
60
200
400
600
-1
-2
-3
-4
-5
-6
-7
0
-2
-4
-6

6DA6
(See type EF89)
6F6G
6H6G
6H6GT

Replacement Type



TYPE 6F6G (OCTAL BASE) POWER PENTODE



RATINGS

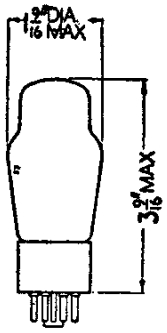
Heater Voltage	6.3 volts	Anode Dissipation	11 watts max.
Heater Current	0.7 amp.	Screen (g_2) Voltage ...	285 volts max.
Anode Voltage	375 volts max.	Screen Dissipation ...	3.75 watts max.

OPERATING CHARACTERISTICS CLASS "A"

	SINGLE VALVE		PUSH-PULL (2 VALVES)	
Anode Voltage	250	285	315	volts
Anode Current	34	38	62	mA
Screen Voltage	250	285	285	volts
Screen Current (Zero Signal)	6.5	7.0	12	mA
Screen Current (Max. Signal)	9.7	12.0	18	mA
Control Grid (g_1) Voltage	−16.5	−20	−24	volts
Cathode Bias Resistor	410	440	320	ohms
Anode Impedance	80,000	78,000	–	ohms
Mutual Conductance	2.50	2.55	–	mA/V
Optimum Load	7,000	7,000	10,000*	ohms
Power Output	3.2	4.5	10.5	watts
Harmonic Distortion	8.0	9.0	3.0	per cent.

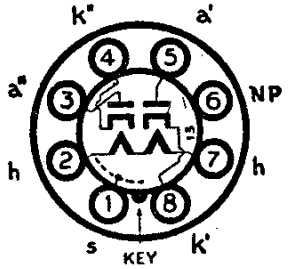
* *Anode to Anode Load.*

Replacement Types

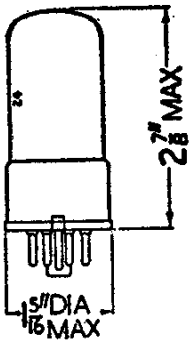


6H6G.

TYPES 6H6G, 6H6GT (OCTAL BASE)



DOUBLE DIODES



6H6GT.

RATINGS

Heater Voltage	6.3 volts
Heater Current	0.3 amp.
Peak Inverse Voltage	420 volts max.
Peak Anode Current (each Anode)	48 mA max.
D.C. Heater-Cathode Voltage	330 volts max.

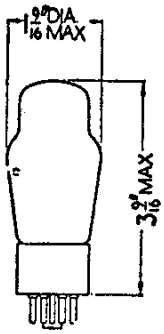
OPERATING AS RECTIFIER

	HALF-WAVE	FULL-WAVE	
R.M.S. Input per Anode	117	117	volts max.
Supply Impedance per Anode	30	15	ohms min.
Rectified Current	8	8	mA max.

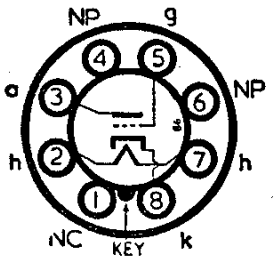
6J5G
6J5GT
6J6

Replacement Types

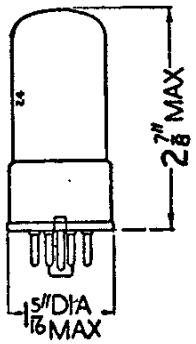
TYPES 6J5G, 6J5GT (OCTAL BASE)



6J5G



Note.—Type 6J5GT has Pin 1 connected to metal shell.



6J5GT

GENERAL PURPOSE TRIODES

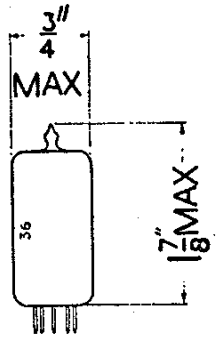
RATINGS

Heater Voltage	6.3 volts	Anode Dissipation	2.5 watts max.
Heater Current	0.3 amp.	Cathode Current	20 mA max.
Anode Voltage	300 volts max.		

OPERATING CHARACTERISTICS

Anode Voltage	100	250	volts
Anode Current	10.6	9.0	mA
Control Grid Voltage	0	—8	volts
Anode Impedance	8,000	7,700	ohms
Mutual Conductance	2.5	2.6	mA/V
Amplification Factor	20	20	

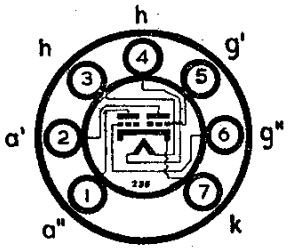
For further characteristics refer to type 6SN7GT.



B7G Base

Replacement Type

TYPE 6J6 MINIATURE DOUBLE TRIODE



RATINGS

Heater Voltage	6.3 volts
Heater Current	0.45 amp.
Anode Voltage	300 volts max.
Anode Dissipation	1.5 watts max.
Anode Input power as an R.F. Amplifier or Oscillator	4.5 watts max.,
Anode Current	15 mA max.
Grid Voltage	0 volts max.
Grid Voltage	—40 volts min.
Grid Current	8 mA max.
Grid Circuit Resistance with Cathode Bias (Fixed Bias not recommended) ...	0.5 Megohms max.
Heater to Cathode Voltage	100 volts max.

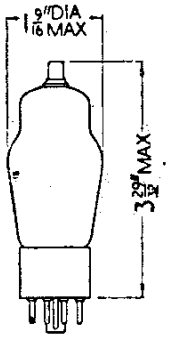
OPERATING CHARACTERISTICS

Anode Voltage	100 volts	Mutual Conductance	5.3 mA/V
Cathode Bias Resistor ...	50 ohms	Amplification Factor	38
Anode Current	8.5 mA	Anode Resistance	7,100 ohms

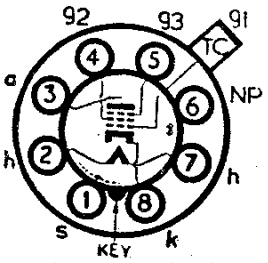
6J7G
6J7GT
6K6G

Replacement Types

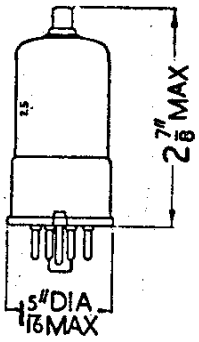
TYPES 6J7G, 6J7GT (OCTAL BASE)



6J7G



Note.—Type 6J7GT, has Pin 1 connected to metal shell.



6J7GT

R.F. PENTODES

RATINGS

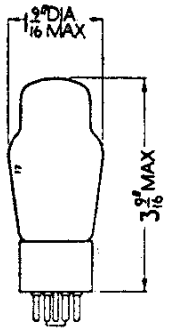
Heater Voltage	6.3 volts	Anode Dissipation	0.75 watt max.
Heater Current	0.3 amp.	Screen (g_2) Voltage	125 volts max.
Anode Voltage	300 volts max.	Screen Dissipation	0.1 watt max.

OPERATING CHARACTERISTICS [Suppressor Grid (g_3) connected to Cathode]

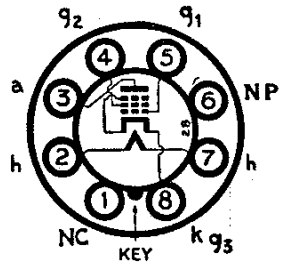
Anode Voltage	100	250	volts	Control Grid (g_1) Voltage	−3	−3	volts
Anode Current	2.0	2.0	mA	Anode Impedance	1.0	1.5	meg.
Screen Voltage	100	100	volts	Mutual Conductance	1.1	1.25	mA/V
Screen Current	0.5	0.5	mA	Control Grid Bias (For Anode current cut-off)	−7	−7	volts

---

Obsolescent Type



TYPE 6K6G (OCTAL BASE) POWER PENTODE



RATINGS

Heater Voltage	6.3 volts	Anode Dissipation	8.5 watts max.
Heater Current	0.4 amp.	Screen (g_2) Voltage	285 volts max.
Anode Voltage	315 volts max.	Screen Dissipation	2.8 watts max.

OPERATING CHARACTERISTICS

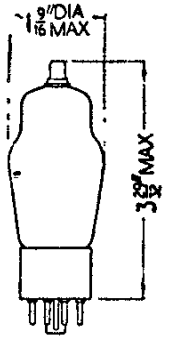
Anode Voltage	100	250	315	volts
Anode Current	9.0	32	25.5	mA
Screen Voltage	100	250	285	volts
Screen Current (Zero Signal)	1.6	5.5	4.0	mA
Screen Current (Max. Signal)	3.0	10	9.0	mA
Control Grid Voltage	−7	−18	−21	volts
Cathode Bias Resistor	600	500	700	ohms
Anode Impedance	100,000	68,000	75,000	ohms
Mutual Conductance	1.5	2.3	2.1	mA/V
Optimum Load	12,000	7,600	9,000	ohms
Power Output	0.35	3.4	4.5	watts
Harmonic Distortion	11	11	15	per cent.

6K7G
6K7GT
6K8G
6K8GT

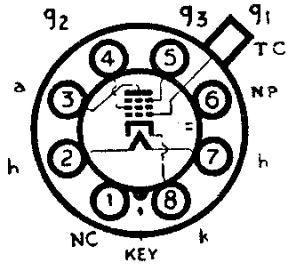
Replacement Types

TYPES 6K7G, 6K7GT

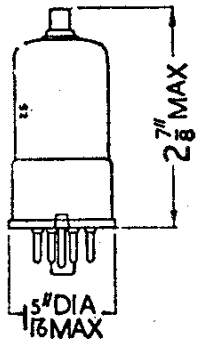
(OCTAL BASE)



6K7G.



Note.—Type 6K7GT has Pin 1 connected to metal shell.



6K7GT.

VARI-MU R.F. PENTODES

RATINGS

Heater Voltage	6.3 volts	Anode Dissipation	2.75 watts max.
Heater Current	0.3 amp.	Screen (g_2) Voltage	125 volts max.
Anode Voltage	300 volts max.	Screen Dissipation	0.35 watts max.

OPERATING CHARACTERISTICS

[Suppressor Grid (g_3) connected to Cathode].

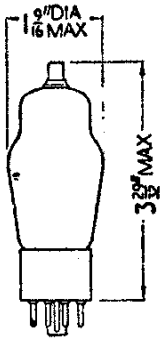
Anode Voltage	100	180	250	250	volts
Anode Current	9.5	4.0	7.0	10.5	mA
Screen Voltage	100	75	100	125	volts
Screen Current	2.7	1.0	1.7	2.6	mA
Control Grid (g_1) Voltage	—1	—3	—3	—3	volts
Cathode Bias Resistor	—	600	330	220	ohms
Anode Impedance	0.15	1.0	0.8	0.6	meg.
Mutual Conductance	1.65	1.1	1.45	1.65	mA/V
Control Grid Voltage	—38	—32	—42	—52	volts

(For mutual conductance of 0.002 mA/V)

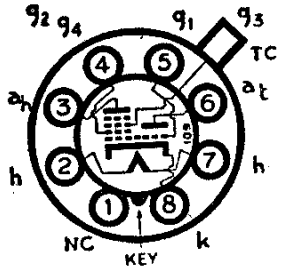
Replacement Types

TYPES 6K8G, 6K8GT

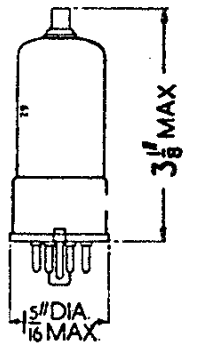
(OCTAL BASE)



6K8G.



Note.—Type 6K8GT has Pin 1 connected to metal shell.



6K8GT.

TRIODE-HEXODE FREQUENCY CHANGERS

RATINGS

Heater Voltage	6.3 volts	Hexode Screen Dissipation	0.7 watt max.
Heater Current	0.3 amp.	Triode Anode (a_t) Voltage	125 volts max.
Hexode Anode (a_h) Voltage	300 volts max.	Triode Anode Dissipation	0.75 watts max.
Hexode Anode Dissipation	0.75 watt max.	Total Cathode Current	16 mA max.
Hexode Screen (g_2, g_4) Voltage	150 volts max.		

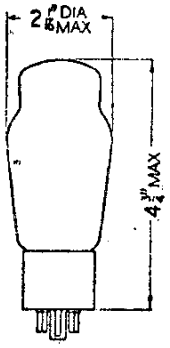
OPERATION AS FREQUENCY CHANGER

Hexode Anode Voltage	100	250	volts	Triode Anode Voltage	100	100	volts
Hexode Anode Current	2.3	2.5	mA	Triode Anode Resistor	—	40,000	ohms
Hexode Screen Voltage	100	100	volts	Triode Anode Current	3.8	3.8	mA
Hexode Screen Current	6.2	6.0	mA	Triode Grid (g_1) Resistor	50,000	50,000	ohms
Hexode Control Grid (g_3) Voltage	—3	—3	volts	Triode Grid Current	0.15	0.15	mA
Cathode Bias Resistor	220	300	ohms	Conversion Conductance	0.33	0.36	mA/V
Hexode Anode Impedance	0.4	0.6	meg.	Hexode Control Grid Voltage	—30	—30	volts
Triode Anode Supply Voltage	100	250	volts	(For conversion conductance of 0.002 mA/V)			

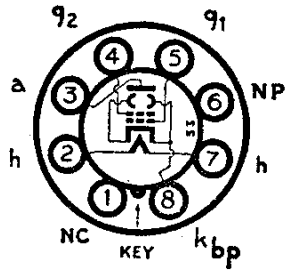
6L6G
6L6GA

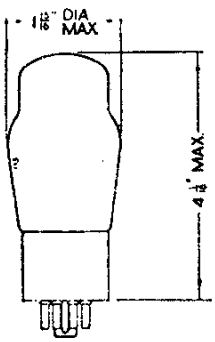
Current Equipment Types

TYPES 6L6G, 6L6GA
(OCTAL BASE)



6L6G





6L6GA

OUTPUT BEAM TETRODES

BRIMAR types 6L6G, 6L6GA are indirectly heated beam power tetrodes for use in the output stages of large audio equipment. Owing to the special construction only a small proportion of odd harmonics are produced and in push-pull connection large outputs may be obtained with low distortion.

RATINGS

Heater Voltage	6.3 volts
Heater Current	0.9 amp.
Anode Voltage	360 volts max.
Anode Dissipation	19 watts max.
Screen (g_2) Voltage	270 volts max.
Screen Dissipation	2.5 watts max.

OPERATING CHARACTERISTICS

	CLASS A			CLASS AB1	
	Single Valve		Push-Pull (2 valves)	Push-Pull (2 valves)	
Anode Voltage	250	350	250	360	volts
Anode Current (Zero Signal)	72	54	120	88	mA
Anode Current (Max. Signal)	79	66	140	100	mA
Screen Voltage	250	250	250	270	volts
Screen Current (Zero Signal)	5.0	2.5	10	5	mA
Screen Current (Max. Signal)	7.3	7.0	16	17	mA
Control Grid (g_1) Voltage	−14	−18	−16	−22.5	volts
Cathode Bias Resistor	170	300	125	250	ohms
Anode Impedance	22,500	33,000	25,000	–	ohms
Mutual Conductance	6.0	5.2	5.5	–	mA/V
Optimum Load	2,500	4,200	5,000	9,000	ohms
Power Output	6.5	11	14	24	watts
Harmonic Distortion	10	15	2	4	per cent.

OPERATION AS TRIODE (g_2 connected to Anode)

CLASS A. PUSH-PULL (2 valves)

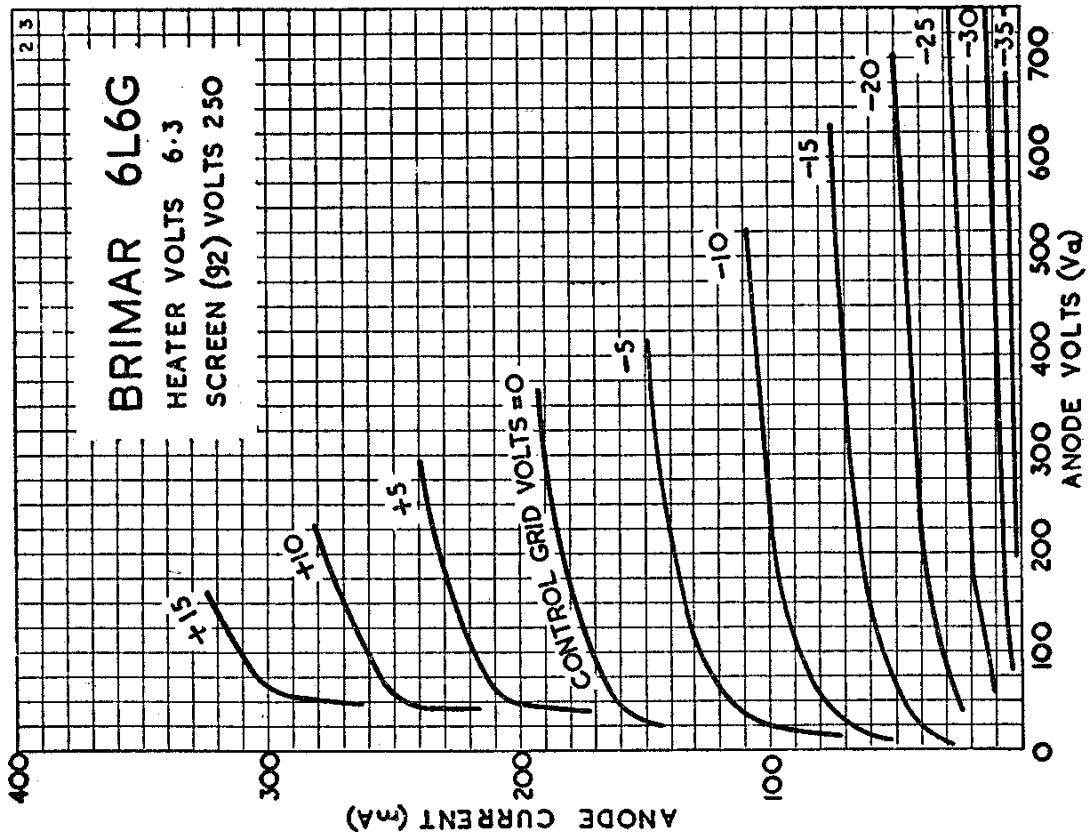
Anode Voltage	325 volts max.
Anode Current	80 mA
Cathode Bias Resistor	375 ohms
Optimum Load	8,000 ohms
Power Output	6 watts
Harmonic Distortion	0.6 per cent.

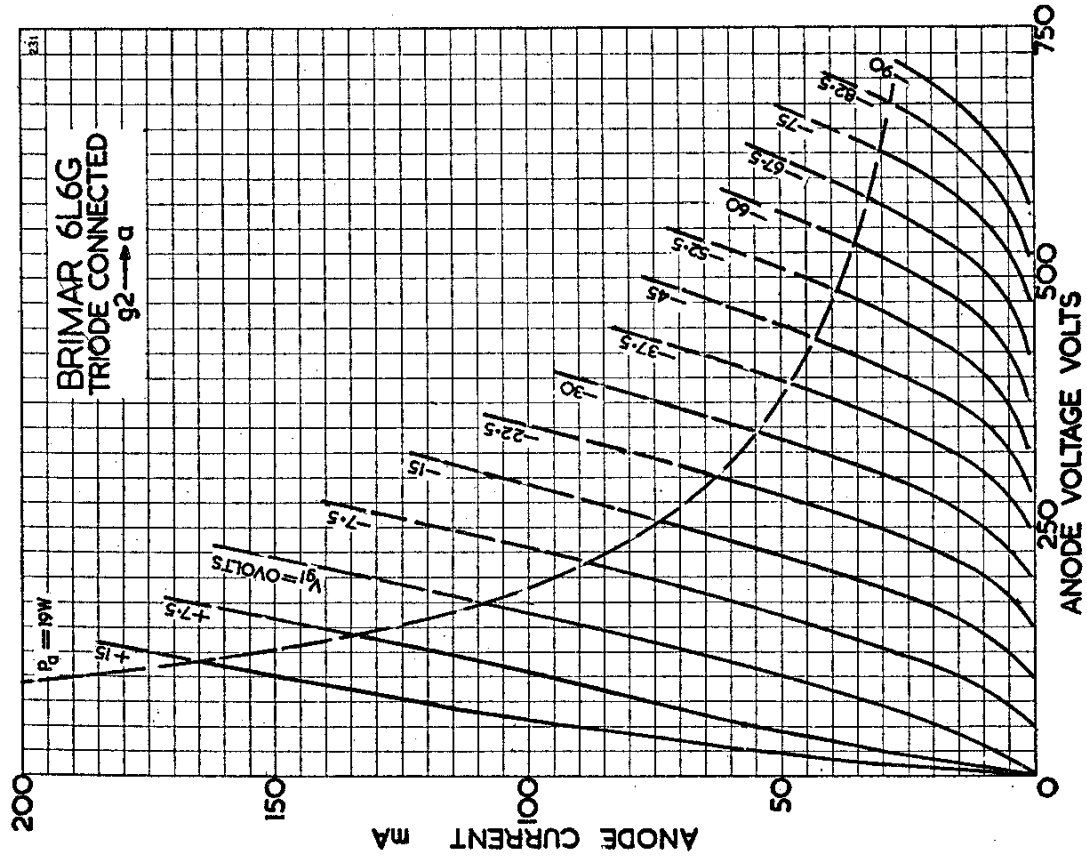
INTER-ELECTRODE CAPACITANCES

Input	11.5 pF
Output	9.5 pF
Control Grid to Anode	0.9 pF

Type 6L6G is a commercial equivalent of the CV1947, and type 6L6GA of the CV2187.

6L6G
6L6GA

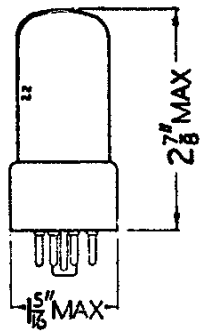

BRIMAR 6L6G
HEATER VOLTS 6·3
SCREEN (92) VOLTS 250
CONTROL GRID VOLTS = 0
+15
+10
+5
-5
-10
-15
-20
-25
-30
-35
ANODE CURRENT (mA)
ANODE VOLTS (Va)


BRIMAR 6L6G
TRIODE CONNECTED
g2 → a
Vg1 = 0 VOLTS
+7·5
-7·5
-15
-22·5
-30
-37·5
-45
-52·5
-60
-67·5
-75
-82·5
-90
ANODE CURRENT mA
ANODE VOLTAGE VOLTS

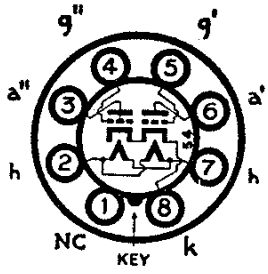
6N7GT
6N8
(See type EBF80)
6Q7G
6Q7GT
6R7G

Obsolescent Type

TYPE 6N7GT
DOUBLE TRIODE



6N7GT

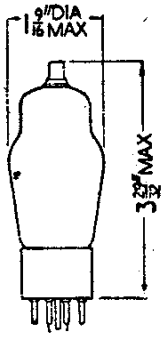


RATINGS

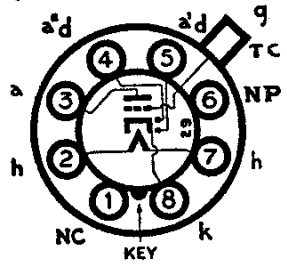
Heater Voltage	6.3 volts	Peak Anode Current (per Anode)	125 mA max.
Heater Current	0.8 amp.	Anode Dissipation (per Anode)	5.5 watts max.
Anode Voltage	300 volts max.		

Replacement Types

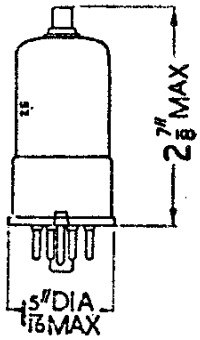
TYPES 6Q7G, 6Q7GT
(OCTAL BASE)



6Q7G



Note.—Type 6Q7GT has Pin 1 connected to metal shell.



6Q7GT

DOUBLE DIODE TRIODES

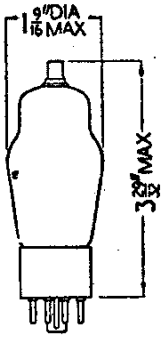
RATINGS

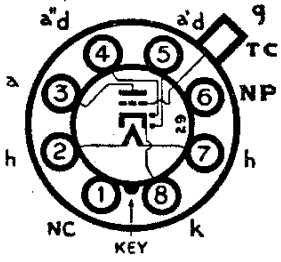
Heater Voltage	6.3 volts	Anode Voltage	300 volts max.
Heater Current	0.3 amp.	Grid Voltage	0 volts max.

For operating characteristics and curves refer to type 6AT6.

Obsolescent Type

TYPE 6R7G
(OCTAL BASE)
DOUBLE DIODE TRIODE





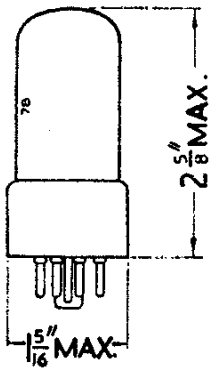
RATINGS

Heater Voltage	6.3 volts	Heater Current	0.3 amp.

OPERATING CHARACTERISTICS

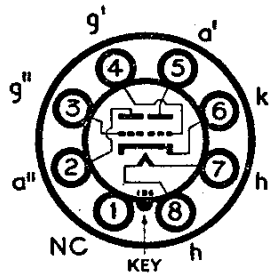
Anode Voltage	250 volts	Anode Impedance ...	8,500 ohms
Anode Current	9.5 mA	Mutual Conductance ...	1.9 mA/V
Control Grid Voltage	—9 volts	Amplification Factor ...	16

6SC7GT
6SL7GT



Obsolescent Type

TYPE 6SC7GT
(OCTAL BASE)
HIGH-MU
DOUBLE TRIODE

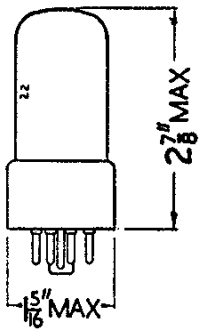


RATINGS

Heater Voltage	6.3 volts	Max. Anode Voltage	250 volts
Heater Current	0.3 amp. (nom.)	Max. Anode Dissipation	1.0 watts

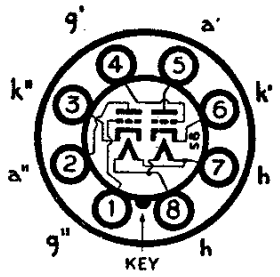
TYPICAL OPERATING CONDITIONS (Single Triode)

Anode Voltage	250 volts	Anode Impedance	53,000 ohms
Grid Voltage	—2.0 volts	Mutual Conductance	1.325 mA/V
Anode Current	2.0 mA	Amplification Factor	70



Replacement Type

TYPE 6SL7GT
(OCTAL BASE)
HIGH-MU
DOUBLE TRIODE



RATINGS

Heater Voltage	6.3 volts	Anode Voltage	250 volts max.
Heater Current	0.3 amp.	Anode Dissipation (each Anode)	1.0 watts max.

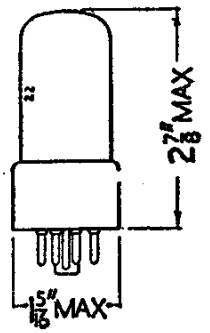
OPERATING CHARACTERISTICS (Each Section)

Anode Voltage	250 volts	Anode Impedance	44,000 ohms
Anode Current	2.3 mA	Mutual Conductance	1.6 mA/V
Control Grid Voltage	—2 volts	Amplification Factor	70

OPERATION AS RESISTANCE COUPLED AMPLIFIER (Each Section)

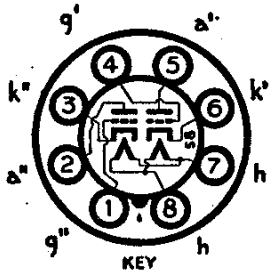
Anode Supply Voltage	100	250	volts
Anode Load Resistor	0.25	0.25	meg.
Cathode Bias Resistor	4,700	3,300	ohms
Peak Output Voltage	21	62	volts
Stage Gain	23	50	

6SN7GT
6U4GT
6U5/6G5



Replacement Type

TYPE 6SN7GT
(OCTAL BASE)
LOW-MU DOUBLE TRIODE



RATINGS

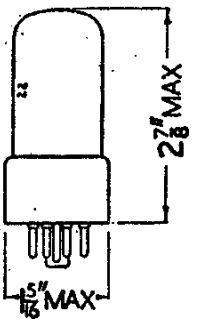
Heater Voltage	... ...	6.3 volts	
Heater Current	... ...	0.6 amp.	
Anode Voltage	... ...	300 volts max.	
Anode Dissipation (each Anode)	... ...	2.5 watts max.	
Average Grid Current	...	1.0 mA max.	

OPERATING CHARACTERISTICS (Each Section)

Anode Voltage	... ...	100	250 volts	Anode Impedance	...	8,000	7,700 ohms
Anode Current	... ...	10.6	9.0 mA	Mutual Conductance		2.5	2.6 mA/V
Control Grid Voltage	...	0	—8 volts	Amplification Factor		20	20
Cathode Bias Resistor	...	1,100	—ohms				

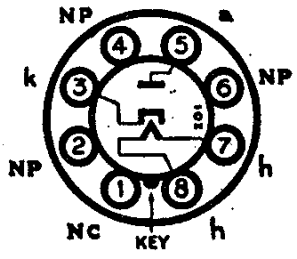
OPERATION AS RESISTANCE COUPLED AMPLIFIER (Each Section)

Anode Supply Voltage	...	200	300 volts	Peak Output	...	38	57 volts
Anode Load Resistor	...	0.1	0.25 meg.	Voltage Gain	...	14	14
Cathode Bias Resistor	...	3,300	6,000 ohms				



Replacement Type

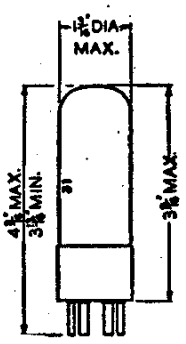
TYPE 6U4GT
(OCTAL BASE)
EFFICIENCY DIODE



RATINGS
(Absolute Maximum)

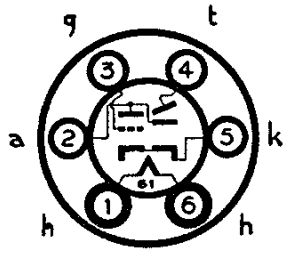
Heater Voltage	6.3 volts
Heater Current	1.2 amps.
Peak Anode Current	660 mA max.
Peak Heater Cathode Potential, Heater Positive	110 volts abs. max.
Peak Heater Cathode Potential, Heater Negative	550 volts abs. max.
*Peak Heater Cathode Potential, Heater Negative	3,850 volts abs. max.
*Peak Inverse Voltage	3,850 volts max.
Direct Output Current	138 mA max.
Hot Switching Transient Anode Current for Duration of 0.2 Seconds Max.	3.85 amps. max.

* *For television efficiency diode service, where the duty cycle of the pulse does not exceed 15 per cent. of the scanning cycle, and its duration does not exceed 15 micro-seconds.*



Obsolescent Types

TYPES 6U5/6G5
(U.X. BASE)
"MAGIC EYE" TUNING INDICATOR

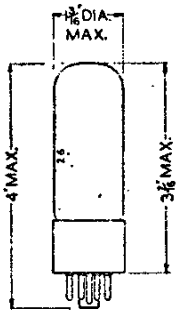


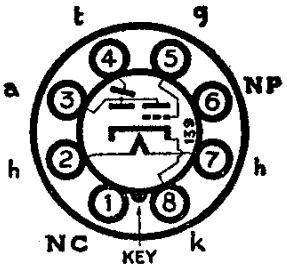
For operating characteristics refer to type 6U5G.

6U5G
6U7G
6U8
(see type ECF82)
6V4
(see type EZ80)
6V6G
6V6GT

Current Equipment Type

TYPE 6U5G
(OCTAL BASE)
"MAGIC EYE"
TUNING INDICATOR





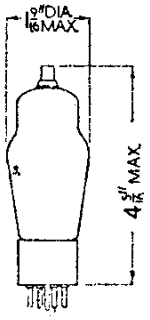
OPERATING CHARACTERISTICS

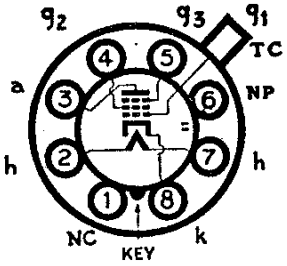
Heater Voltage ...			6.3 volts
Heater Current ...			0.3 amp.
Anode Supply Voltage ...	100	200	250 volts
Anode Load Resistor ...	0.5	1.0	1.0 meg.
Anode Current* ...	0.2	0.2	0.24 mA
Target Voltage ...	100	200	250 volts
Target Current* ...	1	3	4 mA approx.
Grid Voltage† ...	—8	—18.5	—22 volts

** For shadow angle of 90° approx., Grid Voltage zero.*
† For shadow angle of 0°, Anode Current zero.
Type 6U5G is a commercial equivalent of the CV2747.

Obsolescent Type

TYPE 6U7G
(OCTAL BASE)
VARI-MU R.F. PENTODE





OPERATING CHARACTERISTICS

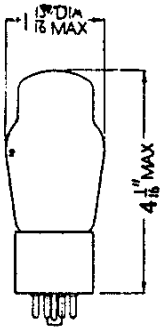
[Suppressor Grid (g_3) connected to Cathode]

Heater Voltage ...		6.3 volts
Heater Current ...		0.3 amp.
Anode Voltage ...	100	250 volts
Anode Current ...	8.0	8.2 mA
Screen (g_2) Voltage ...	100	100 volts
Screen Current ...	2.2	2.0 mA
Control Grid Voltage ...	—3	—3 volts
Cathode Bias Resistor ...	330	330 ohms
Anode Impedance ...	0.25	0.8 meg.
Mutual Conductance ...	1.5	1.6 mA/V
Control Grid Bias ...	—50	—50 volts

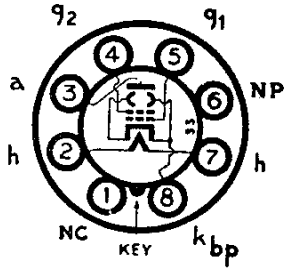
(For Mutual Conductance of 0.002 mA/V)

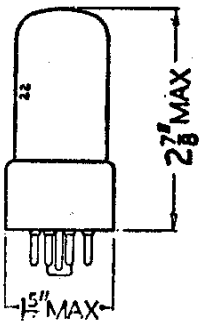
Current Equipment Types

TYPES 6V6G, 6V6GT
(OCTAL BASE)



6V6G.



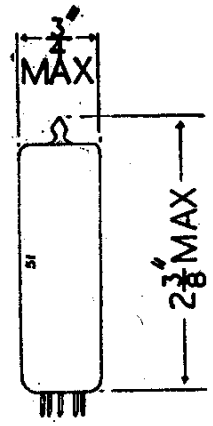


6V6GT.

OUTPUT BEAM TETRODES

For characteristics and ratings see type 6BW6.
Type 6V6G is a commercial equivalent of the CV509, and type 6V6GT of the CV511.

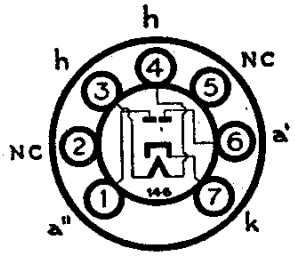
6X4



B7G Base

Current Equipment Type

TYPE 6X4
MINIATURE
FULL-WAVE
RECTIFIER



Heater Voltage ... ... 6.3 volts Heater Current ... ... 0.6 amp.

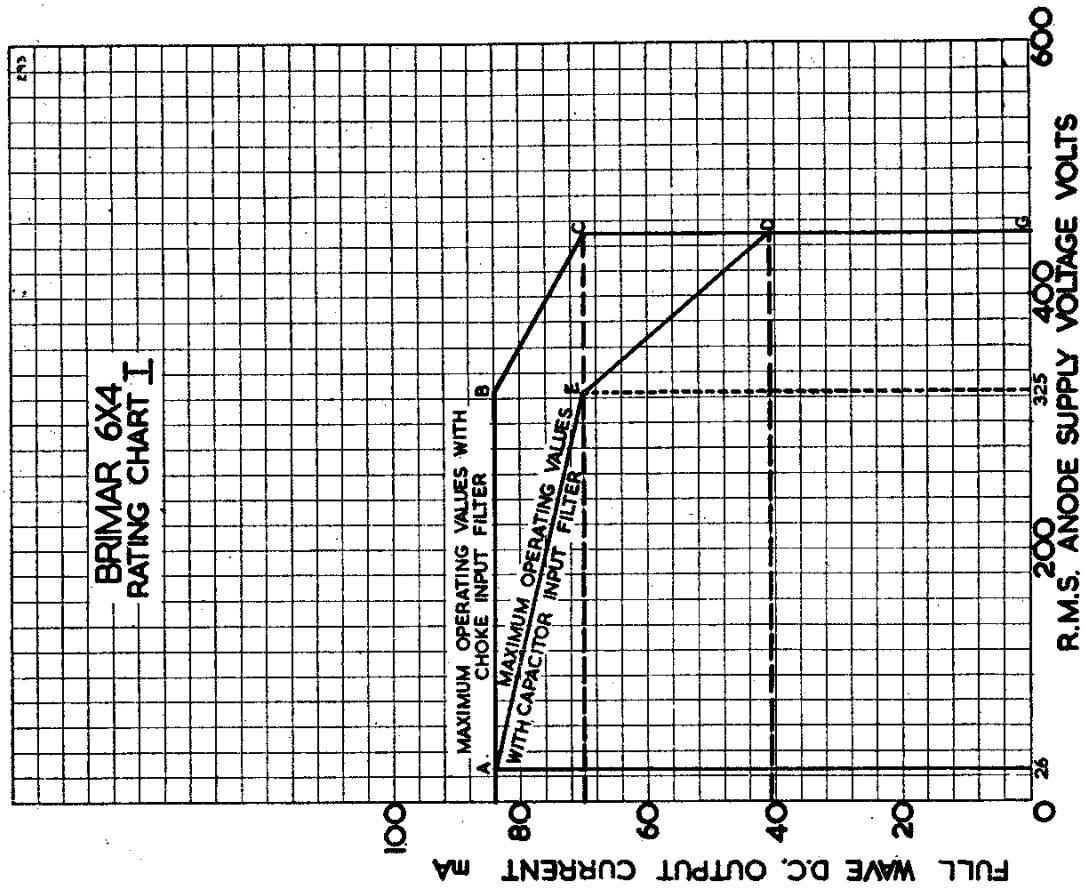
RATINGS

Peak Inverse Voltage	1,250 volts max.
Peak Current (each Anode)	210 mA max.
Peak Surge Current (each Anode)	750 mA max.
Anode Supply Voltage	—see Rating Chart I
D.C. Output Current	—see Rating Chart I
Peak Heater Cathode Potential	450 volts max.

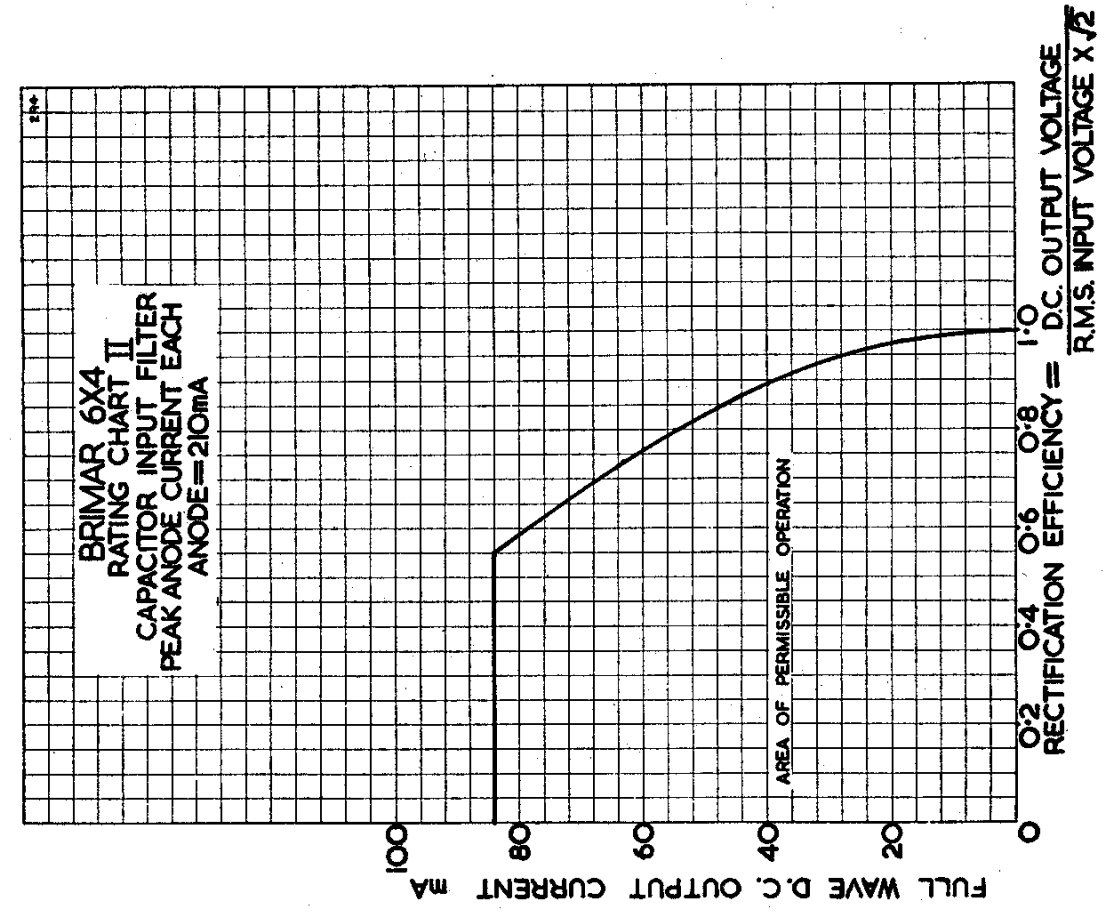
CHARACTERISTICS AS A FULL-WAVE RECTIFIER

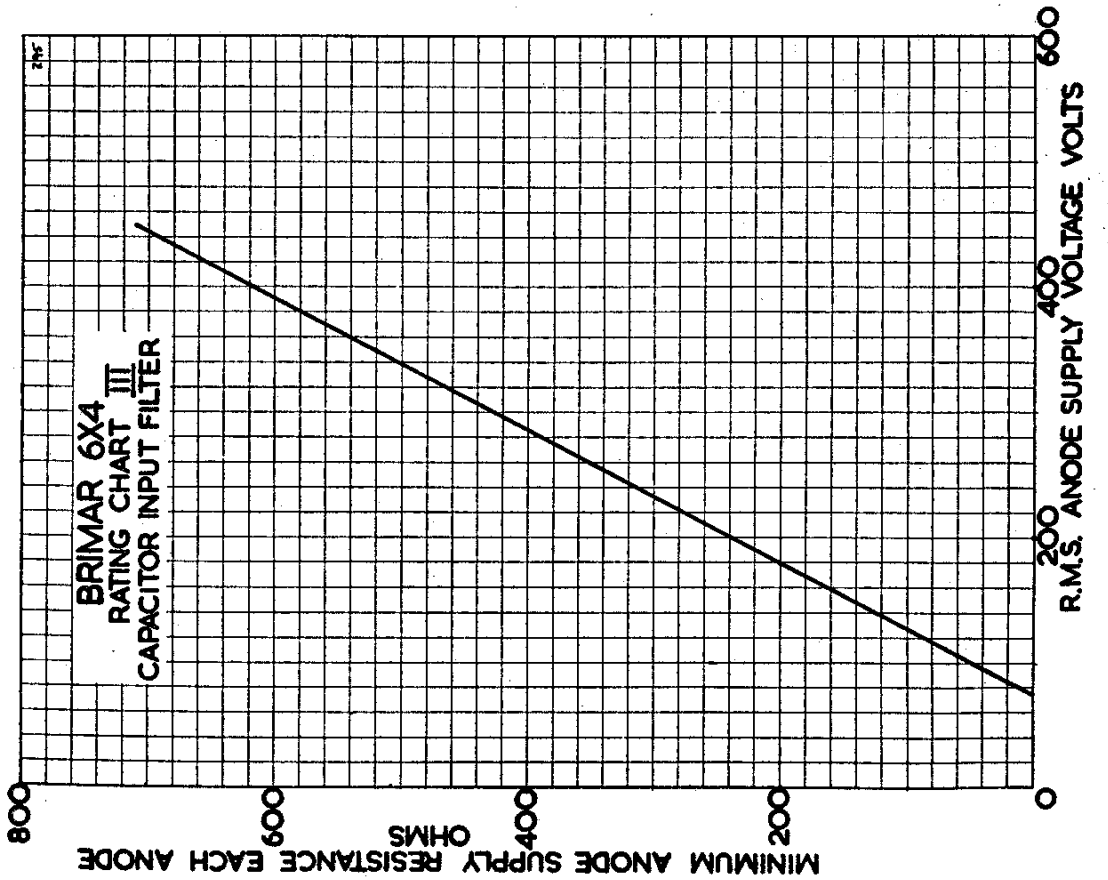
CAPACITOR INPUT		CHOKE INPUT	
R.M.S. Input per Anode	325 volts	R.M.S. Input per Anode	450 volts
Rectified Current	70 mA	Rectified Current	70 mA
D.C. Output Voltage	310 volts	D.C. Output Voltage	380 volts
Supply Impedance per Anode	470 Ω	Minimum Filter Input Choke†	6 Henries
Reservoir Capacitor	16 μF		

† *Limiting value at 62 mA. For operating currents less than 62 mA refer to curve.*
For notes on use of rating charts, refer to " Valve Ratings " section.

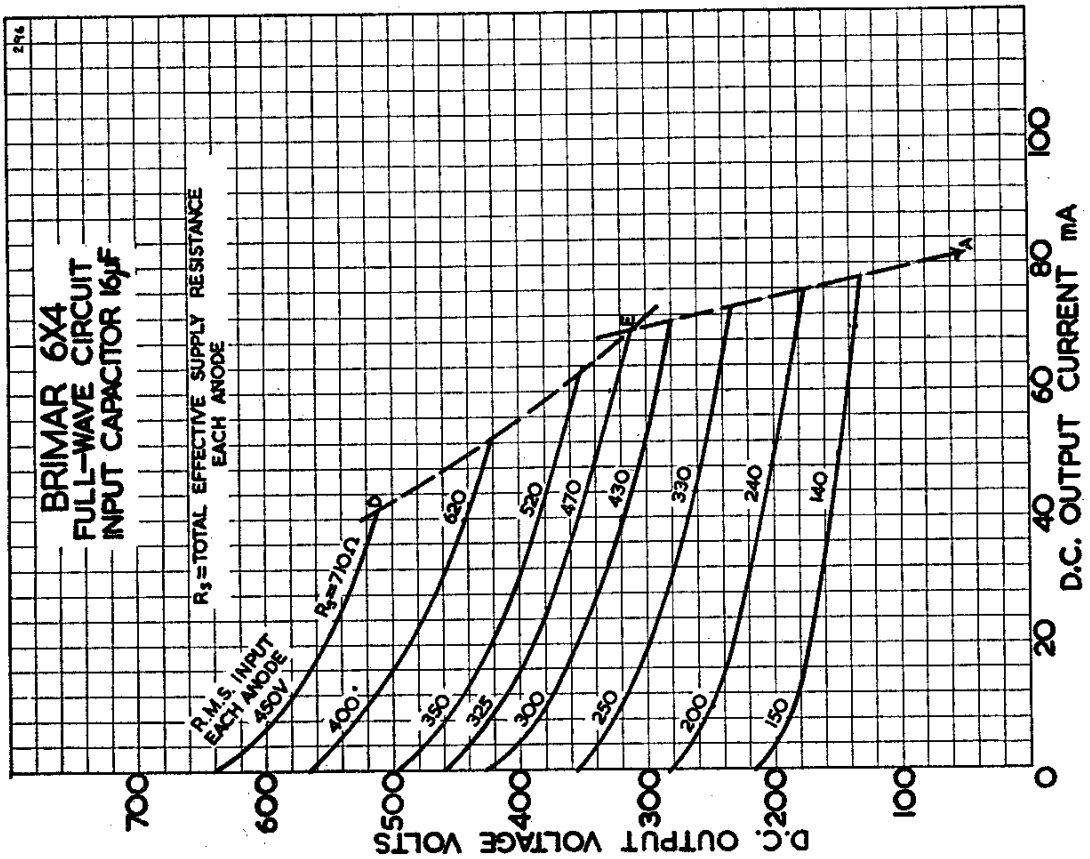


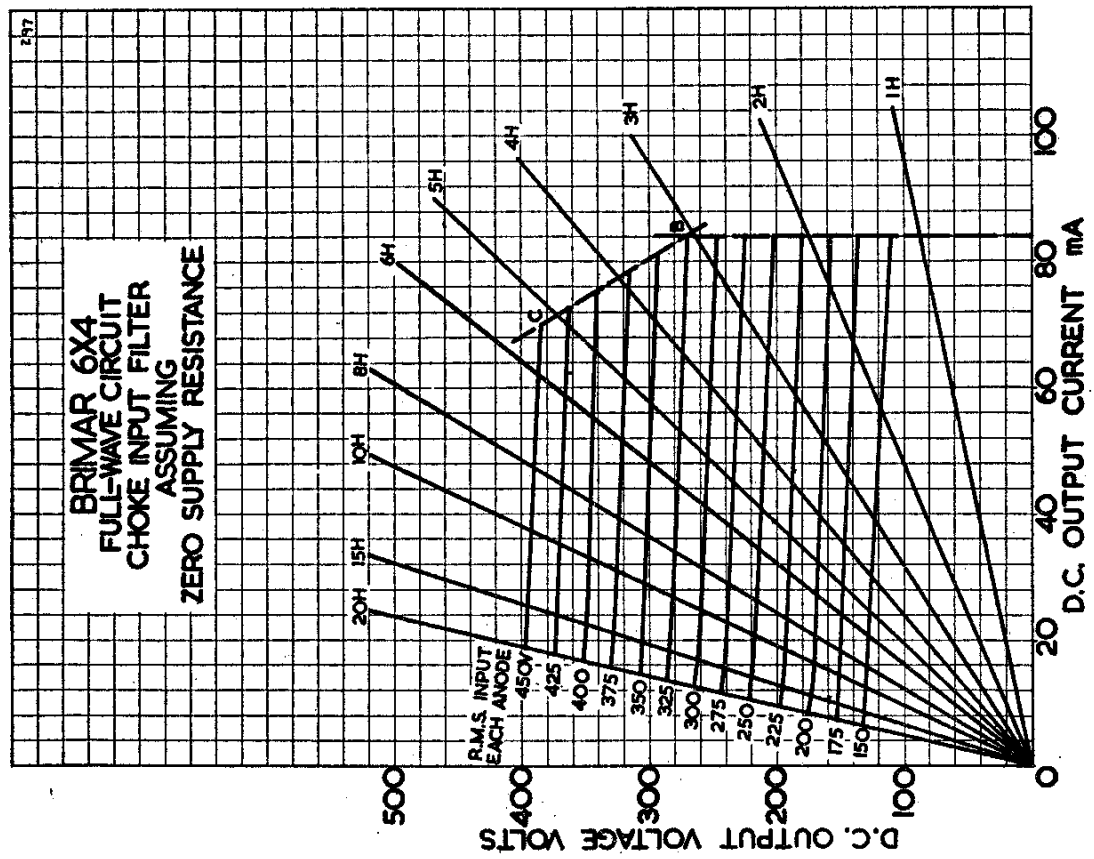
6X4


BRIMAR 6X4
RATING CHART II
CAPACITOR INPUT FILTER
PEAK ANODE CURRENT EACH ANODE = 210mA
AREA OF PERMISSIBLE OPERATION
FULL WAVE D.C. OUTPUT CURRENT mA
0
20
40
60
80
100
RECTIFICATION EFFICIENCY = D.C. OUTPUT VOLTAGE / R.M.S. INPUT VOLTAGE X √2
0·2
0·4
0·6
0·8
1·0


BRIMAR 6X4
RATING CHART III
CAPACITOR INPUT FILTER
MINIMUM ANODE SUPPLY RESISTANCE EACH ANODE OHMS
0
200
400
600
800
R.M.S. ANODE SUPPLY VOLTAGE VOLTS
0
200
400
600

6X4


BRIMAR 6X4
FULL-WAVE CIRCUIT
INPUT CAPACITOR 16μF
R_s = TOTAL EFFECTIVE SUPPLY RESISTANCE EACH ANODE
R.M.S. INPUT EACH ANODE
450V
400
350
325
300
250
200
150
R_s=710Ω
620
520
470
430
330
240
140
A
B
C
D
E
D.C. OUTPUT VOLTAGE VOLTS
D.C. OUTPUT CURRENT mA

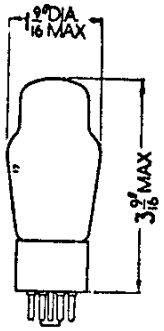

BRIMAR 6X4
FULL-WAVE CIRCUIT
CHOKE INPUT FILTER
ASSUMING
ZERO SUPPLY RESISTANCE
1H
2H
3H
4H
5H
6H
8H
10H
15H
20H
R.M.S. INPUT EACH ANODE
450V
425
400
375
350
325
300
275
250
225
200
175
150
A
B
C
D.C. OUTPUT VOLTAGE VOLTS
D.C. OUTPUT CURRENT mA

6X5G
6X5GT

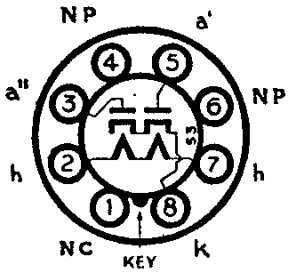
Replacement Types

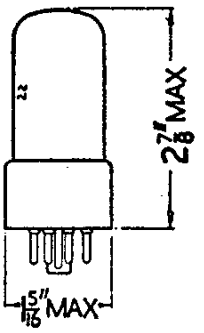
TYPES 6X5G, 6X5GT

(OCTAL BASE)



6X5G.





6X5GT.

FULL-WAVE RECTIFIERS

The BRIMAR types 6X5G, 6X5GT are indirectly heated full-wave rectifiers for use in equipment where the current drain does not exceed 70 mA.

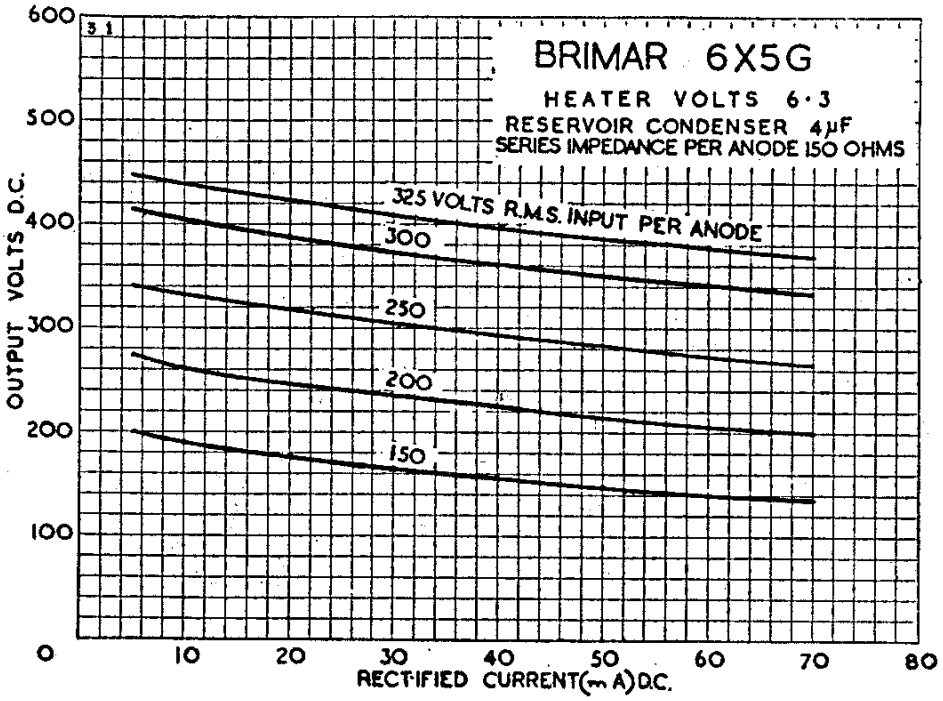
RATINGS

Heater Voltage	6.3 volts
Heater Current	0.6 amp.
Peak Inverse Voltage	1,250 volts max.
Peak Current (each Anode)	210 mA max.
Heater Cathode Potential	450 volts max.

CHARACTERISTICS AS FULL-WAVE RECTIFIER

CONDENSER INPUT

R.M.S. Input per Anode	325 volts max.
Supply Impedance per Anode	150 ohms min.
Rectified Current	70 mA max.
Reservoir Condenser	32 μF max.

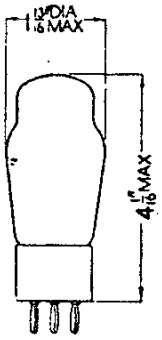


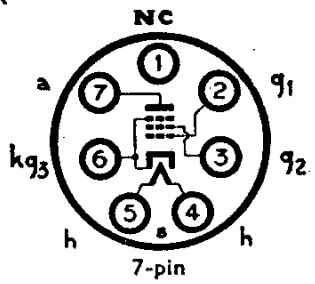
7A2
7A3
7AN7

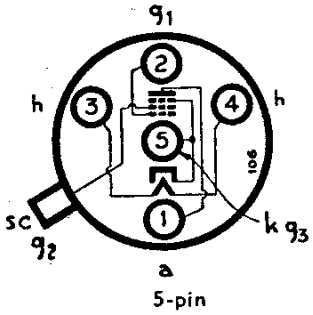
(see type PCC84)

Obsolescent Type

TYPE 7A2
(ENGLISH BASE)







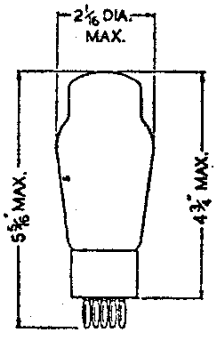
OUTPUT PENTODE

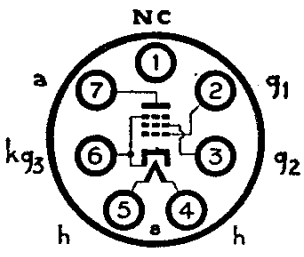
CHARACTERISTICS

Heater Voltage ...	....	4.0 volts	Grid (g_1) Voltage ...	...	−16.5 volts
Heater Current ...	...	1.2 amp.	Cathode Bias Resistor	...	410 ohms
Anode Voltage ...	...	250 volts	Anode Impedance ...	...	80,000 ohms
Anode Current ...	...	34 mA	Mutual Conductance	...	2.35 mA/V
Screen (g_2) Voltage ...	....	250 volts	Optimum Load ...	...	7,000 ohms
Screen Current ...	...	6.5 mA	Power Output ...	...	3.5 watts

Obsolescent Type

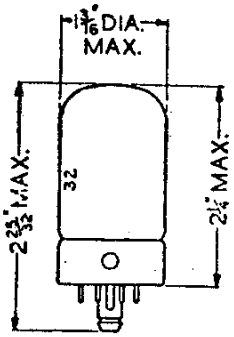
TYPE 7A3
(ENGLISH BASE)
HIGH SLOPE
POWER PENTODE





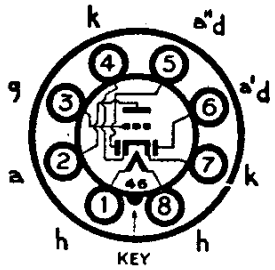
CHARACTERISTICS

Heater Voltage ...	...	4.0 volts	Grid (g_1) Voltage ...	...	−6 volts
Heater Current ...	...	2.0 amp.	Cathode Bias Resistor	...	150 ohms
Anode Voltage ...	...	250 volts	Anode Impedance ...	...	60,000 ohms
Anode Current ...	...	32 mA	Mutual Conductance	...	10 mA/V
Screen (g_2) Voltage ...	...	250 volts	Optimum Load ...	...	8,500 ohms
Screen Current ...	...	6.0 mA	Power Output ...	...	3.75 watts



Replacement Type

TYPE 7B6
(LOCTAL BASE)
DOUBLE DIODE TRIODE



RATINGS

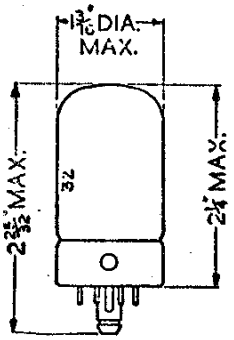
Heater Voltage	6.3 volts	Anode Voltage	300 volts max.
Heater Current	0.3 amp.	Diode Current	1.0 mA max.

OPERATING CHARACTERISTICS

Anode Voltage ...	100	250 volts	Anode Impedance ...	110,000	91,000 ohms
Anode Current ...	0.4	0.9 mA	Mutual Conductance	0.9	1.1 mA/V
Grid Voltage	—1.0	—2.0 volts	Amplification Factor	100	100

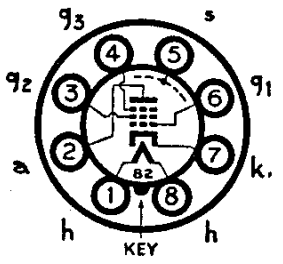
OPERATION AS RESISTANCE CAPACITY COUPLED AMPLIFIER

Anode Supply Voltage	100	250	250	volts
Anode Load Resistor	0.47	0.27	0.27	meg.
Grid Resistor	1.0	1.0	10.0	meg.
Cathode Bias Resistor	8,200	3,300	0	ohms
Succeeding Grid Resistor	0.47	0.47	0.47	meg.
Peak Output Voltage	8.0	44	44	volts
Stage Gain	48	59	56	
Harmonic Distortion	4	4	5	per cent.



Replacement Type

TYPE 7B7
(LOCTAL BASE)
VARI-MU R.F. PENTODE



RATINGS

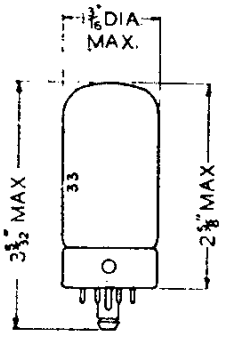
Heater Voltage	6.3 volts	Anode Dissipation ...	2.25 watts max.
Heater Current	0.15 amp.	Screen (g_2) Voltage ...	100 volts max.
Anode Voltage	300 volts max.	Screen Dissipation ...	0.25 watt max.

OPERATING CHARACTERISTICS

Anode Voltage	100	250	volts
Anode Current	8.2	8.5	mA
Screen Voltage	100	100	volts
Screen Current	1.8	1.7	mA
Control Grid (g_1) Voltage	—3	—3	volts
Cathode Bias Resistor	300	300	ohms
Anode Impedance	0.3	0.75	meg.
Mutual Conductance	1.65	1.75	mA/V
*Control Grid Voltage	—40	—40	volts

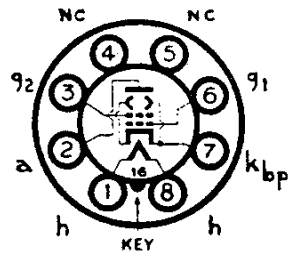
*For Mutual Conductance of 0.01 mA/V.

7C5
7C6



Replacement Type

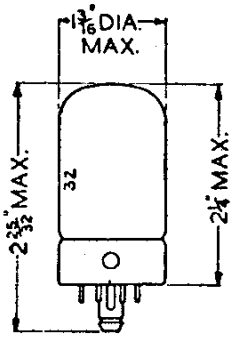
TYPE 7C5
(LOCTAL BASE)
OUTPUT BEAM TETRODE



RATINGS

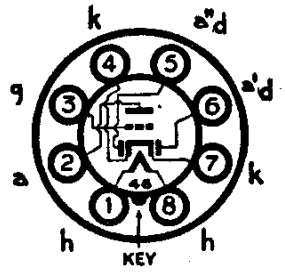
Heater Voltage	6.3 volts
Heater Current	0.45 amp.

For operating characteristics and curves refer to type 6BW6.



Replacement Type

TYPE 7C6
(LOCTAL BASE)
DOUBLE DIODE TRIODE



RATINGS

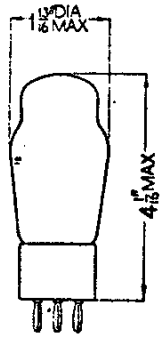
Heater Voltage	6.3 volts	Anode Voltage	300 volts max.
Heater Current	0.15 amp.	Diode Current	1.0 mA max.

OPERATING CHARACTERISTICS

Anode Voltage ...	100	250	volts	Anode Impedance ...	0.1	0.1	meg.
Anode Current ...	1.0	1.3	mA	Mutual Conductance	0.85	1.0	mA/V
Grid Voltage ...	0	—1.0	volts	Amplification Factor	85	100	

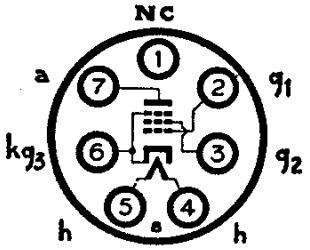
OPERATION AS RESISTANCE CAPACITY COUPLED AMPLIFIER

Anode Supply Voltage	100	250	250	volts
Anode Load Resistor...	0.47	0.27	0.27	meg.
Grid Resistor	1.0	1.0	10.0	meg.
Cathode Bias Resistor	10,000	3,300	0	ohms
Succeeding Grid Resistor	0.47	0.47	0.47	meg.
Peak Output Voltage...	8.5	40	39	volts
Stage Gain	43	53	57	
Harmonic Distortion	5.0	4.8	5.0	per cent.



Obsolescent Type

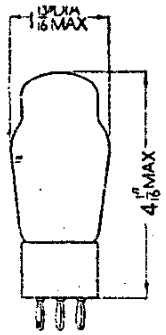
TYPE 7D3
(ENGLISH BASE)
POWER PENTODE



CHARACTERISTICS

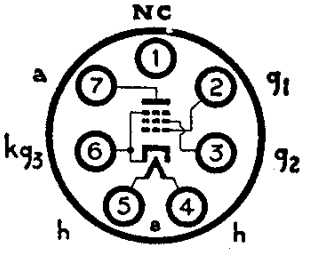
Heater Voltage ... ... 40 volts Heater Current ... ... 0.20 amp.

For further information refer to type 25A6G.



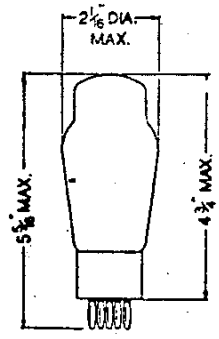
Obsolescent Type

TYPE 7D5
(ENGLISH BASE)
POWER PENTODE



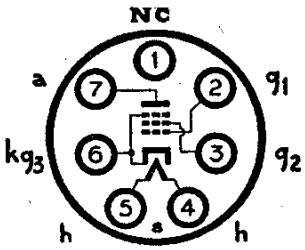
Heater Voltage ... ... 13.0 volts Heater Current ... ... 0.315 amp.

Characteristics as type 6F6G.



Obsolescent Type

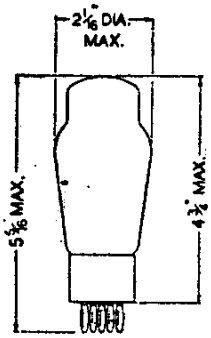
TYPE 7D6
(ENGLISH BASE)
HIGH SLOPE
POWER PENTODE



Heater Voltage ... ... 40 volts Heater Current ... ... 0.20 amp.

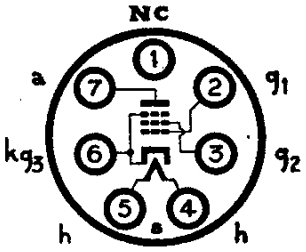
Characteristics as type 6AG6G.

7D8
7D9
(see 6AM5)
7D10
(see 6CH6)
7H7



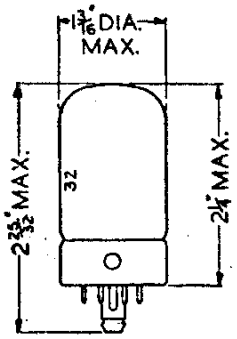
Obsolescent Type

TYPE 7D8
(ENGLISH BASE)
HIGH SLOPE
POWER PENTODE



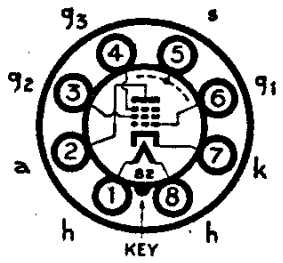
Heater Voltage	13.0 volts
Heater Current	0.65 amp.

Characteristics as type 6AG6G.



Replacement Type

TYPE 7H7
(LOCTAL BASE)
HIGH SLOPE
VARI-MU R.F. PENTODE



RATINGS

Heater Voltage	6.3 volts
Heater Current	0.3 amp.
Anode Voltage	300 volts max.
Anode Dissipation	2.5 watts
Screen (g_2) Voltage	150 volts max
Screen Dissipation	0.5 watts

OPERATING CHARACTERISTICS

[Suppressor Grid (g_3) connected to Cathode]

Anode Voltage	100	250	250	volts
Anode Current	8.2	9.5	9.5	mA
Screen Voltage	100	150	250*	volts
Screen Current	3.3	3.5	3.5	mA
Control Grid (g_1) Voltage	—1	—2.5	—2.5	volts
Cathode Bias Resistor	80	200	200	ohms
Anode Impedance	0.25	0.8	0.8	meg.
Mutual Conductance	4.8	4.2	4.2	mA/V
Control Grid Voltage	—12	—19	—30	volts

(For Mutual Conductance of 0.035 mA/V)

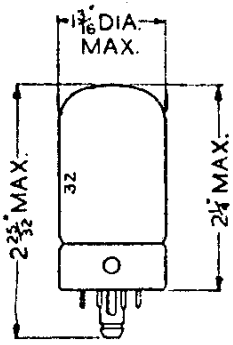
** Via series screen resistor of 30,000 ohms.*

INTER-ELECTRODE CAPACITANCES†

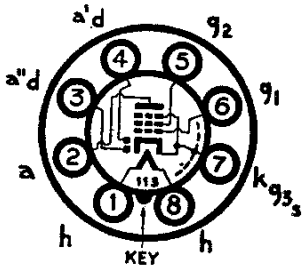
Input (Control Grid to all except Anode)	8.0 pF
Output (Anode to all except Control Grid)	7.0 pF
Control Grid to Anode	0.007 pF max.

† With close fitting external shield connected to Cathode.

Obsolescent Type



TYPE 7R7
(LOCTAL BASE)
DOUBLE DIODE
R.F. PENTODE



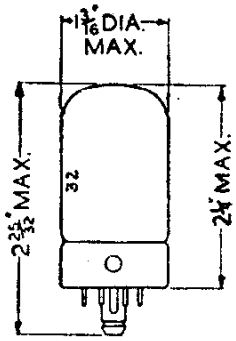
RATINGS

Heater Voltage	6.3 volts	Anode Dissipation... ...	2.0 watts max.
Heater Current	0.3 amp.	Screen (g_2) Voltage... ...	100 volts max.
Anode Voltage	300 volts max.	Screen Dissipation	0.25 watts max.

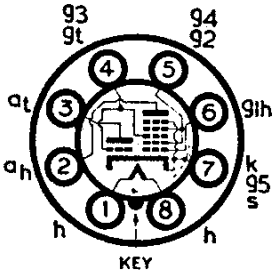
OPERATING CHARACTERISTICS

Anode Voltage	100	250	volts
Anode Current	5.5	6.2	mA
Screen Voltage	100	100	volts
Screen Current	2.2	1.6	mA
Control Grid (g_1) Voltage	—1.0	—1.0	volt
Cathode Bias Resistor	150	150	ohms
Anode Impedance	0.35	1.0	meg.
Mutual Conductance	3.0	3.2	mA/V
Control Grid Voltage	—16	—20	volts
(For Anode Current Cut-off)			

Replacement Type



TYPE 7S7
(LOCTAL BASE)
TRIODE-HEPTODE
FREQUENCY CHANGER



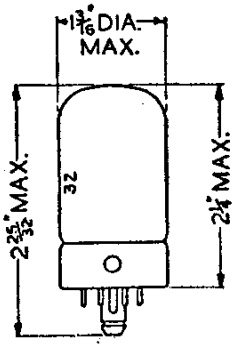
RATINGS

Heater Voltage	6.3 volts	Heptode Screen (g_3, g_4) Voltage	100 volts max.
Heater Current	0.3 amp.	Triode Anode Supply Voltage ...	300 volts max.
Heptode Anode Voltage	300 volts max.	Total Cathode Current	14 mA max.

OPERATING CHARACTERISTICS

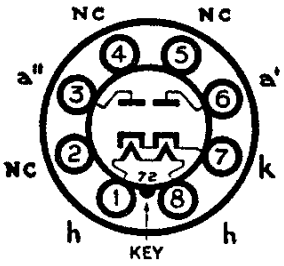
Heptode Anode Voltage	100	250	volts
Heptode Anode Current	1.9	1.8	mA
Heptode Screen Voltage	100	100	volts
Heptode Screen Current	3.0	3.0	mA
Heptode Control Grid (g_1) Voltage	—2	—2	volts
Cathode Bias Resistor	250	200	ohms
Heptode Anode Impedance	0.5	1.25	meg.
Triode Anode Supply Voltage	100	250	volts
Triode Anode Resistor	—	20,000	ohms
Triode Anode Voltage	100	150	volts
Triode Anode Current	3.0	5.0	mA
Triode Grid Current	0.3	0.4	mA
Triode Grid Resistor	50,000	50,000	ohms
Conversion Conductance	0.5	0.53	mA/V
Heptode Control Grid Voltage	—21	—21	volts
(For Conversion Conductance of 0.005 mA/V)			

7Y4
7Z4
8D2
8D3
(see type 6AM6)
8D5
(see type 6BR7)



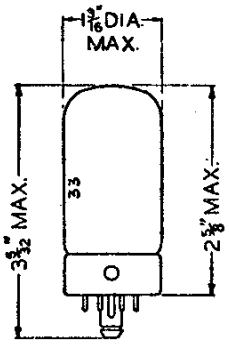
Replacement Type

TYPE 7Y4
(LOCTAL BASE)
FULL-WAVE RECTIFIER



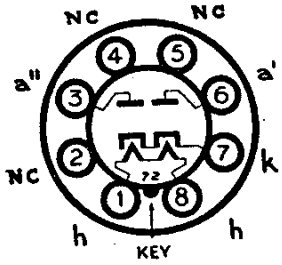
Heater Voltage ... ... 6.3 volts Heater Current ... ... 0.5 amp.

Other characteristics as type 6X4.



Replacement Type

TYPE 7Z4
(LOCTAL BASE)
FULL-WAVE RECTIFIER



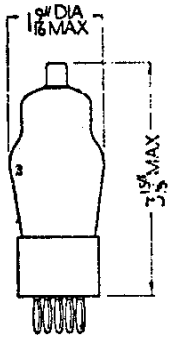
RATINGS

Heater Voltage	6.3 volts	Peak Current (each Anode)	300 mA max.
Heater Current	0.9 amp.	Heater-Cathode Potential...	450 volts max.
Peak Inverse Voltage ...	1,250 volts max.		

CHARACTERISTICS AS FULL-WAVE RECTIFIER

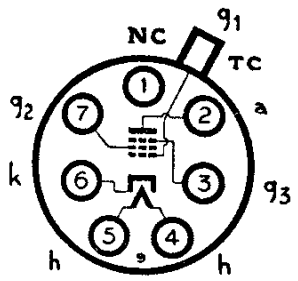
CONDENSER INPUT

R.M.S. Input per Anode ...	325 volts max.	Rectified Current	100 mA max.
Supply Impedance per Anode	75 ohms min.	Reservoir Condenser ...	32 μF max.



Obsolescent Type

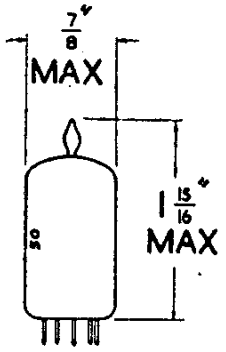
TYPE 8D2
(ENGLISH BASE)
R.F. PENTODE



Heater Voltage ... ... 13.0 volts Heater Current ... ... 0.2 amp.

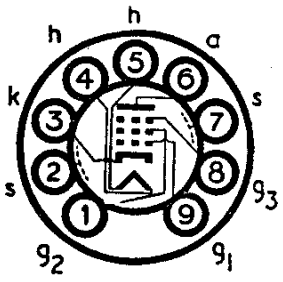
Other characteristics as type 6J7G.

Current Equipment Type



B9A (Noval) Base

TYPE 8D8
MINIATURE
LOW MICROPHONY
AMPLIFIER PENTODE



The BRIMAR type 8D8 has been specially designed for use in the early stages of high gain A.F. amplifiers. Its thorough screening and rigid construction ensure low microphony and very low hum.

RATINGS

Heater Voltage ...	6.3 volts.
Heater Current	0.15 amp.
Anode Voltage ...	300 volts max.
Anode Dissipation	1 watt max.
Screen (g_2) Voltage	200 volts max.
Screen Dissipation	0.2 watt max.

CHARACTERISTICS
(g_3 connected to cathode)

Anode Voltage ...	250 volts
Anode Current	3 mA
Screen Voltage ...	140 volts
Screen Current	0.6 mA
Control Grid (g_1) Voltage	— 2 volts
Anode Impedance	2.5 M Ω
Mutual Conductance	1.9 mA/V

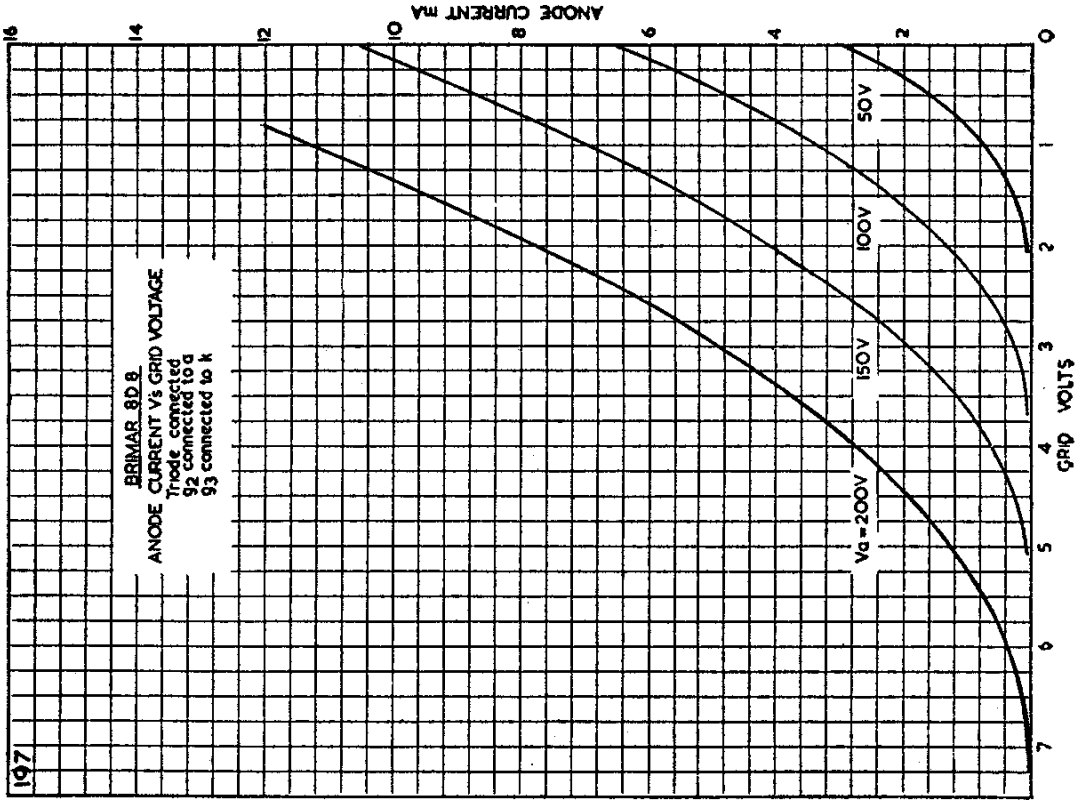
TYPICAL OPERATION AS RESISTANCE COUPLED AMPLIFIER
(g_3 connected to cathode)

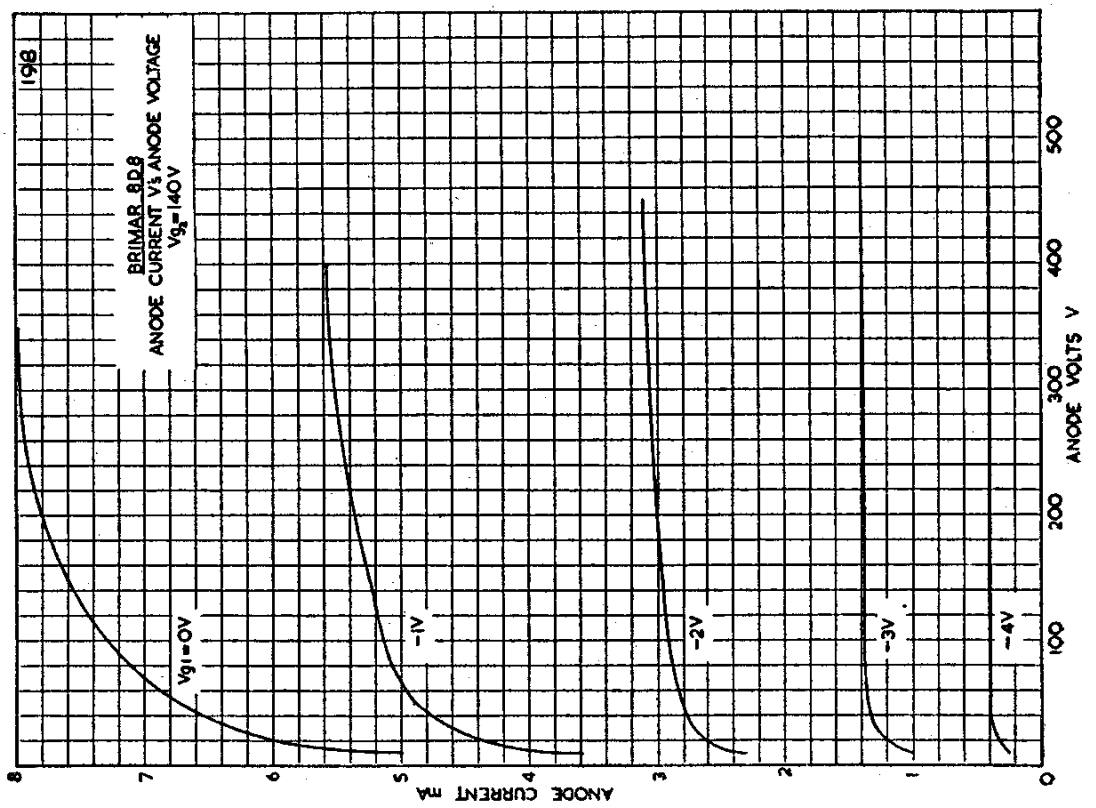
Anode and Screen Supply Voltage ...	200	250	300	400	volts
Anode Load Resistor ...	220	220	220	220	k Ω
Screen Series Resistor ...	1.0	1.0	1.0	1.0	M Ω
Cathode Bias Resistor ...	2.2	2.2	2.2	2.2	k Ω
Output Voltage (r.m.s.)	36	46	54	73	volts
Voltage Gain ...	170	180	188	200	
Following Grid Resistor	680	680	680	680	k Ω

INTER-ELECTRODE CAPACITANCES
(Pentode connected: measured without external shielding)

Input ...	4.0 pF
Output ...	3.9 pF
Control Grid to Anode	0.05 pF max.
Control Grid to Heater	0.002 pF

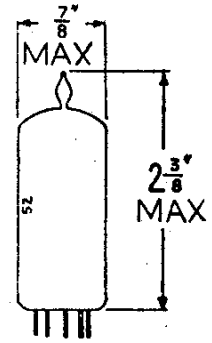
8D8


197
BRIMAR 8D8
ANODE CURRENT V's GRID VOLTAGE
Triode connected
g2 connected to a
g3 connected to k
Va=200V
150V
100V
50V
ANODE CURRENT mA
GRID VOLTS


198
BRIMAR 8D8
ANODE CURRENT V's ANODE VOLTAGE
Vg2=140V
Vg1=0V
-1V
-2V
-3V
-4V
ANODE CURRENT mA
ANODE VOLTS V

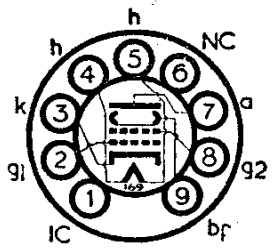
9BW6
9D2

Replacement Type



B9A (Noval) Base

TYPE **9BW6**
MINIATURE
OUTPUT
BEAM TETRODE

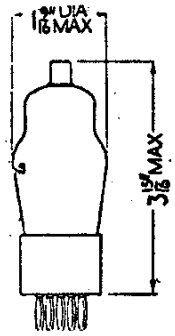


CHARACTERISTICS

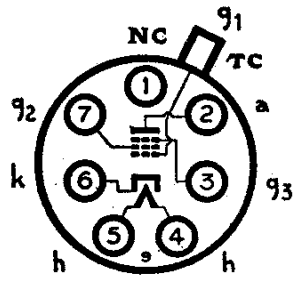
Heater Voltage ... ... 9 volts (Nominal)
Heater Current ... ... 0.3 amps.

For further information on characteristics and curves refer to type 6BW6.

Obsolescent Type



TYPE **9D2**
(ENGLISH BASE)
VARI-MU
R.F. PENTODE



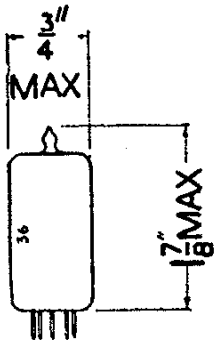
CHARACTERISTICS

Heater Voltage	13.0 volts	Control Grid (g_1) Voltage ...	−3 volts
Heater Current	0.2 amp.	Cathode Bias Resistor ...	220 ohms
Anode Voltage	250 volts	Anode Impedance	0.6 meg.
Anode Current	10.5 mA	Mutual Conductance	1.65 mA/V
Screen (g_2) Voltage	125 volts	Control Grid Voltage	−52 volts
Screen Current...	2.6 mA	(For Mutual Conductance of 0.002 mA/V)	

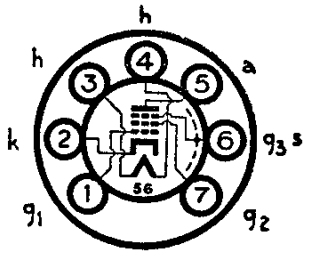
For further information refer to type 6K7G.

9D6

Current Equipment Type



TYPE 9D6
MINIATURE VARI-MU R.F. PENTODE



B7G Base

The BRIMAR 9D6 is an indirectly heated vari-mu R.F. pentode, suitable for use as an R.F. or I.F. amplifier, and in a variety of applications where vari-mu characteristics are required.

RATINGS

Heater Voltage	6.3 volts
Heater Current	0.2 amp.
Anode Voltage	250 volts max.
Anode Dissipation	2.5 watts max.
Screen (g_2) Voltage	250 volts max.
Screen Dissipation	0.6 watt max.

OPERATING CHARACTERISTICS

[Suppressor Grid (g_3) connected to Cathode]

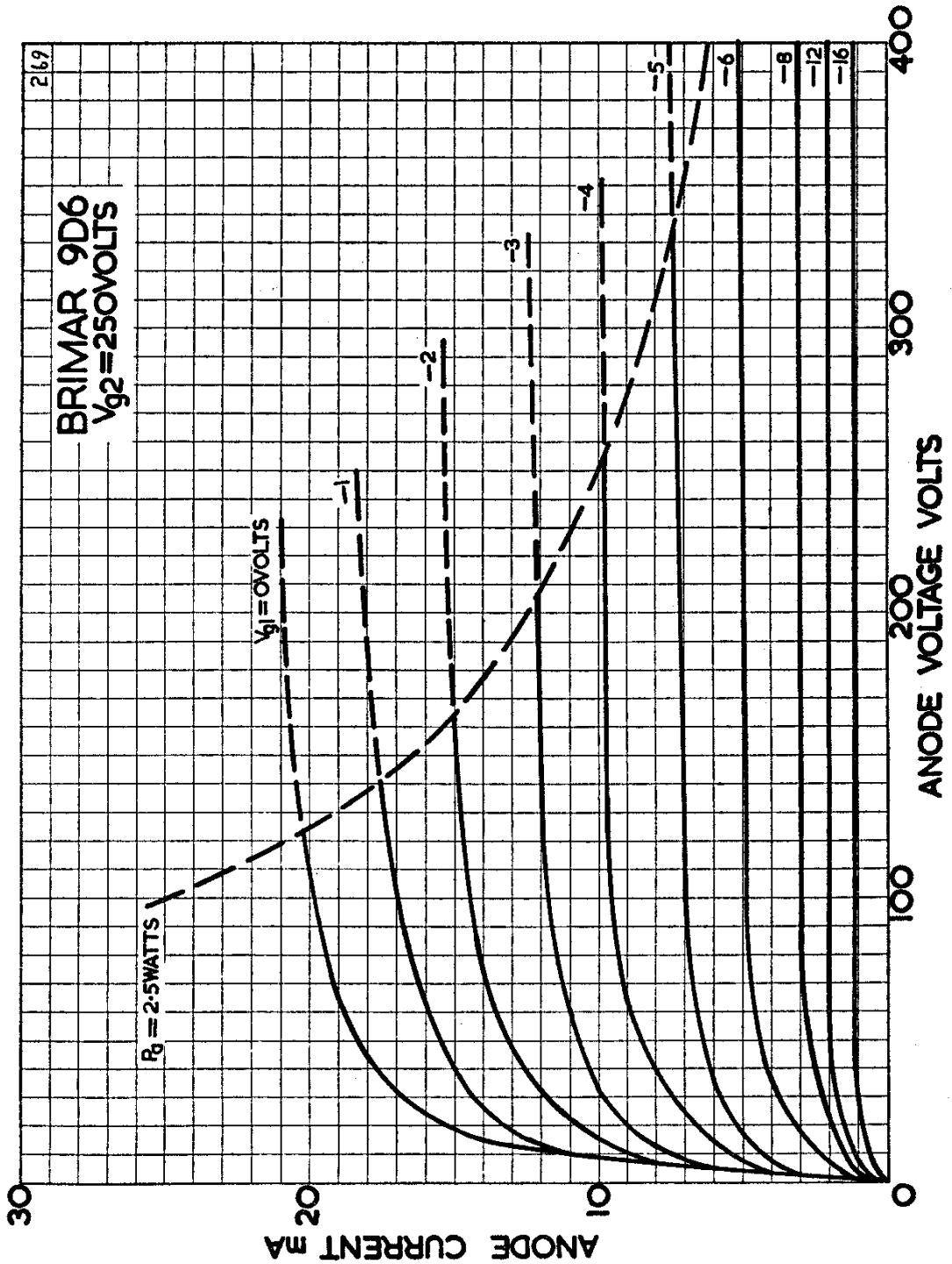
Anode Voltage	250	250	volts
Anode Current	8.0	8.0	mA
Screen Voltage	150	200	volts
Screen Current	2.0	2.1	mA
Control Grid (g_1) Voltage	—0.65	—2.5	volts
Cathode Bias Resistor	65	250	ohms
Anode Impedance	1.0	1.0	meg.
Mutual Conductance	2.5	2.5	mA/V
Inner Amplification Factor (μg_1-g_2)	—	30	
Control Grid Voltage (For Mutual Conductance of 0.005 mA/V)	—15	—28	volts

INTER-ELECTRODE CAPACITANCES*

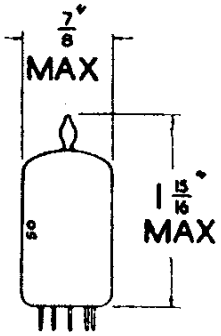
Input	4.5 pF
Output	7.0 pF
Control Grid to Anode	0.004 pF

** With close fitting shield connected to Cathode.*

Type 9D6 is a commercial equivalent of the CV131.

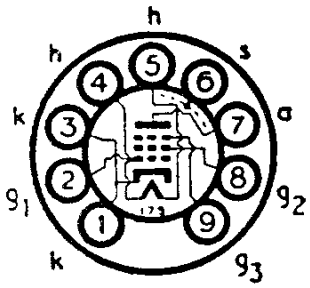

BRIMAR 9D6
V_{g2}=250VOLTS
V_{g1}=0VOLTS
-1
-2
-3
-4
-5
-6
-8
-12
-16
R_g=2·5WATTS
ANODE CURRENT mA
30
20
10
0
100
200
300
400
ANODE VOLTAGE VOLTS

9D7



Current Equipment Type

TYPE 9D7
MINIATURE
HIGH SLOPE
VARI-MU
PENTODE



B9A Base

The BRIMAR 9D7 is a high slope R.F. pentode with a vari-mu characteristic for use in the I.F. stages of television and F.M. receivers using automatic gain control. It is suitable for use with both A.C. and A.C./D.C. operated receivers.

RATINGS

Heater Voltage	6.3 volts
Heater Current	0.3 amp.
Anode Voltage	275 volts max.
Anode Voltage (I_a = 0)	500 volts max.
Anode Dissipation	2.75 watts max.
Screen Voltage	275 volts max.
Screen Voltage (I_{g2} = 0)	500 volts max.
Screen Dissipation	1.2 watts max.
Cathode Current	30 mA max.
Heater-Cathode Voltage	250 volts max.

OPERATING CHARACTERISTICS

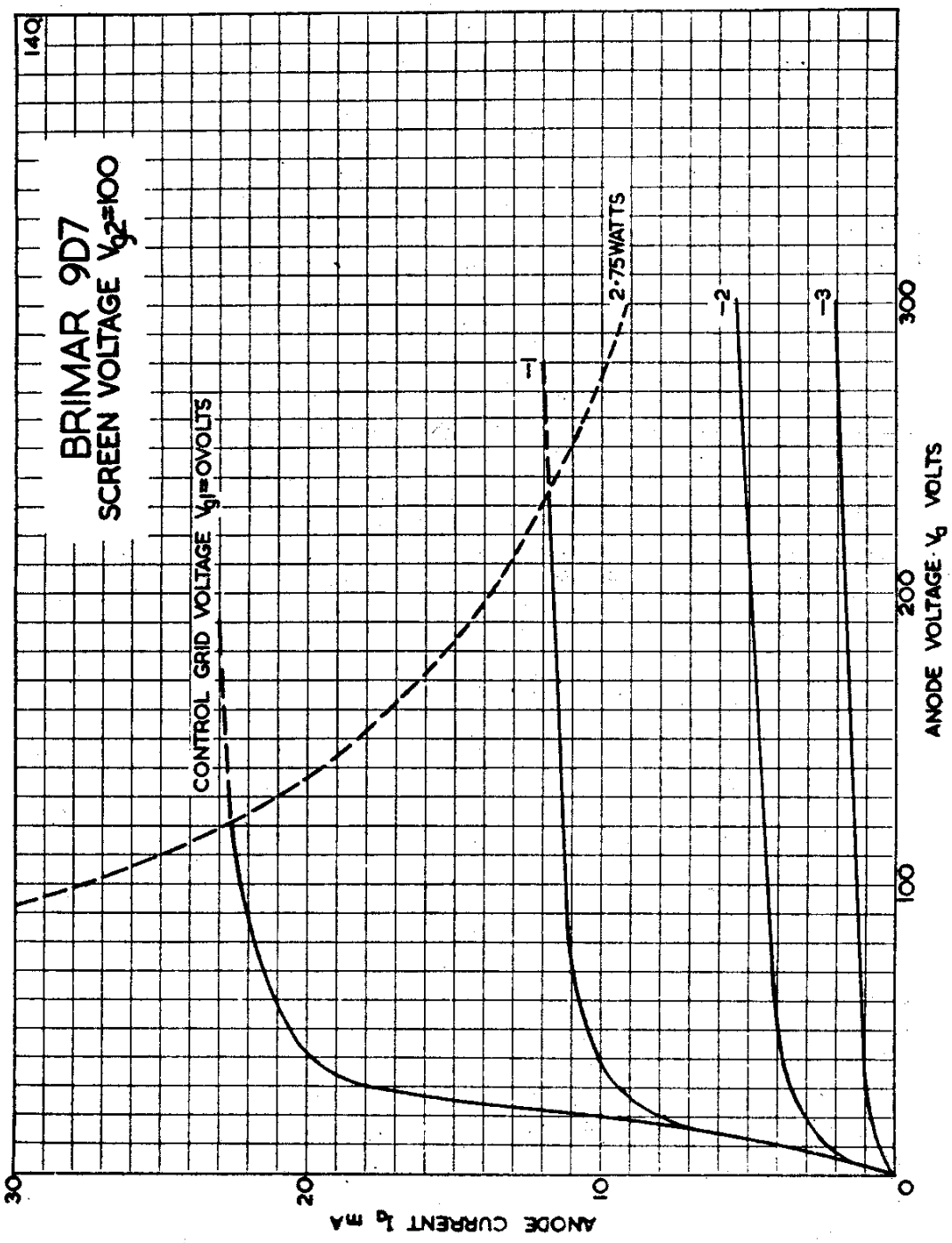
[Suppressor Grid (g_3) connected to Cathode]

Anode Voltage	250 volts
Screen Voltage	100 volts
Cathode Bias Resistor	100 ohms
Anode Current	10 mA
Screen Current	3.3 mA
Mutual Conductance	8.4 mA/V
Anode Impedance	750 kilohms
Inner Amplification Factor (μg_1-g_2)	35
Mutual Conductance at V_{g1} = —20V	7 μA/V

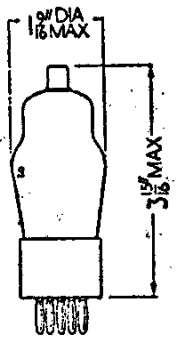
INTER-ELECTRODE CAPACITANCES *

Input	9.0 pF
Output	3.0 pF
Grid to Anode	0.01 pF max.

** With no external shield.*

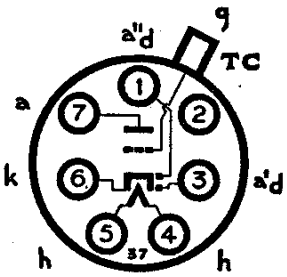

BRIMAR 9D7
SCREEN VOLTAGE V_{g2}=100
CONTROL GRID VOLTAGE V_{g1}=0VOLTS
-1
-2
-3
2·75WATTS
140
30
20
10
0
300
200
100
ANODE CURRENT I_a mA
ANODE VOLTAGE V_a VOLTS

9U8
(see type PCF82)
11D3
11D5



Obsolescent Type

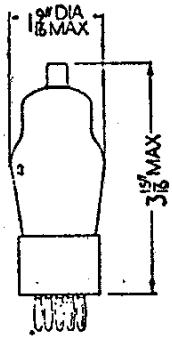
TYPE 11D3
(ENGLISH BASE)
DOUBLE DIODE TRIODE



CHARACTERISTICS

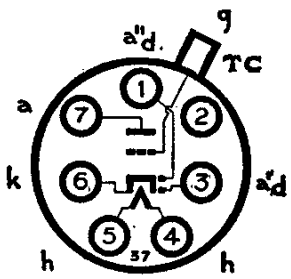
Heater Voltage	13.0 volts
Heater Current	0.2 amp.

Other characteristics as type 75.



Obsolescent Type

TYPE 11D5
(ENGLISH BASE)
DOUBLE DIODE TRIODE

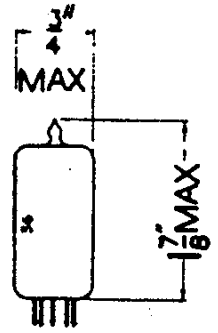


CHARACTERISTICS

Heater Voltage	13.0 volts
Heater Current	0.15 amp.
Anode Voltage	250 volts
Anode Current	3.8 mA
Grid Voltage	–3 volts
Cathode Bias Resistor	750 ohms
Anode Impedance	26,700 ohms
Mutual Conductance	1.5 mA/V
Amplification Factor	40

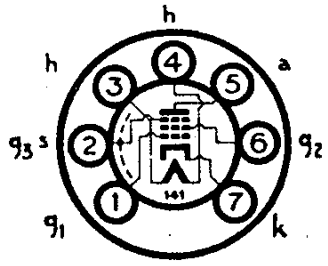
12AC6

Current Equipment Type



B7G Base

TYPE 12AC6
MINIATURE
VARI-MU
PENTODE



The BRIMAR 12AC6 is a vari-mu pentode for use in car radio receivers for operation direct from the 12-volt battery without the use of a vibrator H.T. system. It is designed to operate over the range of voltage variation normally encountered with car batteries.

RATINGS

Heater Voltage	12.6 volts
Heater Current	0.15 amp.
Anode Voltage	30 volts max.
Screen Voltage	30 volts max.
Grid 1 Circuit Resistance	2.2 MΩ max.
Cathode Current	20 mA max.
Heater-Cathode Voltage	±30 volts max.

OPERATING CHARACTERISTICS *

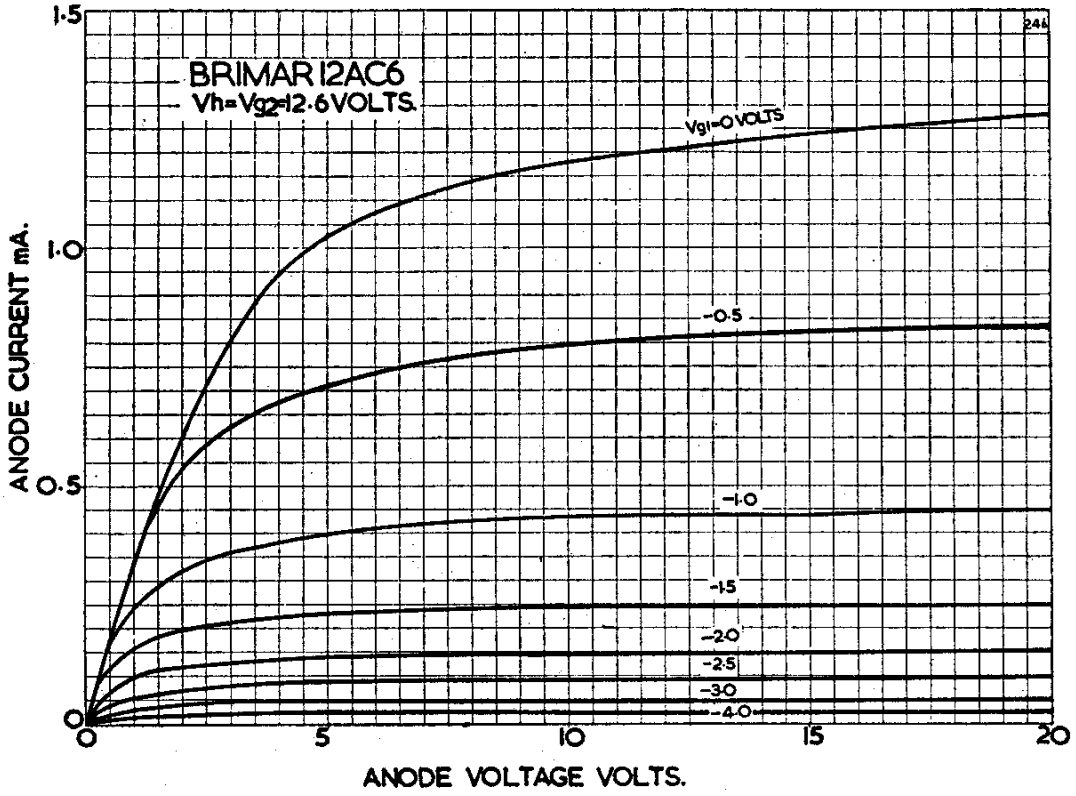
Anode Voltage	12.6 volts
Screen Voltage	12.6 volts
Control Grid Voltage (R_{g1} = 2.2 MΩ)	0 volts
Anode Current	550 μA
Screen Current	200 μA
Mutual Conductance	730 μA/V
Anode Impedance	0.5 MΩ
Grid 1 Voltage for g_m = 10μA/V (V_{g3} = 0)	—5.2 volts approx.
Grid 3 Voltage for g_m = 10μA/V (V_{g1} = 0, R_{g1} = 2.2MΩ)	—3.7 volts approx.

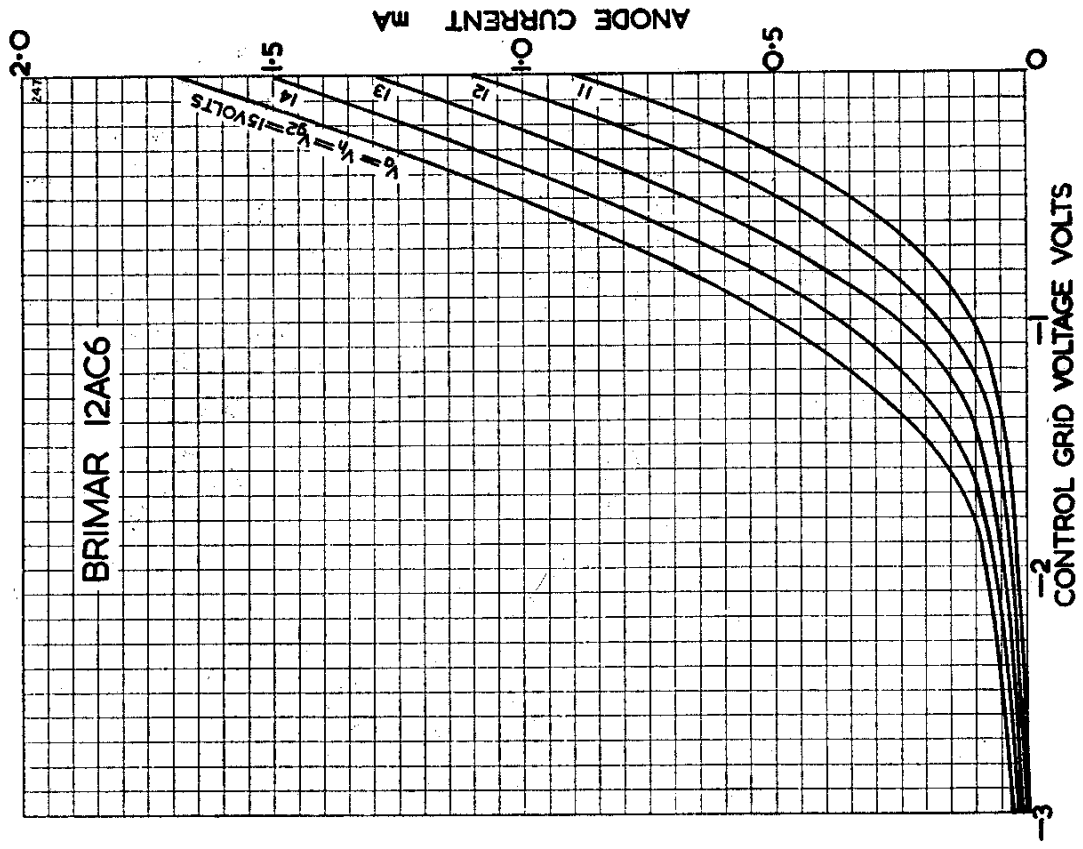
* g_3 connected to cathode.

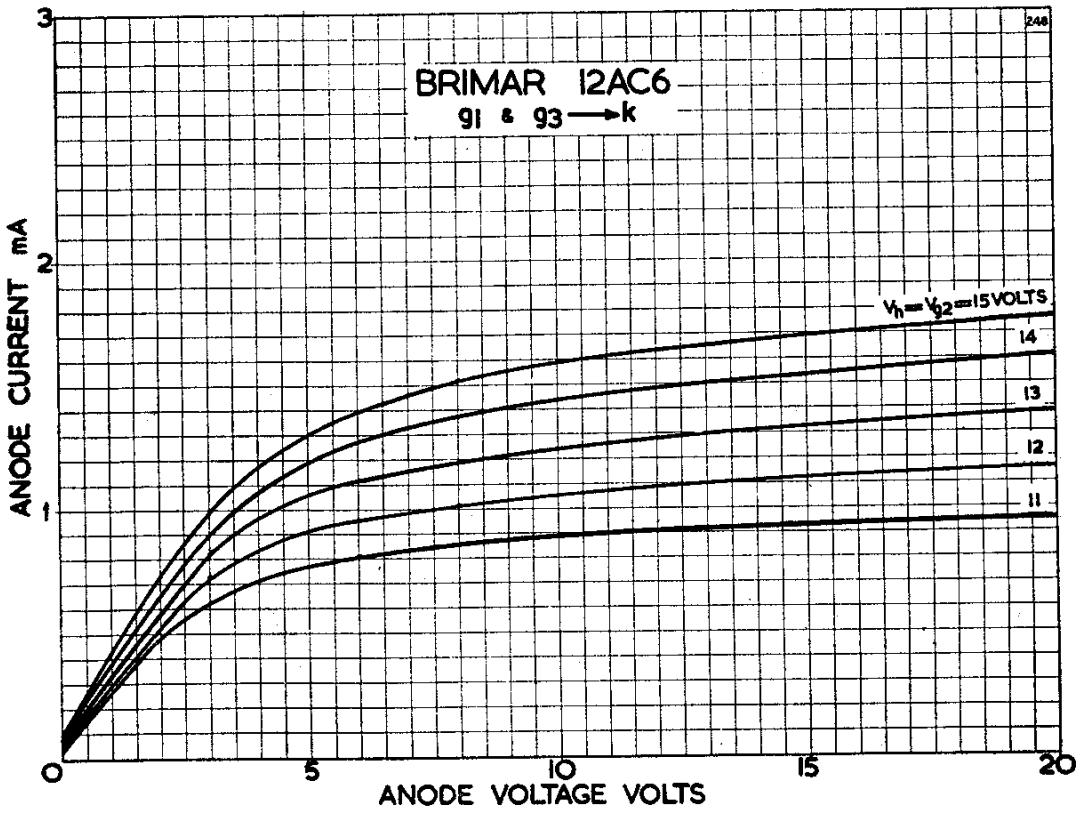
INTER-ELECTRODE CAPACITANCES

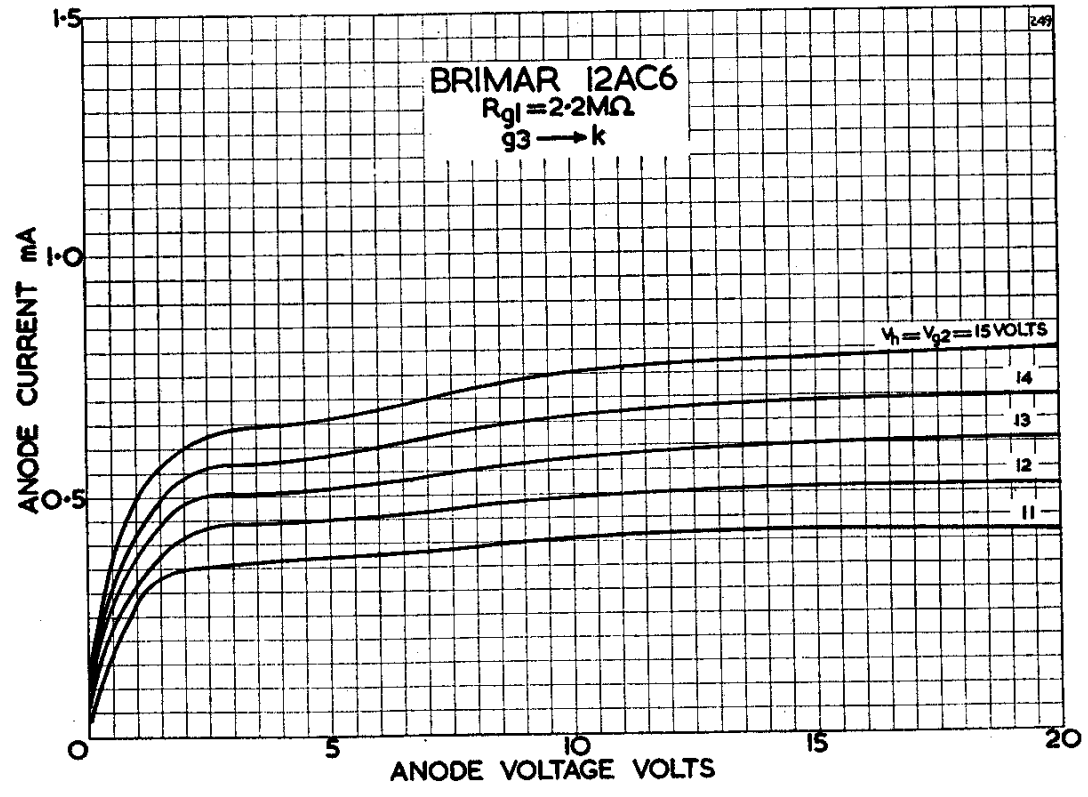
	With external screen	Without external screen
Input	4.3	4.3 pF
Output	5.0	5.0 pF
Anode to Grid	0.004	0.005 pF

12AC6


BRIMAR 12AC6
Vh=Vg2=12·6 VOLTS.
Vg1=0 VOLTS
-0·5
-1·0
-1·5
-2·0
-2·5
-3·0
-4·0
ANODE CURRENT mA.
1·5
1·0
0·5
0
0
5
10
15
20
ANODE VOLTAGE VOLTS.

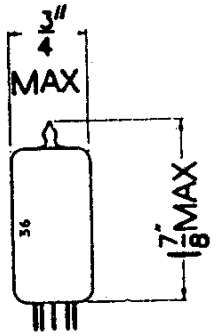

ANODE CURRENT mA
2·0
1·5
1·0
0·5
0
Ib=Vh=Vg2=15 VOLTS
14
13
12
11
BRIMAR 12AC6
CONTROL GRID VOLTAGE VOLTS
-1
-2
-3


248
BRIMAR 12AC6
g1 & g3 → k
ANODE CURRENT mA
3
2
1
0
5
10
15
20
ANODE VOLTAGE VOLTS
Vh = Vg2 = 15 VOLTS
14
13
12
11


249
BRIMAR 12AC6
Rg1 = 2·2MΩ
g3 → k
ANODE CURRENT mA
1·5
1·0
0·5
0
5
10
15
20
ANODE VOLTAGE VOLTS
Vh = Vg2 = 15 VOLTS
14
13
12
11

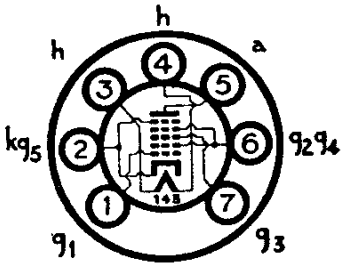
12AD6

Current Equipment Type



B7G Base

TYPE 12AD6 MINIATURE HEPTODE FREQUENCY CHANGER



The BRIMAR 12AD6 is a miniature frequency changer for use in car radio receivers to operate directly from the 12-volt battery without the use of a vibrator H.T. system. It is designed to operate over the range of voltage variations normally encountered with car batteries.

RATINGS

Heater Voltage	12.6 volts
Heater Current	0.15 amp.
Anode Voltage	30 volts max.
Screen Grid (g_2, g_4) Voltage	30 volts max.
Screen Grid Supply Voltage	30 volts max.
Negative Control Grid (g_3) Voltage	—30 volts max.
Positive Control Grid Voltage	0 volts max.
Control Grid Circuit Resistance	10 megohms max.
Cathode Current	20 mA max.
Heater-Cathode Voltage	±30 volts max.

STATIC CHARACTERISTICS—OSCILLATOR SECTION

Measured with grids 2 and 4 connected to anode

Anode, g_2 and g_4 Voltage	12.6 volts
Control Grid (g_3) Voltage	0 volts
Oscillator Grid (g_1) Voltage	0 volts
Mutual Conductance (g_1 to g_2+g_4+a)	3.8 mA/V
Amplification Factor (g_1 to g_2+g_4+a)	9
Cathode Current	5 mA
Control Grid Voltage for I_k = 10μA	—4 volts

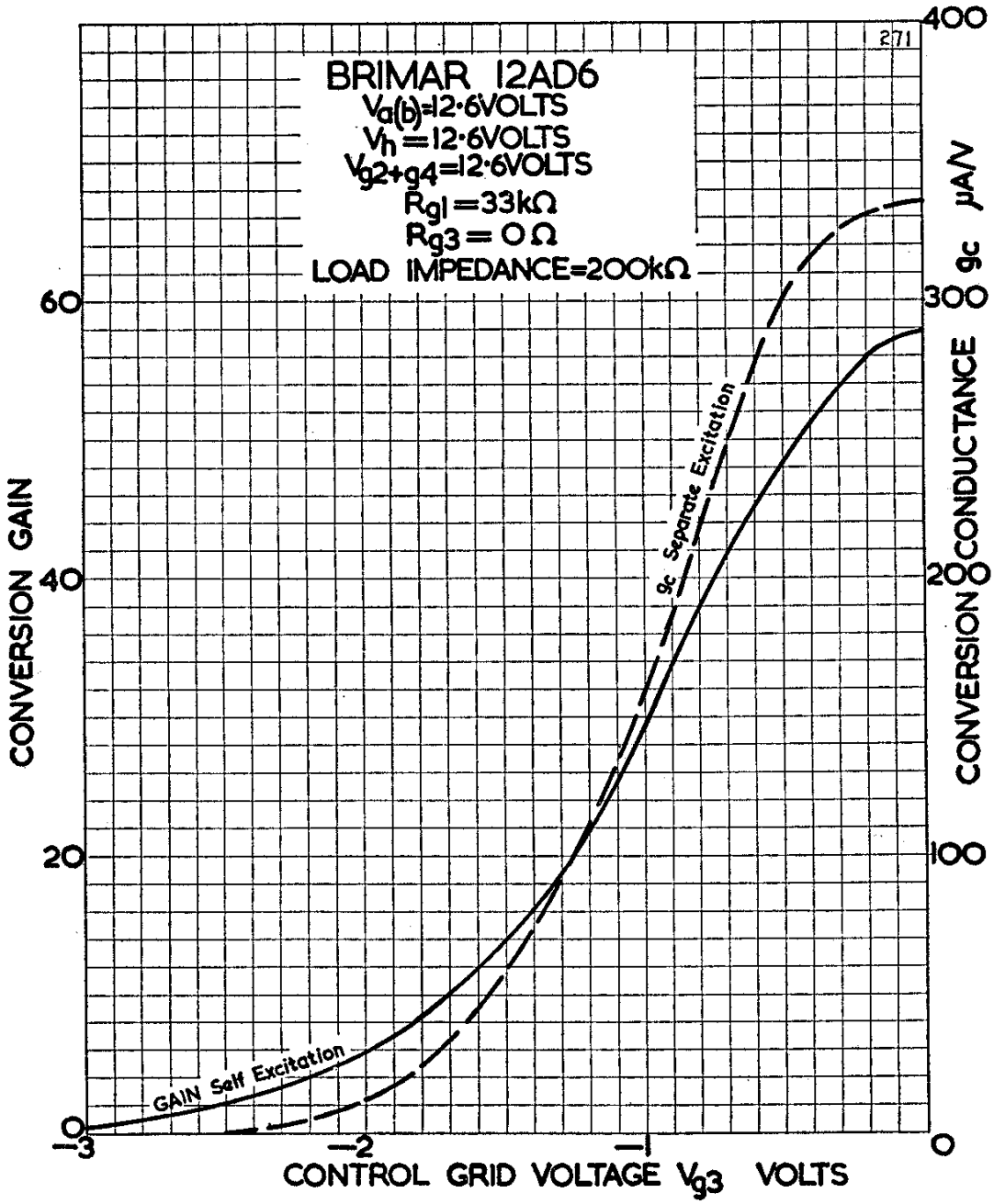
OPERATING CHARACTERISTICS AS A SELF EXCITED MIXER

Anode Voltage	12.6 volts
Screen Grid (g_2, g_4) Voltage	12.6 volts
Control Grid (g_3) Voltage	0 volts
Control Grid Resistance	2.2 megohms
Oscillator Grid (g_1) Resistance	33 kilohms
Oscillatory Voltage on Oscillator Grid	1.6 volts r.m.s.
Oscillator Grid Current	50 μA
Anode Current	450 μA
Screen Grid Current	1.5 mA
Cathode Current	2 mA
Conversion Conductance	260 μA/V
Control Grid Voltage for g_c = 5μA/V	—2.2 volts approx.
Control Grid Voltage for g_c = 20μA/V	—1.8 volts approx.

INTER-ELECTRODE CAPACITANCES

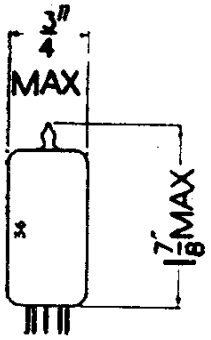
	With external screen	Without external screen
Control Grid to Anode (g_3 to a)	0.25	0.30 pF max.
Control Grid to Oscillator Grid (g_3 to g_1)	0.15	0.15 pF max.
R.F. Input (g_3 to all)	8.0	8.0 pF
Oscillator Input (g_1 to all)	5.5	5.5 pF
Mixer Output (a to all)	13.0	8.0 pF
Oscillator Grid to Cathode (g_1 to $k+g_5$)	3.0	3.0 pF
Oscillator Output (k to all except g_1)	20.0	15.0 pF
Oscillator Grid to Anode (g_1 to a)	0.05	0.1 pF

12AD6

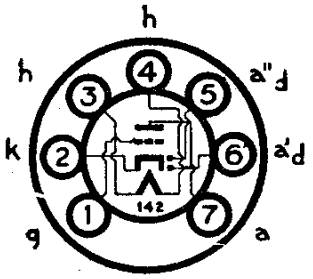

BRIMAR 12AD6
Va(b)=12·6VOLTS
Vh=12·6VOLTS
Vg2+g4=12·6VOLTS
Rg1=33kΩ
Rg3=0Ω
LOAD IMPEDANCE=200kΩ
271
CONVERSION GAIN
CONVERSION CONDUCTANCE gc μA/V
GAIN Self Excitation
gc Separate Excitation
CONTROL GRID VOLTAGE Vg3 VOLTS
60
40
20
0
400
300
200
100
0
−3
−2
−1

12AE6

Current Equipment Type



TYPE 12AE6
MINIATURE
DOUBLE
DIODE TRIODE



B7G Base

The BRIMAR 12AE6 is a double diode triode for use in detector, A.V.C. and A.F. amplifier circuits of car radio receivers and is intended to operate directly from the 12-volt battery without the use of a vibrator H.T. system. It is designed to operate over the range of voltage variations normally encountered with car batteries.

RATINGS

Heater Voltage	12.6 volts
Heater Current	0.15 amp.
Anode Voltage	30 volts max.
Grid Circuit Resistance	10 MΩ max.
Cathode Current	20 mA max.
Diode Current (Average)	1 mA max.
Heater-Cathode Voltage	±30 volts max.

OPERATING CHARACTERISTICS

Anode Voltage	12.6 volts
Grid Voltage	0 volts
Anode Current	750 μA
Mutual Conductance	1 mA/V
Anode Impedance	15 kilohms
Amplification Factor	15

OPERATION AS AN R.C. COUPLED AMPLIFIER

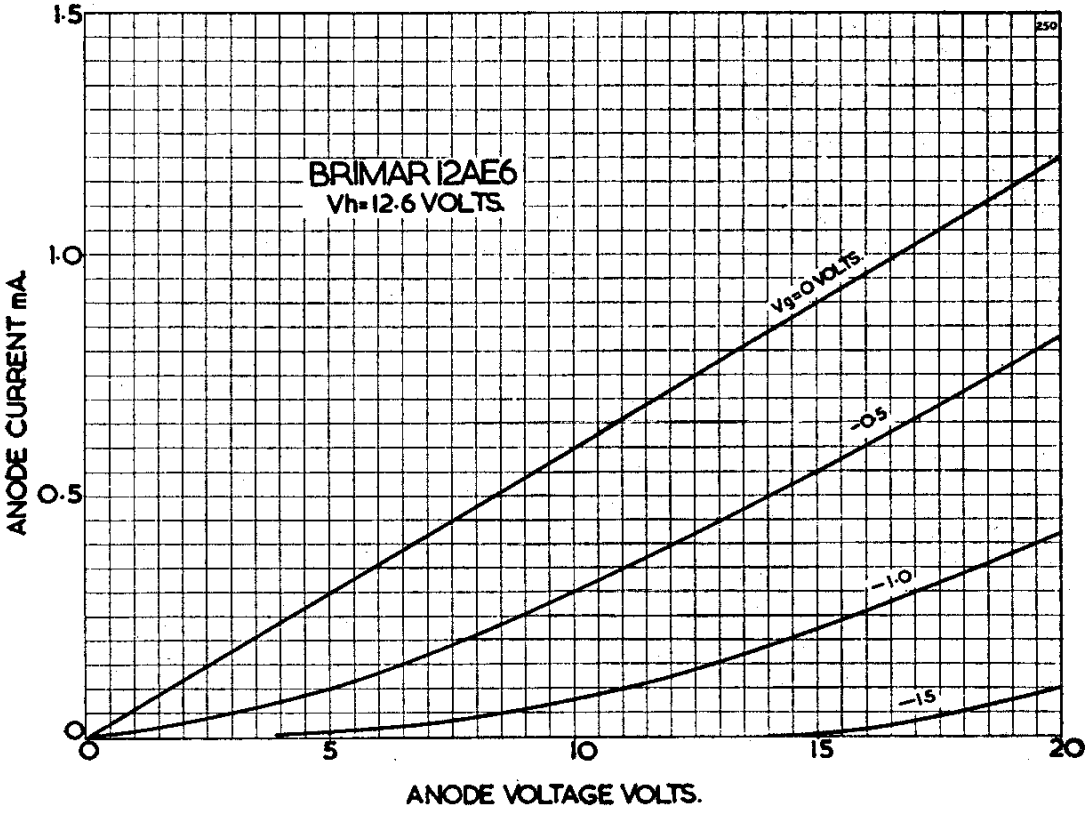
Anode Supply Voltage	14.4 volts
Grid Voltage	0 volts
Anode Load Resistor	470 KΩ
Grid Resistor	2.2 MΩ
Input Grid Coupling Capacitor	.01 μF
Grid Resistor of following Stage	2.2 MΩ
Signal Source Impedance	1,000 Ω max.
Voltage Gain	10

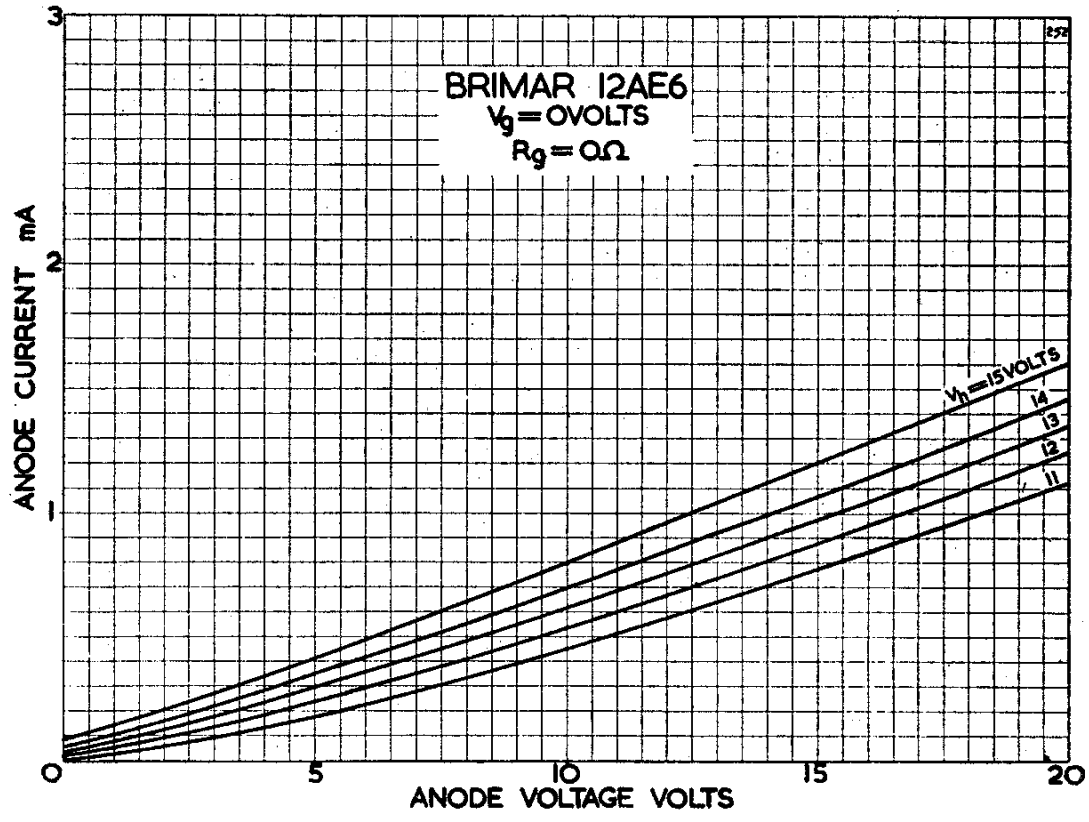
INTER-ELECTRODE CAPACITANCES *

Input	1.8 pF
Output	1.1 pF
Anode to Grid	2.0 pF
Diode Anode to Diode Anode	0.9 pF

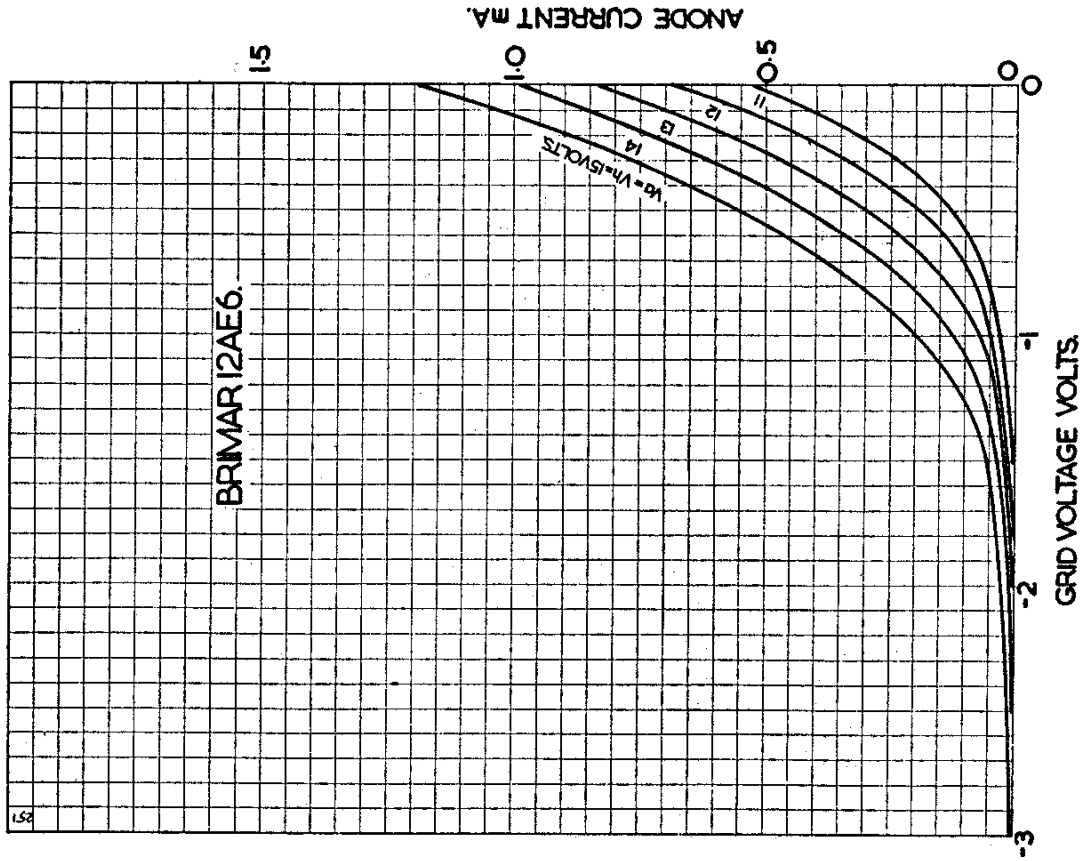
** Measured without external screen.*

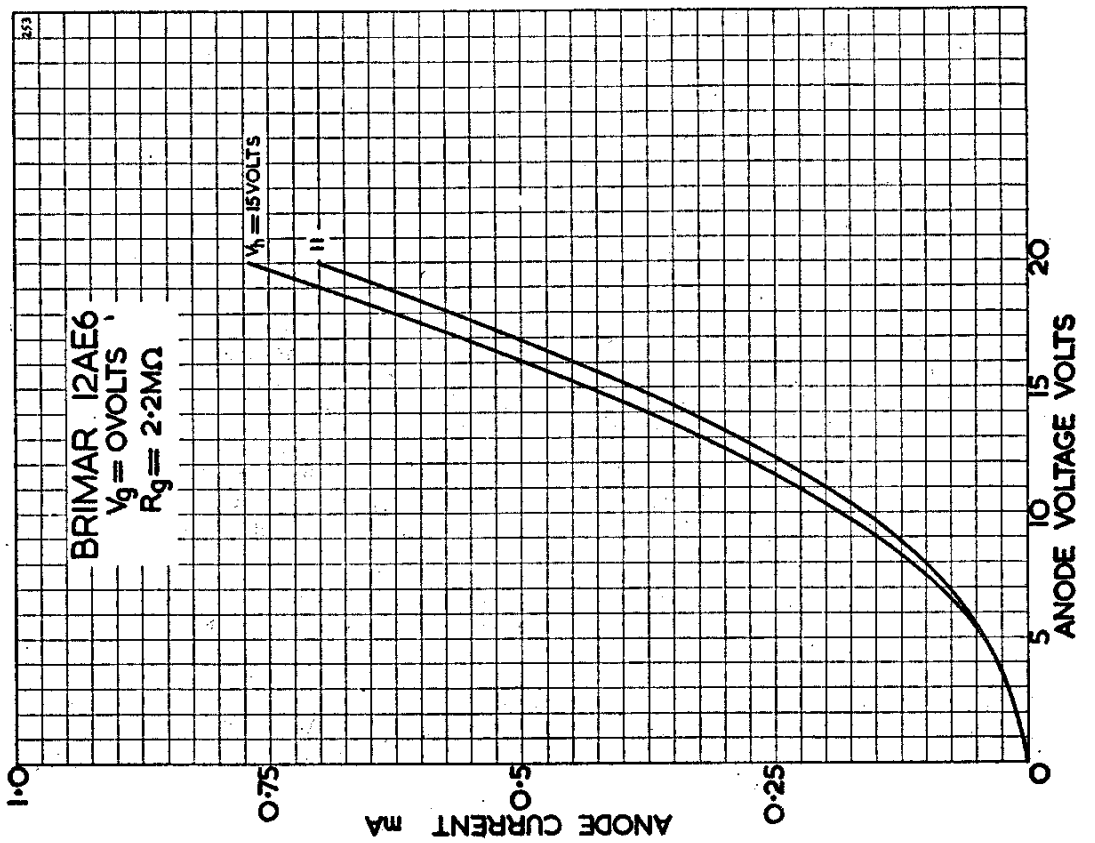
12AE6


BRIMAR 12AE6
Vh=12·6 VOLTS.
ANODE CURRENT mA.
1·5
1·0
0·5
0
0
5
10
15
20
ANODE VOLTAGE VOLTS.
Vg=0 VOLTS.
-0·5
-1·0
-1·5

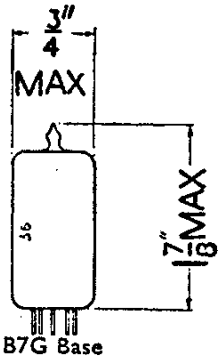

BRIMAR 12AE6
Vg=0VOLTS
Rg=0Ω
ANODE CURRENT mA
3
2
1
0
5
10
15
20
ANODE VOLTAGE VOLTS
Vh=15VOLTS
I4
I3
I2
I1

12AE6


ANODE CURRENT mA.
1·5
1·0
0·5
0
I1
I2
I3
I4
Ia = Vh = 15VOLTS
BRIMAR 12AE6.
GRID VOLTAGE VOLTS.
0
-1
-2
-3

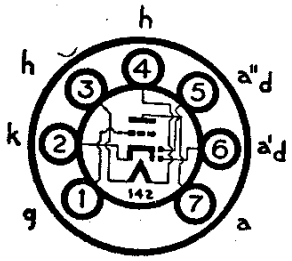

BRIMAR 12AE6
Vg = 0VOLTS
Rg = 2·2MΩ
Vh = 15VOLTS
I1
ANODE CURRENT mA
1·0
0·75
0·5
0·25
0
5
10
15
20
ANODE VOLTAGE VOLTS

12AT6
12AH8



Current Equipment Type

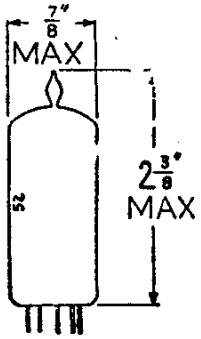
TYPE 12AT6
MINIATURE
DOUBLE DIODE
TRIODE



RATINGS

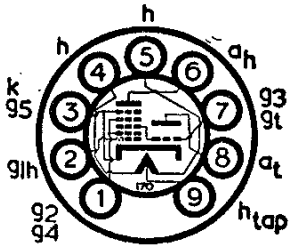
Heater Voltage .. ... 12.6 volts Heater Current ... ... 0.15 amp.

For further information and characteristic curves refer to type 6AT6.



Current Equipment Type

TYPE 12AH8
MINIATURE
TRIODE-HEPTODE
FREQUENCY CHANGER



The Brimar 12AH8 is a triode-heptode frequency changer on the Noval (B9A) base, featuring high conversion conductance, conversion impedance and oscillator mutual conductance. The centre tapped heater permits operation from either 6.3 or 12.6 volts, enabling the same valve to be used in both A.C. and A.C./D.C. equipment.

RATINGS

Heater Voltage ...	6.3 / 0.3 or 12.6 volts / 0.15 amp.
Heater Current ...	
Heptode Anode Voltage	300 volts max.
Heptode Screen (g_2, g_4) Voltage	125 volts max.
Triode Anode Voltage ...	150 volts max.
Total Cathode Current	17.5 mA max.

OPERATING CHARACTERISTICS

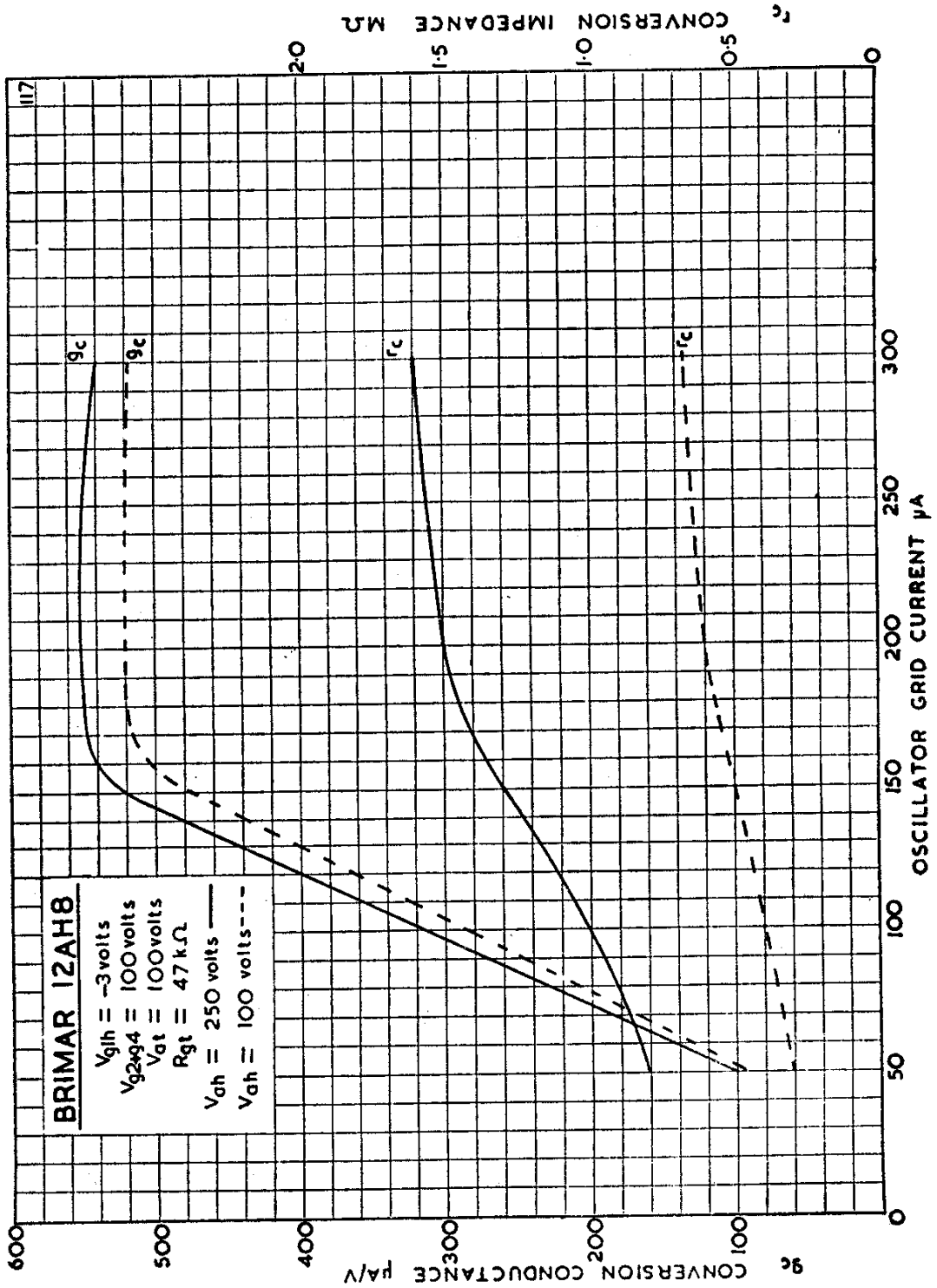
Heptode Anode Voltage	100	250 volts
Heptode Anode Current	2.5	2.6 mA
Heptode Screen Voltage	100	100 volts
Heptode Screen Current	4.5	4.4 mA
Signal Grid (g_1) Voltage	—3	—3 volts
Cathode Bias Resistor ...	220	220 ohms
Heptode Anode Impedance	0.6	1.5 meg.
Triode Anode Supply Voltage	100	250 volts
Triode Anode Resistor	0	27,000 ohms
Triode Anode Voltage ...	100	100 volts
Triode Anode Current	5.7	5.7 mA
Triode Grid Current ...	0.2	0.2 mA
Triode Grid Resistor ...	47	47 kilohms
Conversion Conductance	0.52	0.55 mA/V.
Conversion Conductance for Vg_1—22 volts ...	0.005	0.005 mA/V.
Equivalent Noise Resistance ...	100,000	100,000 ohms approx.
*Triode Mutual Conductance	3.5	3.5 mA/V.
*Triode Amplication Factor ...	17	17

* Taken at V_{at} = 100 v. V_{gt} = 0 v.

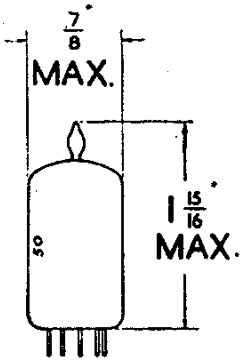
INTER-ELECTRODE CAPACITANCES
(with external close fitting shield)

R.F. Input (g_1h-all) ...	5.0 pF
I.F. Output (a_h-all) ...	8.0 pF
Triode Input ...	7.0 pF
Triode Output ...	2.5 pF
Heptode Grid to Heptode Anode (g_1h-a_h) ...	0.025 pF
Triode Grid to Triode Anode (g_t-a_t) ...	1.2 pF

12AH8

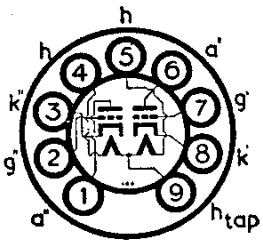

BRIMAR 12AH8
Vglh = −3 volts
Vg2+g4 = 100 volts
Vat = 100 volts
Rgt = 47 kΩ
Vah = 250 volts ——
Vah = 100 volts - - -
gc
rc
CONVERSION CONDUCTANCE μA/V
CONVERSION IMPEDANCE MΩ
OSCILLATOR GRID CURRENT μA
1117

12AT7



Current Equipment Type

TYPE 12AT7
MINIATURE
HIGH SLOPE
DOUBLE TRIODE



B9A (Noval) Base

The separate cathode connections and tapped heater features enable the 12AT7 to be used in a variety of applications. As a frequency changer it will operate at frequencies up to 500 Mc/s.

RATINGS

Heater Voltage	6.3	or 12.6 volts
Heater Current	0.3	or 0.15 amp.
Anode Voltage	300 volts max.	
Anode Dissipation (each section)	2.5 watts max.	
D.C. Cathode Current (each section)	20 mA. max.	
Anode Voltage (zero Anode Current)	550 volts max.	

OPERATING CHARACTERISTICS

	(Each Section, Class A)			
Anode Voltage	100	180	250	volts
Anode Current	3.7	11.0	10.0	mA
Grid Voltage	—1	—1	—2	volts
Anode Impedance	13,500	9,400	10,000	ohms
Mutual Conductance	4.0	6.6	5.5	mA/V
Amplification Factor	54	62	55	
Grid Voltage (for Anode Current cut-off)	—6	—8	—12	volts

OPERATION AS FREQUENCY CHANGER

OSCILLATOR SECTION

Anode Supply Voltage	250 volts
Anode Decoupling Resistor	1,000 ohms
Grid Resistor	10,000 ohms

MIXER SECTION

Anode Supply Voltage	250 volts
Anode Decoupling Resistor	1,000 ohms
Cathode Bias Resistor	680 ohms
* Conversion Conductance	2.5 mA/V
† Heterodyne Voltage	(See note)

** Exact value depends on circuit constants and input impedance considerations.*

† Heterodyne voltage should be just less than that required to cause grid current in the mixer section.

INTER-ELECTRODE CAPACITANCES *

Grid to Grid	0.005 pF max.
Anode to Anode	0.4 pF max.

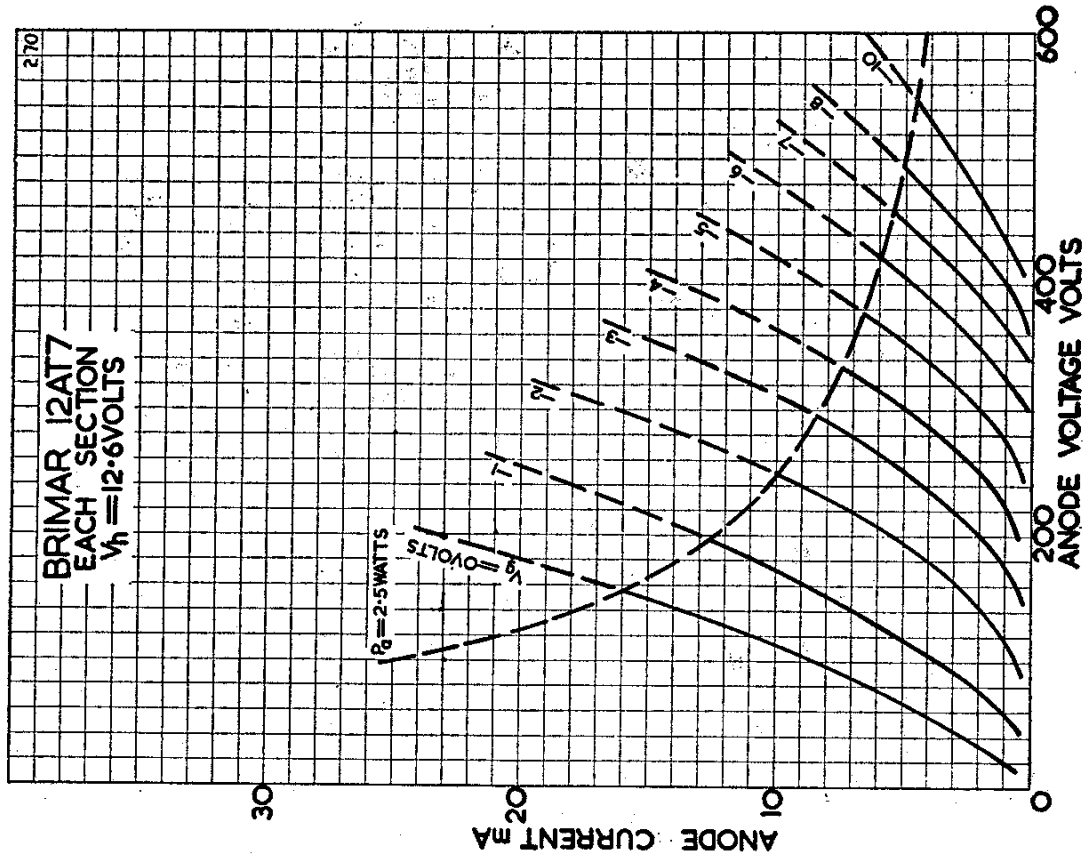
EACH SECTION

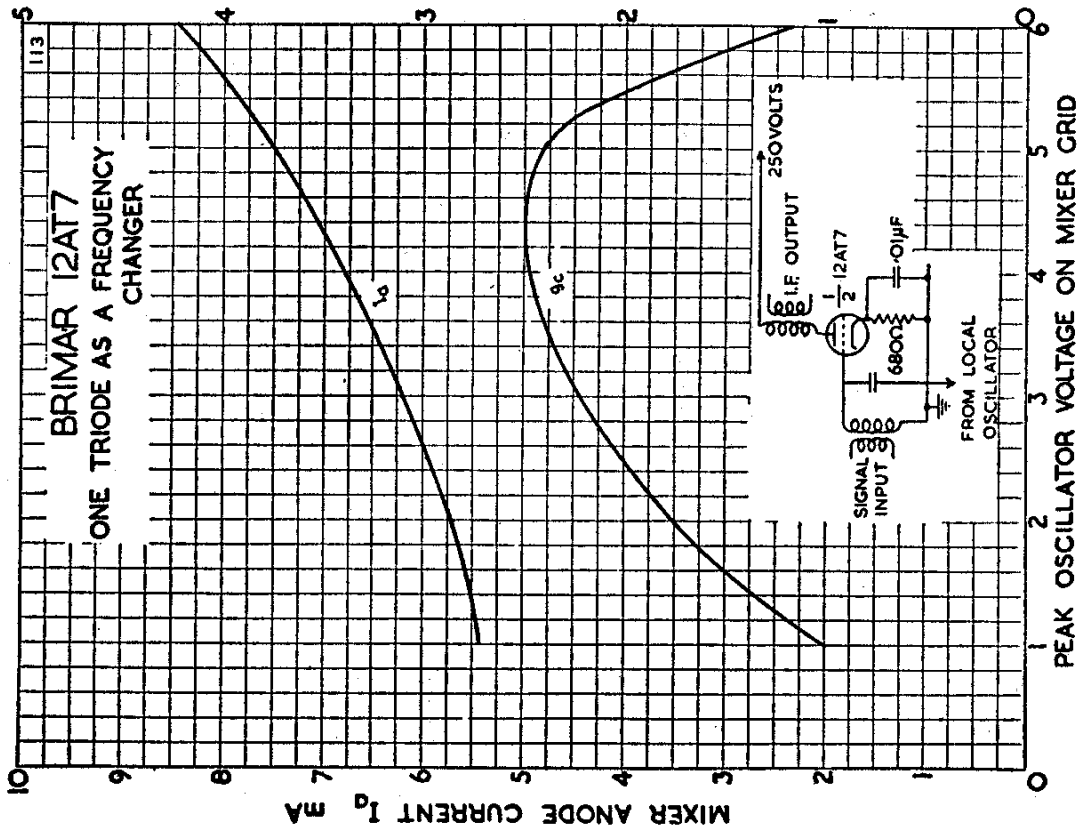
Input	2.5 pF
Output	0.4 pF
Grid to Anode	1.5 pF
Cathode to Heater	2.5 pF

**Measured with no external shield.*

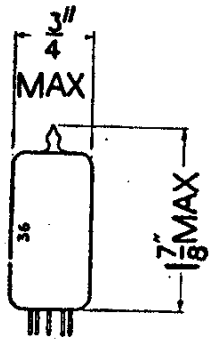
Type 12AT7 is a commercial equivalent of the CV455.

12AT7


BRIMAR 12AT7
EACH SECTION
V_h=12·6VOLTS
P_a=2·5WATTS
V_g=0VOLTS
ANODE CURRENT mA
ANODE VOLTAGE VOLTS


BRIMAR 12AT7
ONE TRIODE AS A FREQUENCY CHANGER
CONVERSION CONDUCTANCE g_c mA/V
MIXER ANODE CURRENT I_a mA
PEAK OSCILLATOR VOLTAGE ON MIXER GRID
I.F. OUTPUT
250VOLTS
½ 12AT7
·01μF
6800Ω
SIGNAL INPUT
FROM LOCAL OSCILLATOR

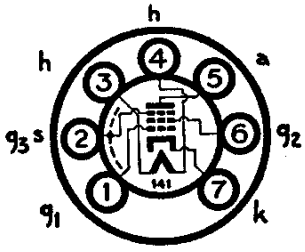
12AU6
12AU7



B7G Base

Current Equipment Type

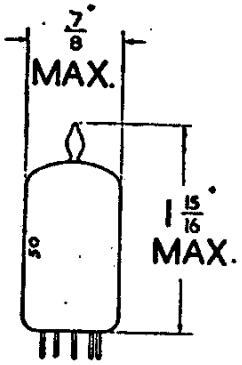
TYPE 12AU6
MINIATURE
HIGH SLOPE
R.F. PENTODE



RATINGS

Heater Voltage	12.6 volts
Heater Current	0.15 amp.

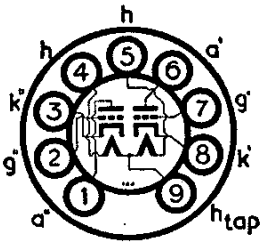
For further information and characteristics refer to type 6AU6.



B9A (Noval) Base

Current Equipment Type

TYPE 12AU7
MINIATURE
DOUBLE TRIODE
(LOW-MU)



RATINGS

Heater Voltage	6.3	or	12.6 volts
Heater Current...	0.3	or	0.15 amp.
Anode Voltage	300		volts max.
Anode Dissipation (per section)	2.75		watts max.
Cathode Current (per section)	20		mA max.
Anode Voltage (zero Anode Current) ...	550		volts max.

OPERATING CHARACTERISTICS

Anode Voltage	100	250	volts
Anode Current	11.8	10.5	mA
Grid Voltage	0	—8.5	volts
Anode Impedance	6,250	7,700	ohms
Mutual Conductance	3.1	2.2	mA/V
Amplification Factor	19	17	

OPERATION AS RESISTANCE COUPLED AMPLIFIER

Anode Supply Voltage	100	250	volts
Anode Load Resistor	0.1	0.1	meg.
Cathode Bias Resistor	4,000	3,000	ohms
Peak Output	17	50	volts
Stage Gain	11	12	

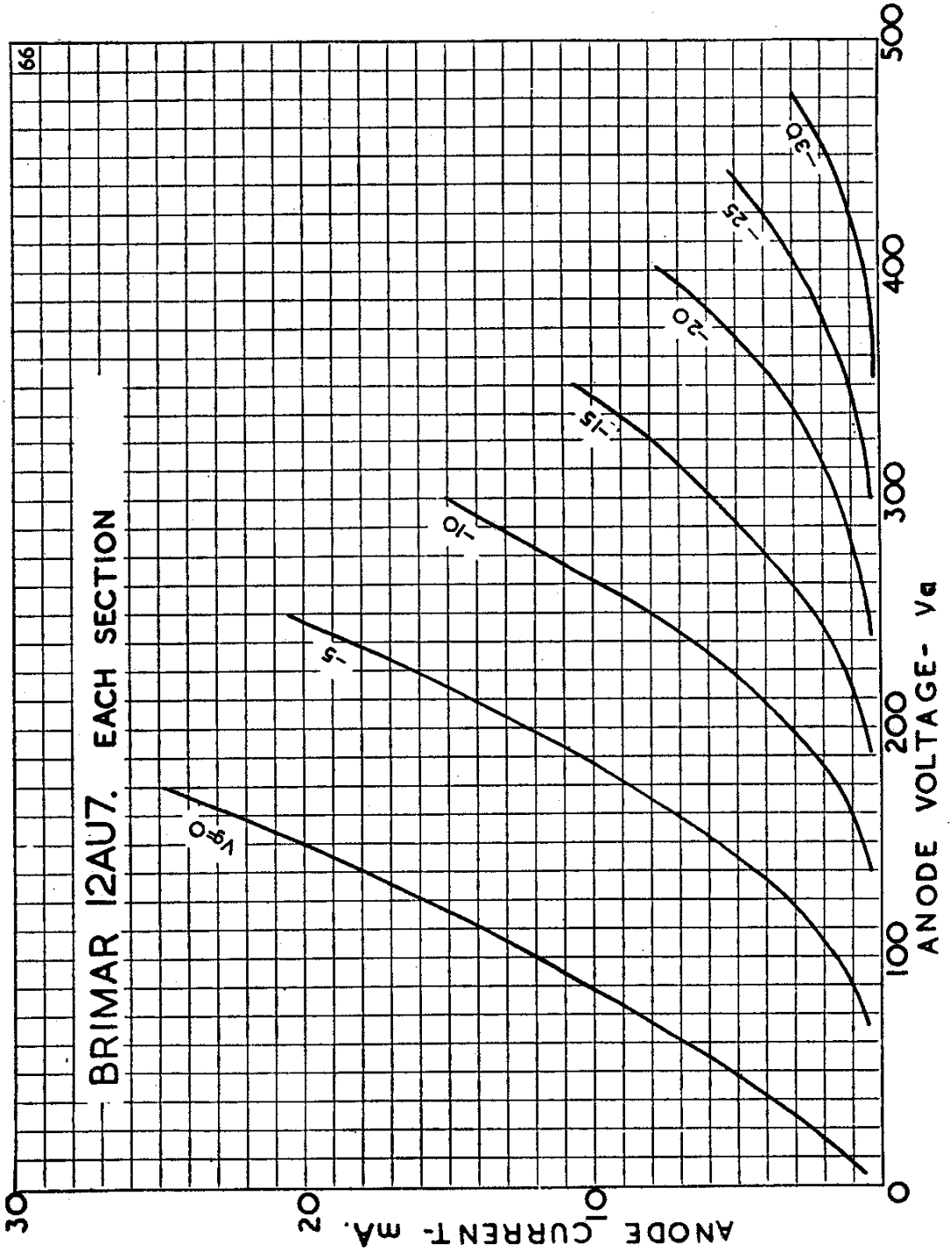
INTER-ELECTRODE CAPACITANCES *

	Section 1	Section 2	
Input	1.6	1.6	pF
Output	0.5	0.35	pF
Grid to Anode	1.5	1.5	pF

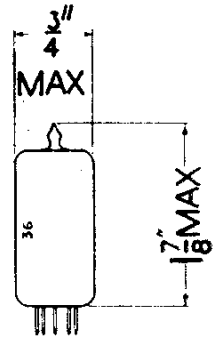
** With no external shield.*

Type 12AU7 is a commercial equivalent of the CV491.

12AU7


66
BRIMAR 12AU7. EACH SECTION
Vg=0
-5
-10
-15
-20
-25
-30
ANODE CURRENT- mA.
30
20
0
ANODE VOLTAGE- Va
0
100
200
300
400
500

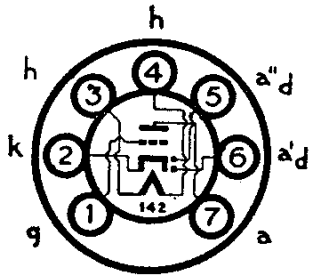
12AV6
12AX7



B7G Base

Replacement Type

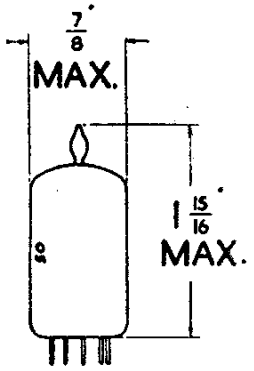
TYPE 12AV6
MINIATURE
DOUBLE DIODE
TRIODE



RATINGS

Heater Voltage ... ... 12.6 volts Heater Current ... ... 0.15 amp.

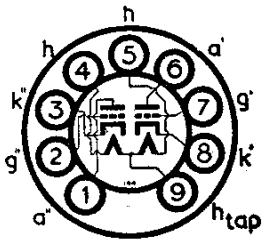
For further information, see type 6AV6.



B9A (Noval) Base

Current Equipment Type

TYPE 12AX7
MINIATURE
DOUBLE TRIODE
(HIGH-MU)



RATINGS

Heater Voltage ...	6.3 } or {	12.6	volts
Heater Current ...	0.3 }	0.15	amp.
Anode Voltage ...		300	volts max.
Anode Dissipation ...		1.0	watt max.
Anode Voltage (Zero Anode Current)		550	volts max.

OPERATING CHARACTERISTICS (Each Section)

Anode Voltage ...	100	250	volts
Anode Current ...	0.5	1.2	mA
Grid Voltage ...	—1	—2	volts
Anode Impedance ...	80,000	62,500	ohms
Mutual Conductance ...	1.25	1.6	mA/V
Amplification Factor ...	100	100	

OPERATION AS RESISTANCE COUPLED AMPLIFIER

Anode Supply Voltage ...	100	250	volts
Anode Load Resistor ...	0.25	0.25	meg.
Cathode Bias Resistor ...	6,500	3,000	ohms
Peak Output ...	10	50	volts
Stage gain ...	45	60	

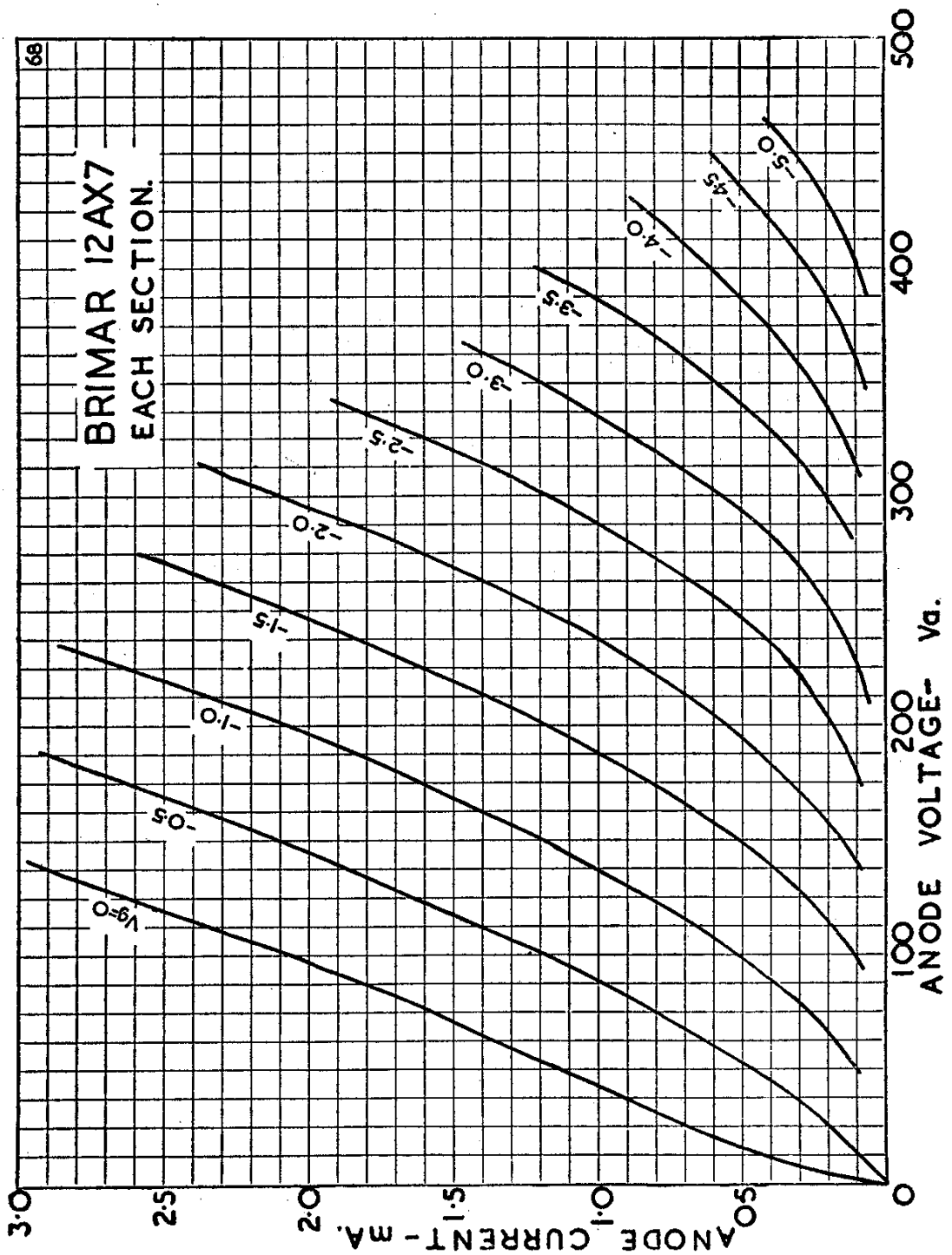
INTER-ELECTRODE CAPACITANCES *

	Section 1	Section 2	
Input ...	1.6	1.6	pF
Output ...	0.46	0.34	pF
Grid to Anode ...	1.7	1.7	pF

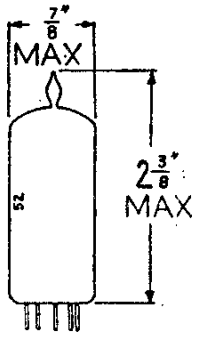
* *With no external shield.*

Type 12AX7 is a commercial equivalent of the CV492.

12AX7

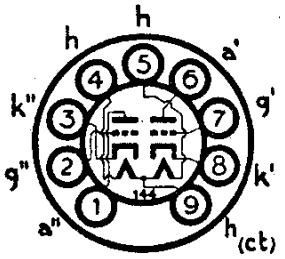

68
BRIMAR 12AX7
EACH SECTION.
-5.0
-4.5
-4.0
-3.5
-3.0
-2.5
-2.0
-1.5
-1.0
-0.5
Vg=0
ANODE CURRENT - mA.
3·0
2·5
2·0
1·5
1·0
0·5
0
100
200
300
400
500
ANODE VOLTAGE - Va.

Current Equipment Type



B9A (Noval) Base

TYPE 12BH7
MINIATURE
DOUBLE TRIODE
(LOW-MU)



The BRIMAR type 12BH7 is a double triode with two independent low impedance units. It may be used in a variety of pulse, time-base and A.F. applications.

RATINGS

Heater Voltage	6.3	or	12.6 volts
Heater Current	0.6	or	0.3 amp.
Direct Anode Voltage as Frame Scan Output Valve			500 volts max.
Direct Anode Voltage as Class A Amplifier			300 volts max.
Anode Dissipation, each section			3.5 watts max.
Cathode Current, each section			20 mA max.
*Peak Positive Pulse Anode Voltage			1,500 volts max.
*Peak Negative Pulse Grid Voltage			220 volts max.
Peak Cathode Current, each section			70 mA max.

OPERATING CHARACTERISTICS

(As Class A Amplifier, each section)

Anode Voltage	85	250	volts
Anode Current	20	11.5	mA
Grid Voltage	0	—10.5	volts
Mutual Conductance	6.2	3.1	mA/V
Amplification Factor	21	17	
Anode Impedance	3,400	5,500	ohms
Grid Voltage for Cut-off	—8	—20	volts

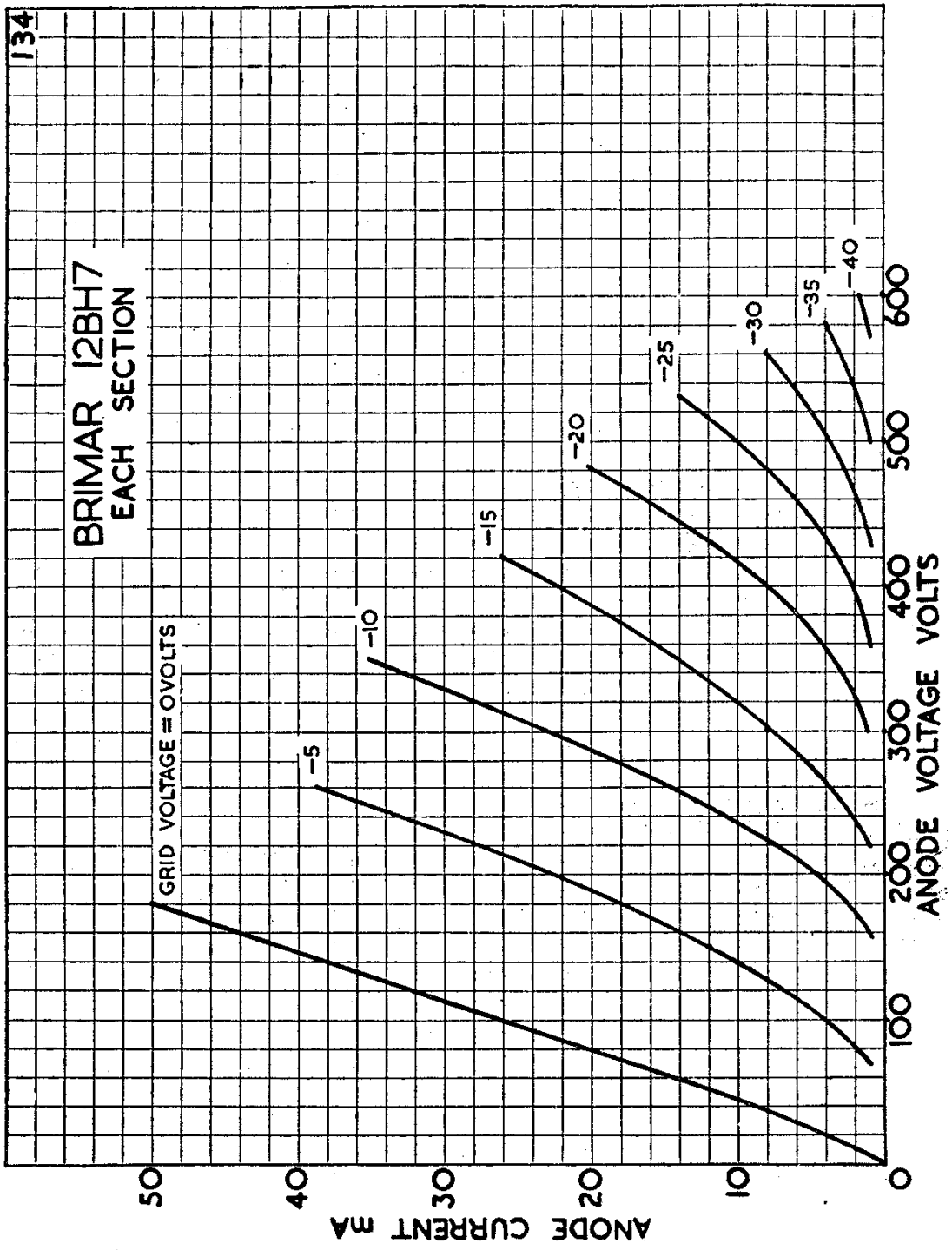
INTER-ELECTRODE CAPACITANCES †

Anode 1 to Anode 2 ($C_{a', a''}$)	0.9 pF
Each Section :	
Input (C_{in})	3.0 pF
Output (C_{out})	0.8 pF
Grid to Anode ($C_{g, a}$)	2.4 pF

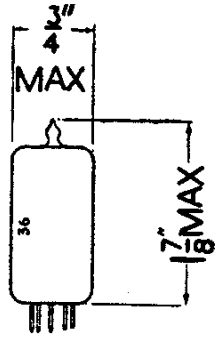
** The duty cycle must not exceed 15 per cent. of the scanning cycle, and its duration must not exceed 3 milli-seconds. Ratings are absolute values.*

† No external shield.

12BH7

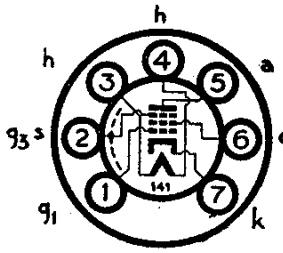

134
BRIMAR 12BH7
EACH SECTION
GRID VOLTAGE = 0 VOLTS
-5
-10
-15
-20
-25
-30
-35
-40
ANODE CURRENT mA
0
10
20
30
40
50
ANODE VOLTAGE VOLTS
100
200
300
400
500
600

12BA6
12BE6
12C8GT
12J7GT



Current Equipment Type

TYPE 12BA6
MINIATURE
HIGH SLOPE
VARI-MU
R.F. PENTODE

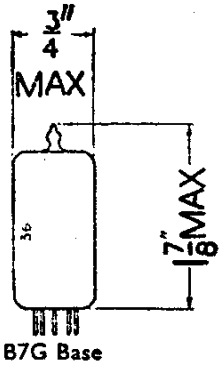


RATINGS

Heater Voltage ... ... 12.6 volts Heater Current ... ... 0.15 amp.

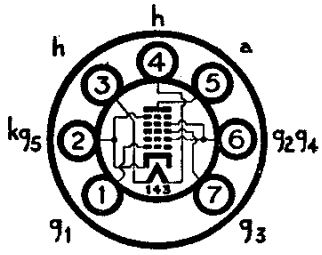
Type 12BA6 is a commercial equivalent to CV1928.

For further information and characteristic curves refer to type 6BA6.



Current Equipment Type

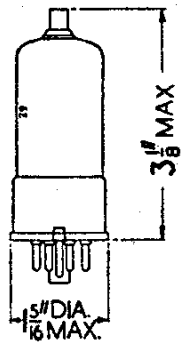
TYPE 12BE6
MINIATURE
HEPTODE
FREQUENCY
CHANGER



RATINGS

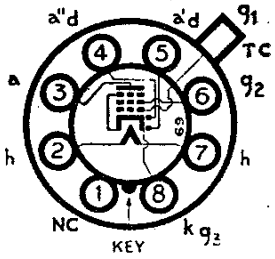
Heater Voltage ... ... 12.6 volts Heater Current ... ... 0.15 amp.

For further information and characteristic curves refer to type 6BE6.



Obsolescent Type

TYPE 12C8GT
(OCTAL BASE)
DOUBLE DIODE
AMPLIFIER PENTODE

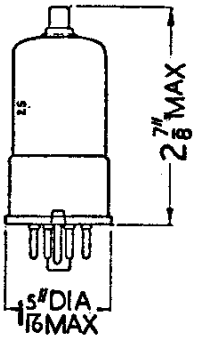


Note.—Pin 1 connected to metal shell.

RATINGS

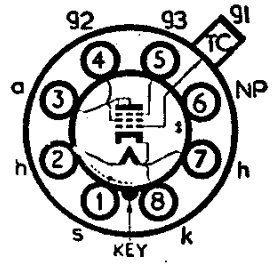
Heater Voltage ... ... 12.6 volts Heater Current ... ... 0.15 amp.

For further information and characteristics refer to type 6B8GT.



Replacement Type

TYPE 12J7GT
(OCTAL BASE)
R.F. PENTODE



Note.—Pin 1 connected to metal shell.

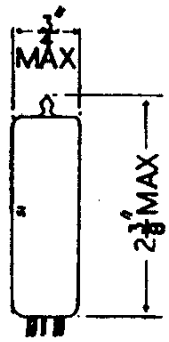
RATINGS

Heater Voltage ... ... 12.6 volts Heater Current ... ... 0.15 amp.

For further information refer to type 6J7GT.

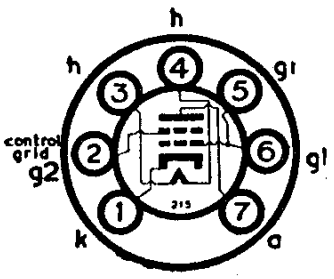
12K5

Current Equipment Type



B7G Base

TYPE 12K5
MINIATURE
OUTPUT
TETRODE



The BRIMAR 12K5 is a miniature tetrode with a space charge grid, g_1, the control grid being g_2. The valve is intended for use as a driver stage in A.F. applications in car radio receivers and will operate directly from the 12-volt battery without the use of vibrator H.T. system. It is designed to operate over the range of voltage variation normally encountered with car batteries.

RATINGS

Heater Voltage	12.6 volts
Heater Current	0.45 amp.
Anode Voltage	30 volts max.
Control Grid (g_2) Voltage	—20 volts max.
Control Grid Circuit Resistance	2.2 megohms max.
Space Charge Grid (g_1) Voltage	16 volts abs. max.
Space Charge Grid Supply Voltage	30 volts max.
Heater-Cathode Voltage	±30 volts max.

OPERATING CHARACTERISTICS

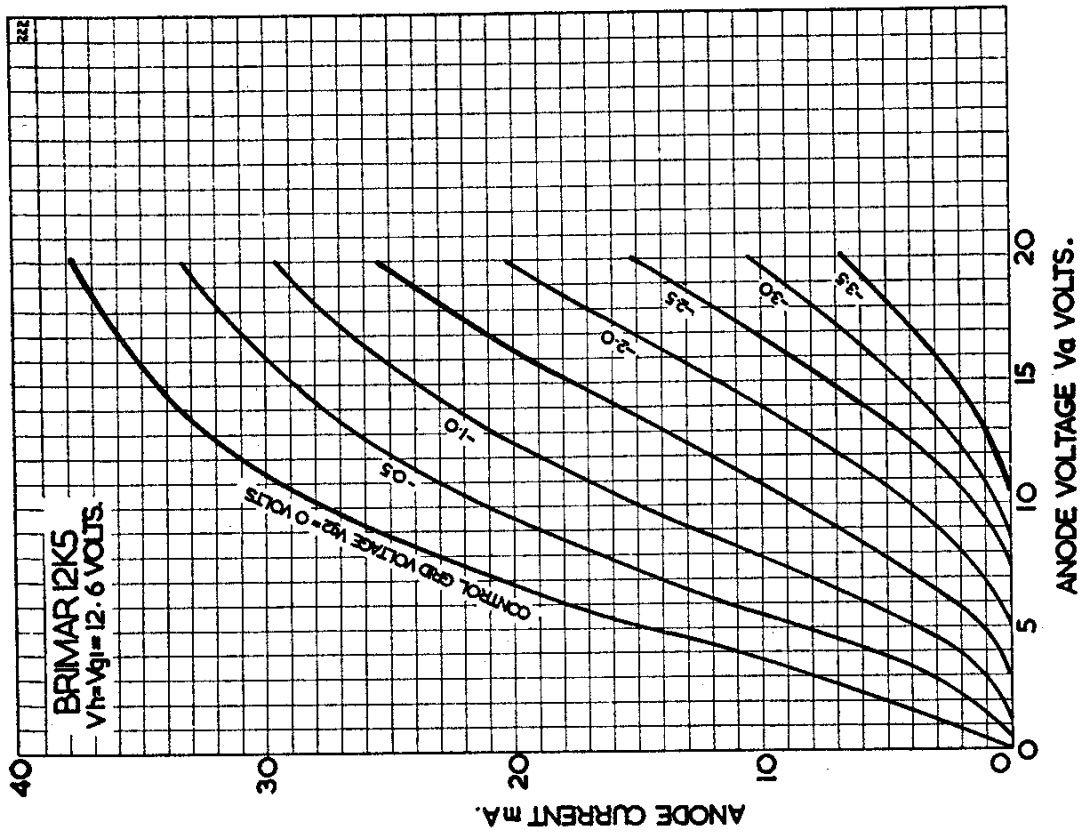
Anode Voltage	12.6 volts
Space Charge Grid Voltage	12.6 volts
Control Grid Voltage	—2 volts
Anode Current	8 mA
Space Charge Grid Current	85 mA
Mutual Conductance (g_2 to a)	7 mA/V
Anode Impedance	800 ohms
Amplification Factor	5.6

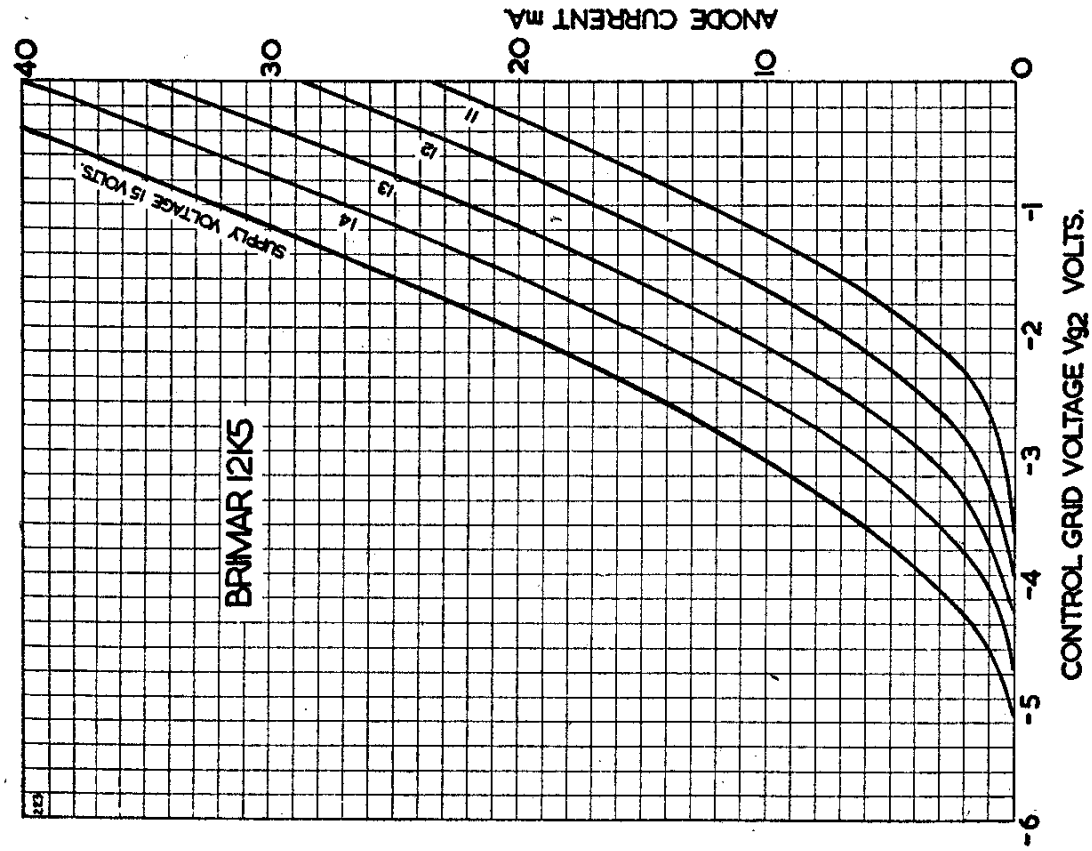
TYPICAL OPERATION AS A DRIVER STAGE

Anode Voltage	12.6 volts
Space Charge Grid Voltage	12.6 volts
Control Grid Resistor *	2.2 megohms
Input Coupling Capacitor	0.1 μF
Signal Source Impedance	100 KΩ
Optimum Load	800 ohms
Anode Current, no signal	35 mA
Anode Current, maximum signal	8 mA
Power Output	35 mW
Distortion	10 per cent.

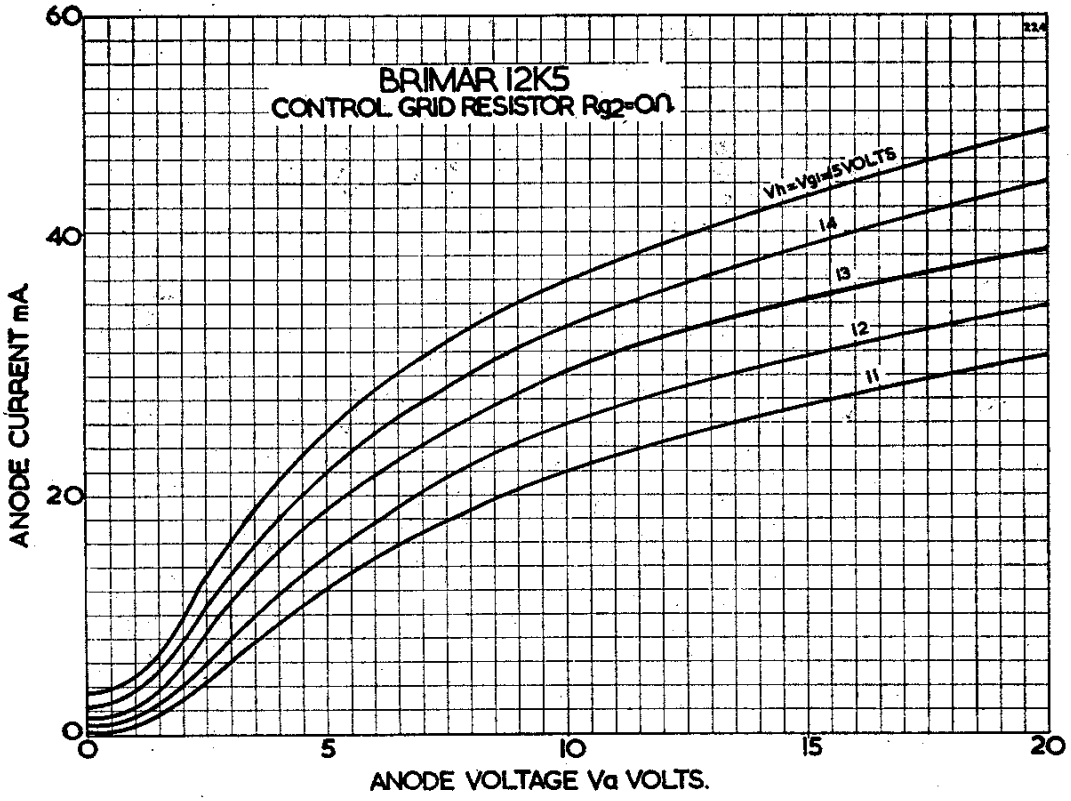
* Bias is provided by grid current rectification.

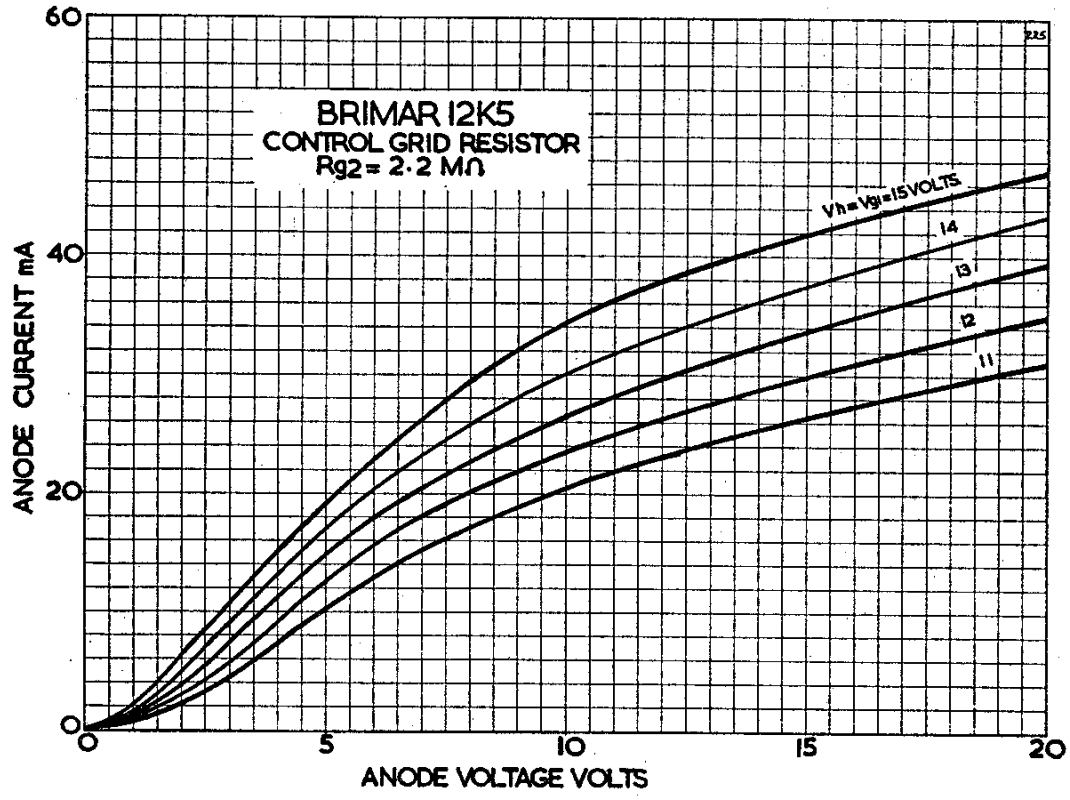
12K5


BRIMAR 12K5
Vh=Vg1=12·6 VOLTS.
CONTROL GRID VOLTAGE Vg2=0 VOLTS
-.5
-1.0
-2.0
-2.5
-3.0
-3.5
ANODE CURRENT mA.
40
30
20
10
0
0
5
10
15
20
ANODE VOLTAGE Va VOLTS.


ANODE CURRENT mA
40
30
20
10
0
BRIMAR 12K5
SUPPLY VOLTAGE 15 VOLTS.
11
12
13
14
-1
-2
-3
-4
-5
-6
CONTROL GRID VOLTAGE Vg2 VOLTS.

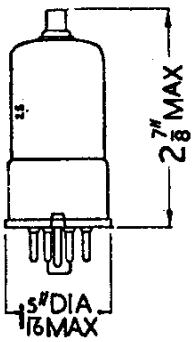
12K5


BRIMAR 12K5
CONTROL GRID RESISTOR Rg2=0Ω
Vh=Vg1=15VOLTS
14
13
12
11
ANODE CURRENT mA
60
40
20
0
0
5
10
15
20
ANODE VOLTAGE Va VOLTS.

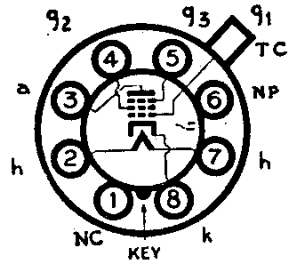

BRIMAR 12K5
CONTROL GRID RESISTOR
Rg2 = 2·2 MΩ
Vh=Vg1=15VOLTS
14
13
12
11
ANODE CURRENT mA
60
40
20
0
0
5
10
15
20
ANODE VOLTAGE VOLTS

12K7GT
12K8GT
12Q7GT

Replacement Type



TYPE 12K7GT
(OCTAL BASE)
VARI-MU
R.F. PENTODE



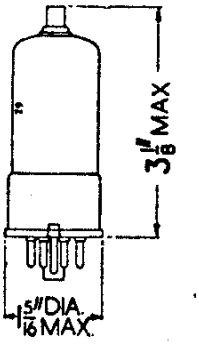
Note.—Pin 1 connected to metal shell.

RATINGS

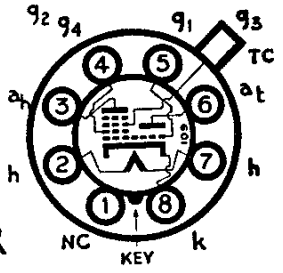
Heater Voltage ... ... 12.6 volts **Heater Current** ... ... 0.15 amp

For further information refer to type 6K7GT.

Replacement Type



TYPE 12K8GT
(OCTAL BASE)
TRIODE-HEXODE
FREQUENCY CHANGER



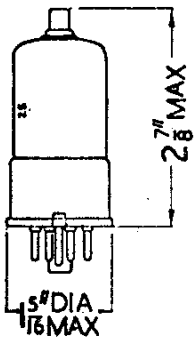
Note.—Pin 1 connected to metal shell.

RATINGS

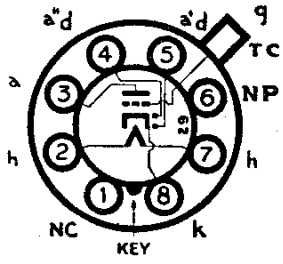
Heater Voltage ... ... 12.6 volts **Heater Current** ... ... 0.15 amp.

For further information refer to type 6K8GT.

Replacement Type



TYPE 12Q7GT
(OCTAL BASE)
DOUBLE DIODE TRIODE



Note.—Pin 1 connected to metal shell.

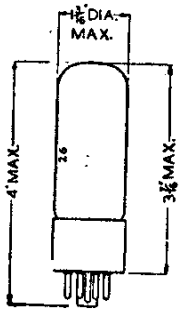
RATINGS

Heater Voltage ... ... 12.6 volts **Heater Current** ... ... 0.15 amp.

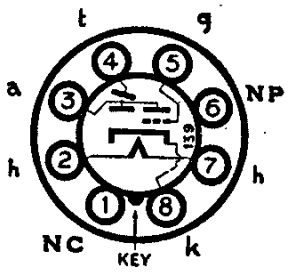
For further information and characteristics refer to type 6AT6.

12U5G
13D1
13D2

Replacement Type



TYPE 12U5G
(OCTAL BASE)
"MAGIC EYE"
TUNING INDICATOR

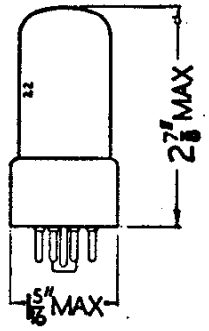


RATINGS

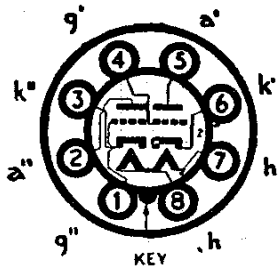
Heater Voltage ... ... 12.6 volts **Heater Current** ... ... 0.15 amp.

For further information refer to type 6U5G.

Obsolescent Type



TYPE 13D1
(OCTAL BASE)
LOW-MU DOUBLE
TRIODE

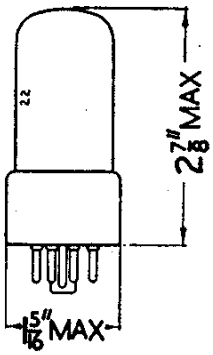


RATINGS

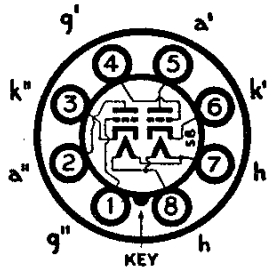
Heater Voltage ... ... 25 volts Heater Current ... ... 0.15 amp.

For further information and characteristics refer to type 6SN7GT.

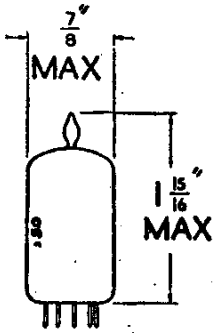
Obsolescent Type



TYPE 13D2
(OCTAL BASE)
LOW-MU DOUBLE
TRIODE

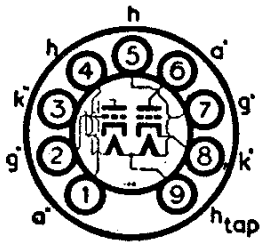


For ratings and characteristics refer to type 6SN7GT.



Current Equipment Type

TYPE 13D3
MINIATURE
DOUBLE TRIODE
(MEDIUM MU)



BRIMAR type 13D3 is an indirectly heated double triode, having a rigid structure to reduce microphony. It is particularly suitable as a D.C. amplifier due to its stable characteristics.

Heater Voltage	6.3	or	12.6 volts
Heater Current	0.6	or	0.3 amp.

RATINGS

Anode Voltage (Ia = 0)	500 volts max.
Anode Voltage	300 volts max.
Anode Dissipation (each Section)	5 watts max.
Cathode Current	35 mA max.
Negative Grid Voltage	75 volts max.
Average Grid Current	7 mA max.
Grid Resistor (Fixed Bias)	250 k Ω max.
(Auto Bias)	1.5 M Ω max.

OPERATING CHARACTERISTICS

Anode Voltage	100	250 volts
Grid Voltage	—1	—4.6 volts
Anode Current	3.5	6 mA
Amplification Factor	32.5	32
Mutual Conductance	2.05	2.3 mA/V
Anode Impedance	16.5	14 k Ω

OPERATION AS A PUSH-PULL ZERO BIAS CLASS "B" AMPLIFIER

Anode Voltage	250 volts
Grid Voltage	0 volts
Anode Current (Zero Signal)	39 mA
Anode Current (Max. Signal)	43.2 mA
Output Load Impedance (Anode-Anode)	20 k Ω
R.M.S. Input Voltage (Grid-Grid)	32 volts
Grid Current	12.8 mA
Total Harmonic Distortion	11.5 per cent.
Power Output	6.7 watts

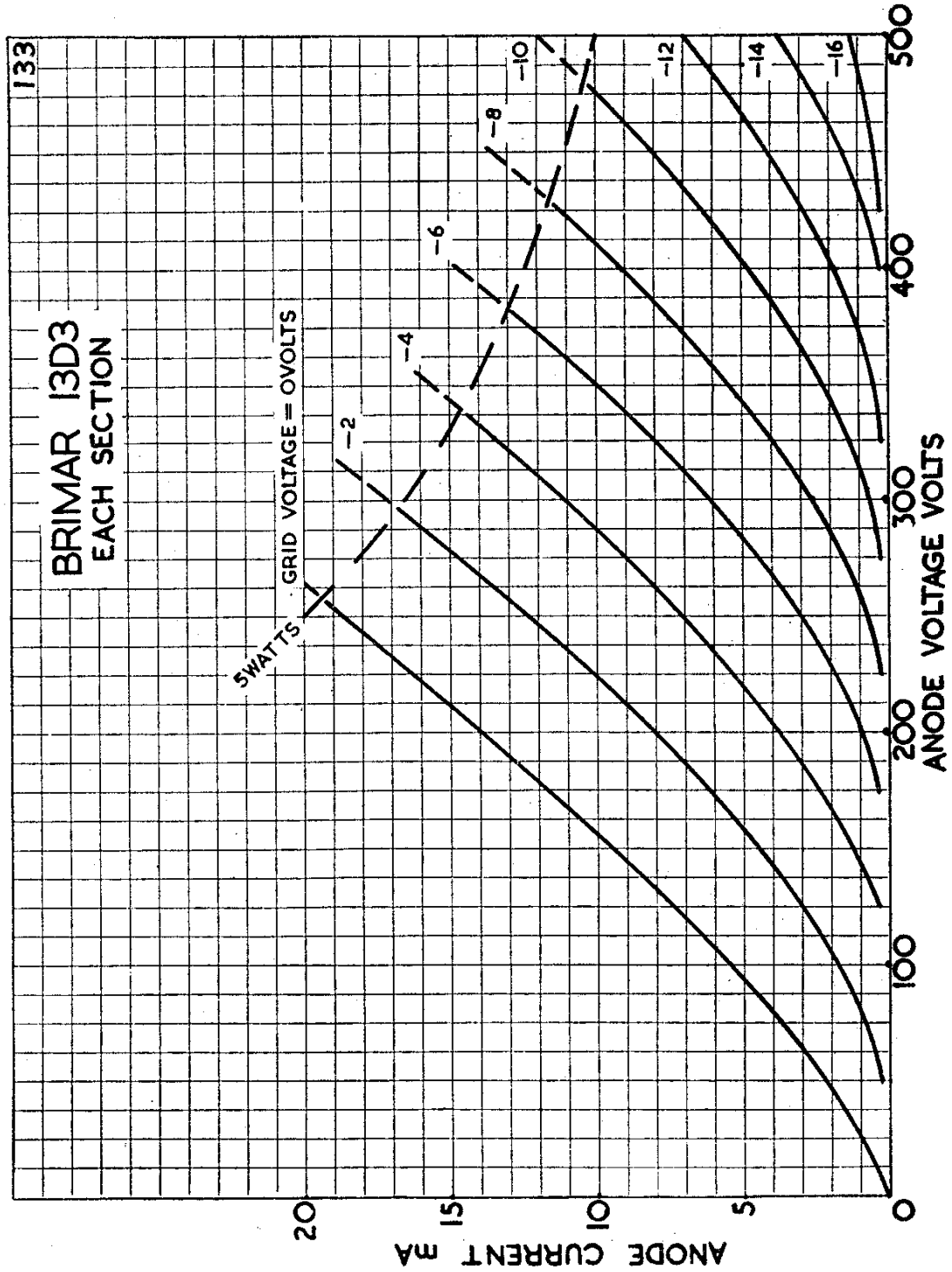
INTER-ELECTRODE CAPACITANCES†

	Section 1	Section 2
Input	2.3	2.3 pF
Output	0.95	0.85 pF
Grid to Anode	2.1	2.1 pF
Heater to Cathode	4.9	4.9
Grid 1 to Anode 2	0.02 pF	
Grid 2 to Anode 1	0.035 pF	
Anode 1 to Anode 2	1 pF	
Grid 1 to Grid 2	0.0035 pF	

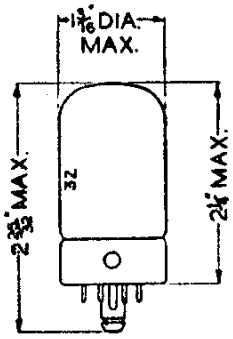
† *With no external shield.*

Type 13D3 is a commercial equivalent to CV2212.

13D3

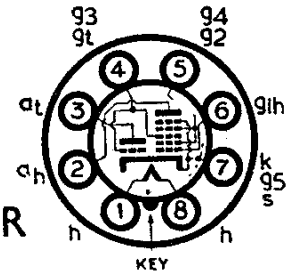

133
BRIMAR 13D3
EACH SECTION
GRID VOLTAGE = 0VOLTS
5WATTS
-2
-4
-6
-8
-10
-12
-14
-16
ANODE CURRENT mA
0
5
10
15
20
ANODE VOLTAGE VOLTS
100
200
300
400
500

14S7
17Z3
(see type PY81)
19BG6G



Replacement Type

TYPE **14S7**
(LOCTAL BASE)
TRIODE-HEPTODE
FREQUENCY CHANGER

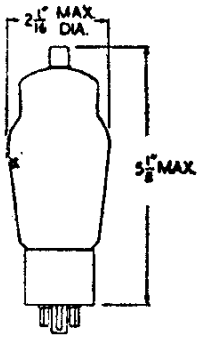


RATINGS

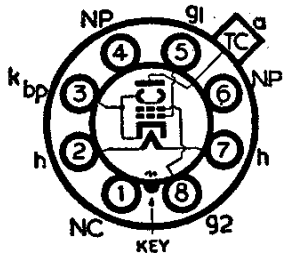
Heater Voltage	... ...	12.6 volts
Heater Current	... ...	0.15 amp.

For further information refer to type 7S7.

Replacement Type



TYPE **19BG6G**
(OCTAL BASE)
LINE TIME BASE
OUTPUT VALVE

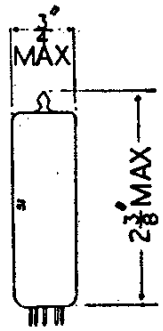


RATINGS

Heater Voltage	... ...	19 volts
Heater Current	... ...	0.3 amp.

For further information refer to type 6BG6G.

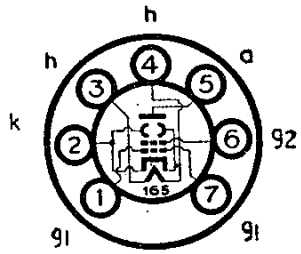
19AQ5



B7G Base

Current Equipment Type

TYPE 19AQ5 MINIATURE OUTPUT BEAM TETRODE



The BRIMAR type 19AQ5 is a miniature output tetrode for use in A.C./D.C. equipment. The characteristics are similar to those of type 6BW6.

RATINGS

Heater Voltage	19 volts
Heater Current	0.15 amp.
Anode Voltage	250 volts max.
Anode Dissipation	12 watts max.
Screen (g_2) Voltage	250 volts max.
Screen Dissipation	2.0 watts max.
Heater-Cathode Potential	250 volts max.
D.C. Cathode Current	65 mA max.

OPERATING CHARACTERISTICS

Anode Voltage	180	250 volts
Anode Current	29	45 mA
Screen Voltage	180	250 volts
Screen Current	3.0	4.5 mA
Control Grid (g_1) Voltage	—8.5	—12.5 volts
Cathode Bias Resistor	270	240 ohms
Anode Impedance	58,000	52,000 ohms
Mutual Conductance	3.7	4.1 mA/V
Inner Amp. Factor (μg_1, g_2)	10	10
Optimum Load	5,500	5,000 ohms
Power Output	2.0	4.5 watts
Harmonic Distortion	8.0	8.0 per cent.

INTER-ELECTRODE CAPACITANCES *

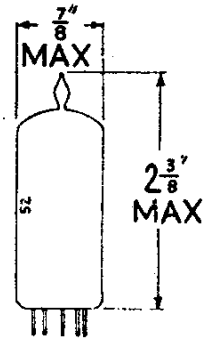
Input	7.6 pF
Output	6.0 pF
Control Grid to Anode	0.35 pF

* *With no external shield.*

The characteristic curves of the 6BW6 apply to the 19AQ5 within its ratings.

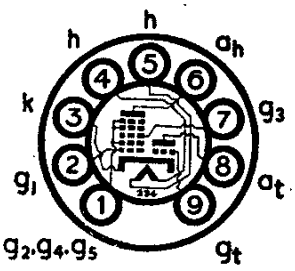
20D4

Current Equipment Type



B9A Base

TYPE 20D4 MINIATURE TRIODE-HEPTODE FREQUENCY CHANGER



The BRIMAR 20D4 is a triode-heptode frequency changer on the Noval (B9A) base, featuring very high conversion conductance.

RATINGS

Heater Voltage	6.3 volts
Heater Current	0.3 amp.
Heptode Anode Voltage	300 volts max.
Heptode Screen Voltage	125 volts max.
Triode Anode Voltage	150 volts max.
Total Cathode Current	17.5 mA max.

OPERATING CHARACTERISTICS

Heptode Anode Voltage	250 volts
Heptode Screen Voltage	100 volts
Heptode Control Grid (g_1) Voltage	—2 volts
Heptode Injection Grid (g_3) Voltage	0 volts
Anode Current	7.0 mA
Screen Grid Current	2.3 mA
Mutual Conductance (g_1-a)	2.8 mA/V
Anode Impedance	0.9 Megohms
Control Grid Voltage for gm/100	—20 volts
Triode Anode Voltage	100 volts
Triode Grid Voltage	0 volts
Anode Current	15 mA
Mutual Conductance	3.5 mA/V
Amplification Factor	16

OPERATION AS A FREQUENCY CHANGER

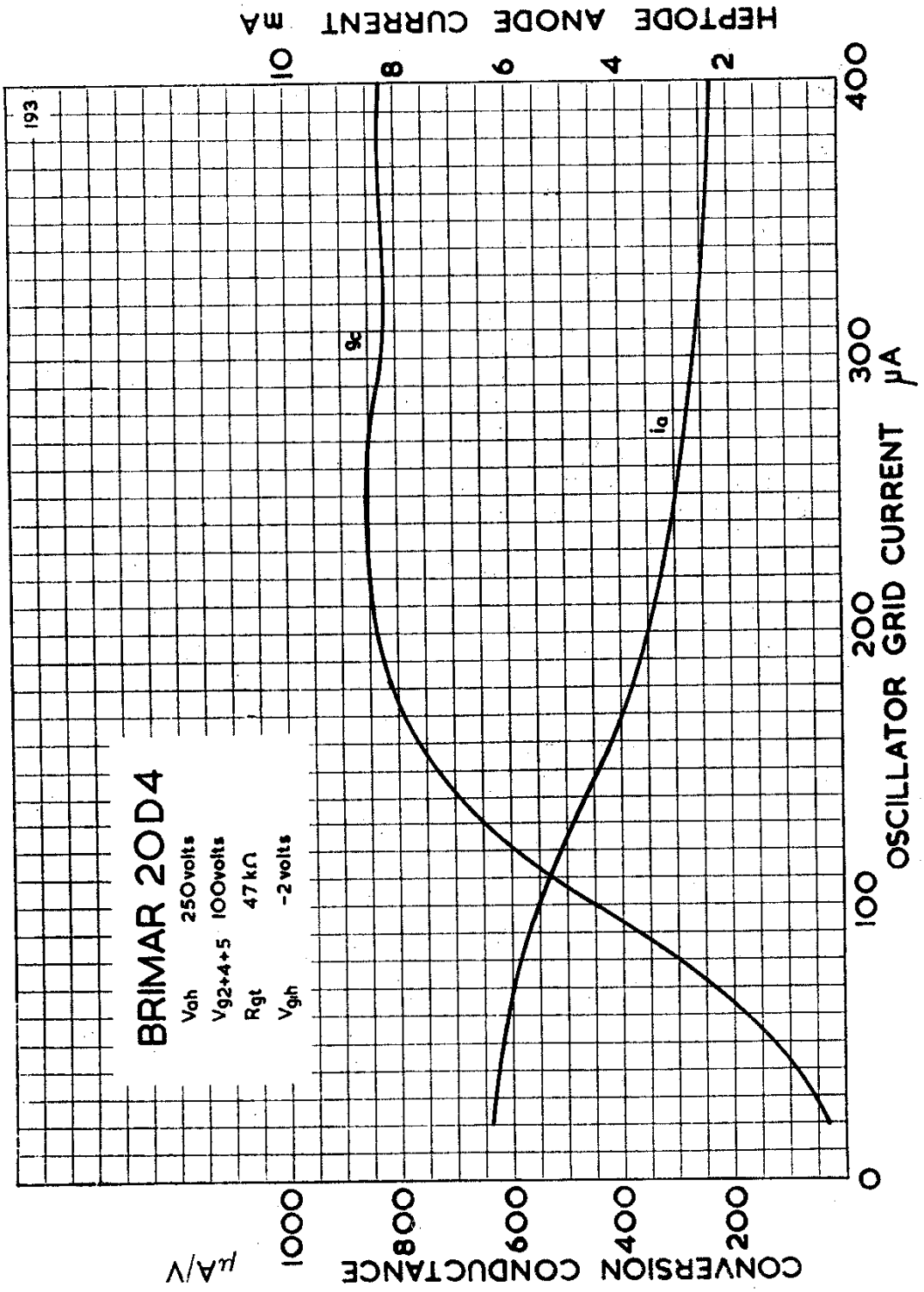
Heptode Anode Voltage	250 volts
Heptode Screen Voltage	100 volts
Heptode Control Grid Voltage	—2 volts
Triode Grid Resistor (g_t connected to g_3)	50 kilohms
Triode Grid Current	250 μA
Conversion Conductance	850 μA/V
Heptode Anode Current	3.0 mA
Heptode Screen Current	3.6 mA

INTER-ELECTRODE CAPACITANCES *

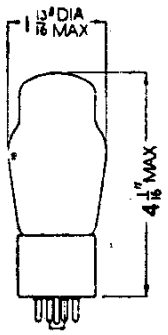
R.F. Input (g_{1h}-all)	4.5 pF
I.F. Output (a_h-all)	8.2 pF
Triode Input	2.1 pF
Triode Output	2.5 pF
Heptode Grid to Heptode Anode	0.01 pF

* *Measured with external shield.*

20D4

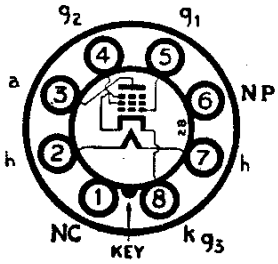

HEPTODE ANODE CURRENT mA
10
8
6
4
2
400
300
200
100
0
OSCILLATOR GRID CURRENT μA
CONVERSION CONDUCTANCE μA/V
1000
800
600
400
200
193
BRIMAR 20D4
Voh 250volts
Vg2+4+5 100volts
Rgt 47kΩ
Vgih -2volts
gc
ia

21A6
(see type PL81)
25A6G



Replacement Type

TYPE 25A6G
(OCTAL BASE)
POWER PENTODE



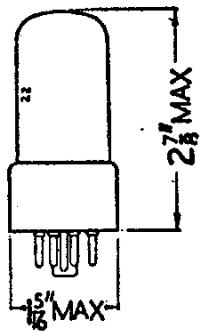
RATINGS

Heater Voltage	25.0 volts
Heater Current	0.3 amp.
Anode Voltage	160 volts max.
Anode Dissipation	5.3 watts max.
Screen (g_2) Voltage	135 volts max.
Screen Dissipation	1.9 watts max.

OPERATING CHARACTERISTICS (CLASS "A")

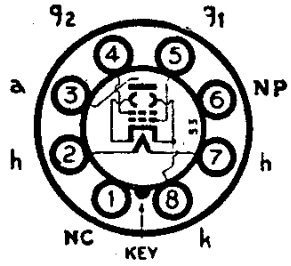
Anode Voltage	95	135	160	volts
Anode Current	20	37	33	mA
Screen Voltage	95	135	120	volts
Screen Current (Zero Signal)	4.0	8.0	6.5	mA
Screen Current (Max. Signal)	8	14	12	mA
Control Grid (g_1) Voltage	—15	—20	—18	volts
Cathode Bias Resistor	625	440	440	ohms
Anode Impedance	45,000	35,000	42,000	ohms
Mutual Conductance	2.0	2.45	2.4	mA/V
Optimum Load	4,500	4,000	5,000	ohms
Power Output	0.9	2.0	2.2	watts
Harmonic Distortion	11	9	10	per cent.

25L6GT



Current Equipment Type

TYPE 25L6GT
(OCTAL BASE)
OUTPUT
BEAM TETRODE



The BRIMAR type 25L6GT is an indirectly heated beam power tetrode suitable for series heater operation.

Heater Voltage	25 volts
Heater Current	0.3 amp.

RATINGS

Anode Voltage	200 volts max.
Screen Voltage	125 volts max.
Anode Dissipation	10 watts max.
Screen Input	1.25 watts max.
Peak Heater-Cathode Voltage (Heater Negative)	90 volts max.
(Heater Positive)	90 volts max.
Control Grid Circuit Resistance (Fixed Bias)	0.1 M Ω max.
(Auto Bias)	0.5 M Ω max.

CHARACTERISTICS

Anode Voltage	110	200 volts
Screen Voltage	110	125 volts
Control Grid Voltage	—7.5	— volts
Cathode Bias Resistor	—	180 ohms
Peak A.F. Grid 1 Voltage	7.5	8.5 volts
Anode Current (Zero Signal)	49	46 mA
(Max. Signal)	50	47 mA
Screen Current (Zero Signal)	4	2.2 mA
(Max. Signal)	10	8.5 mA
Anode Impedance (approx.)	13,000	28,000 ohms
Mutual Conductance	8	8 mA/V
Optimum Load	2,000	4,000 ohms
Total Harmonic Distortion	10	10 per cent.
Power Output	2.1	3.8 watts

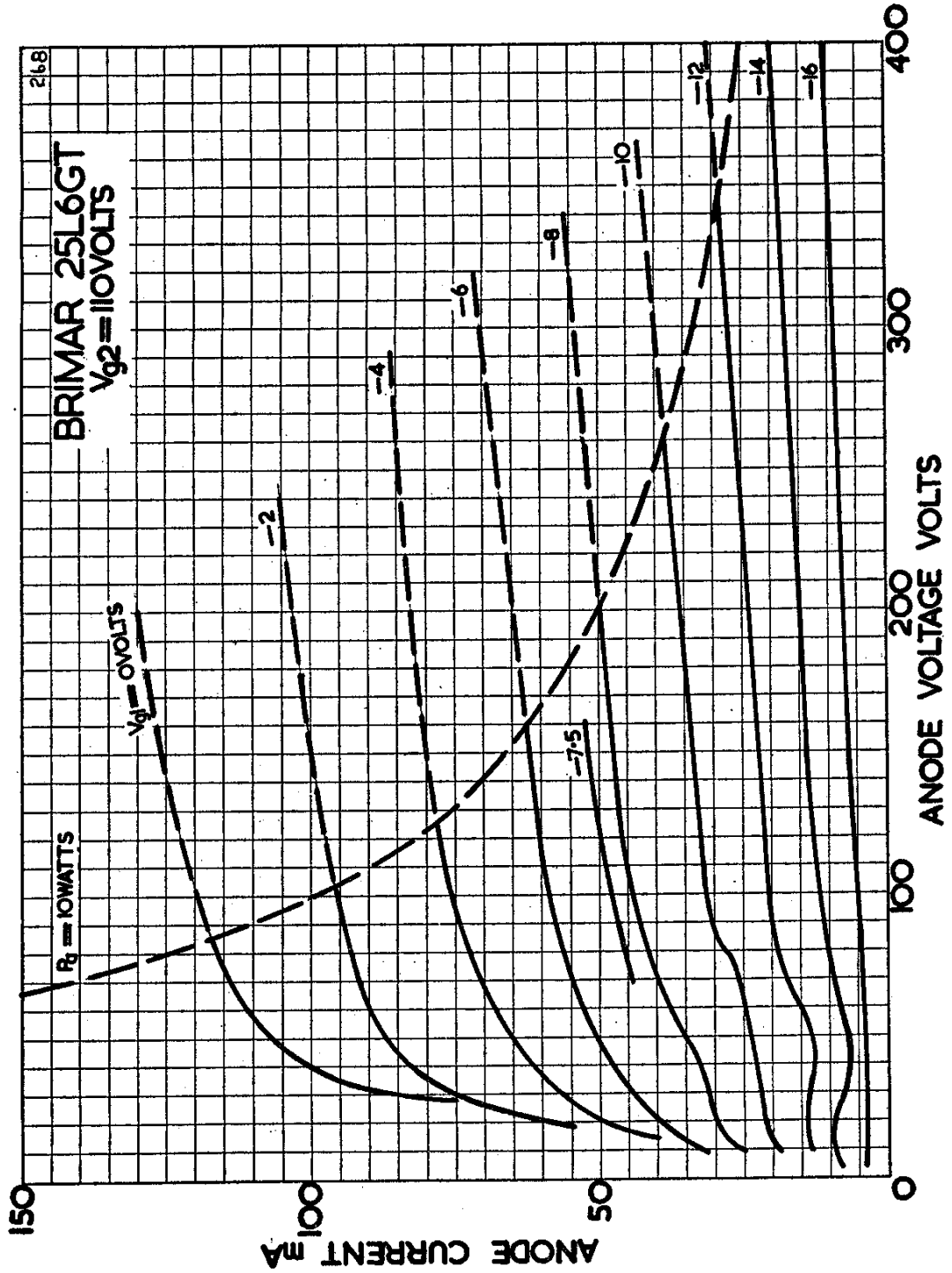
INTER-ELECTRODE CAPACITANCES†

Control Grid to Anode	0.8 pF
Input	15 pF
Output	10 pF

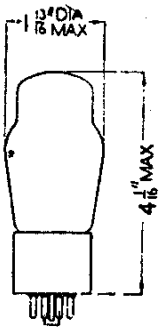
† *Measured with no external shield.*

Type 25L6GT *is a commercial equivalent of the* CV553.

25L6GT


BRIMAR 25L6GT
V_{g2} = 110VOLTS
V_{g1} = 0VOLTS
R_g = 1OWATTS
-2
-4
-6
-8
-10
-12
-14
-16
-7.5
ANODE CURRENT mA
150
100
50
0
ANODE VOLTAGE VOLTS
0
100
200
300
400

25Z4G

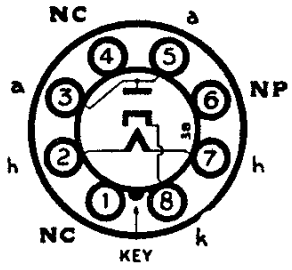


Replacement Type

TYPE 25Z4G

(OCTAL BASE)

HALF-WAVE RECTIFIER

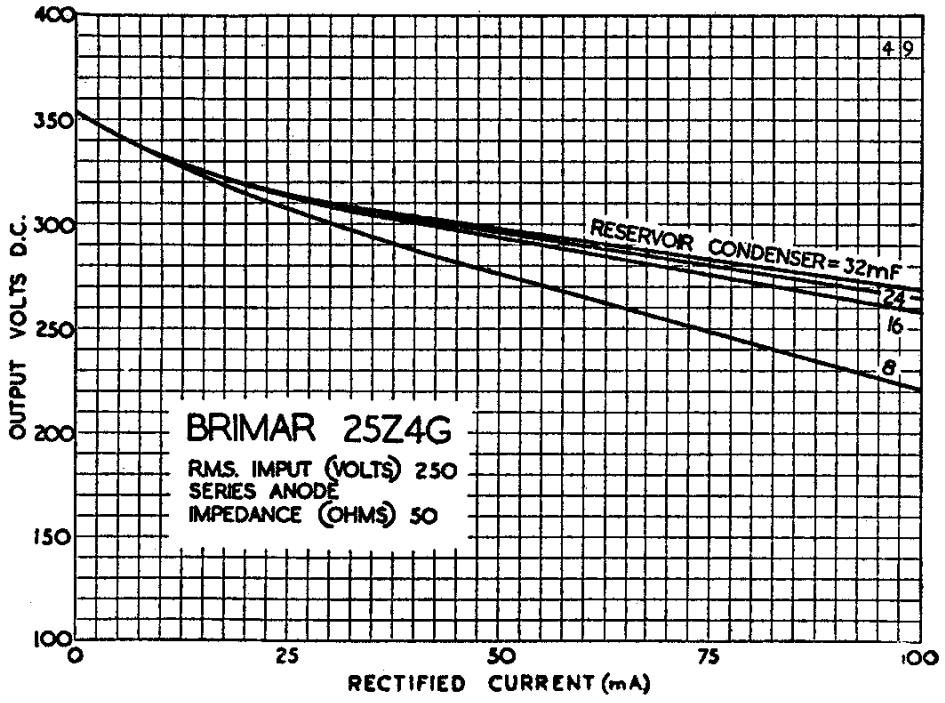


RATINGS

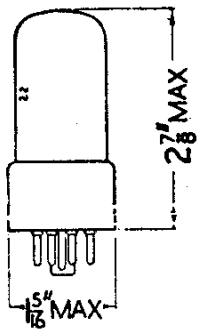
Heater Voltage	25 volts
Heater Current	0.30 amp.
Peak Inverse Voltage	700 volts max.
Peak Anode Current	450 mA max.
Heater-Cathode Potential	350 volts max.

CHARACTERISTICS AS HALF-WAVE RECTIFIER

R.M.S. Input	117	250	volts max.
Supply Impedance	0	50	ohms min.
Rectified Current	100	100	mA max.



35L6GT



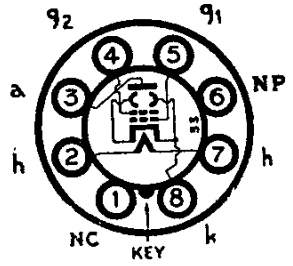
Replacement Type

TYPE **35L6GT**

(OCTAL BASE)

OUTPUT BEAM

TETRODE



RATINGS

Heater Voltage	35 volts
Heater Current	0.15 amp.
Anode Voltage	200 volts max.
Anode Dissipation	8.5 watts max.
Screen (g_2) Voltage	110 volts max.
Screen Dissipation	1.0 watt max.

OPERATING CHARACTERISTICS

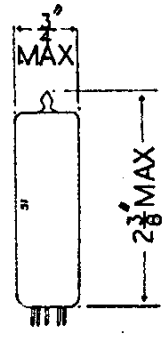
Anode Voltage	110	200	volts
Anode Current	40	41	mA
Screen Voltage	110	110	volts
Screen Current (Zero Signal)	3.0	2.0	mA
Screen Current (Max. Signal)	7	7	mA
Control Grid (g_1) Voltage	—7.5	—8	volts
Cathode Bias Resistor	170	185	ohms
Anode Impedance	14,000	40,000	ohms
Mutual Conductance	5.8	5.9	mA/V
Optimum Load	2,500	4,500	ohms
Power Output	1.5	3.3	watts
Harmonic Distortion	10	10	per cent.

INTER-ELECTRODE CAPACITANCES

Input	13.2 pF
Output	8.25 pF
Control Grid to Anode	0.95 pF

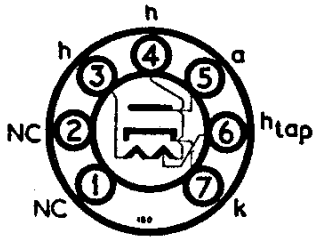
35W4

Current Equipment Type



B7G Base

TYPE 35W4
MINIATURE
HALF WAVE RECTIFIER



Heater Current	... 0.15 amp.	Heater Voltage	... 45 volts

RATINGS

Peak Inverse Voltage...	330 volts max.	Peak Current	600 mA max.
Peak Surge Current ...	2 amps. max.	Anode Supply Voltage	—see Rating Chart I
D.C. Output Current†	—see Rating Chart I	Peak Heater Cathode Potential	330 volts max.

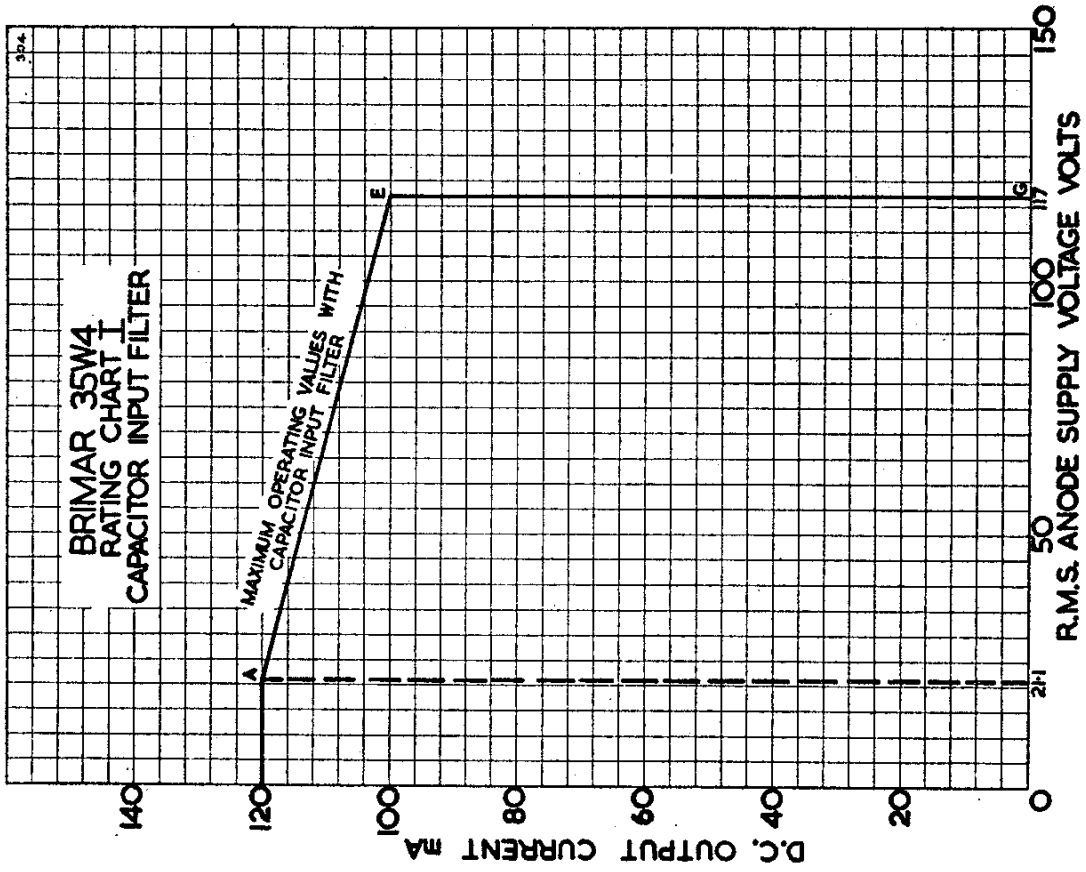
† *With a panel lamp rated at 6.3 volts, 0.15 amps. connected between pins 4 and 6 the rectified current must be limited to 60 mA with 117 volts R.M.S. input, or to 90 mA if the panel lamp is shunted by a resistor not exceeding 250 Ω.*

CHARACTERISTICS AS A HALF-WAVE RECTIFIER

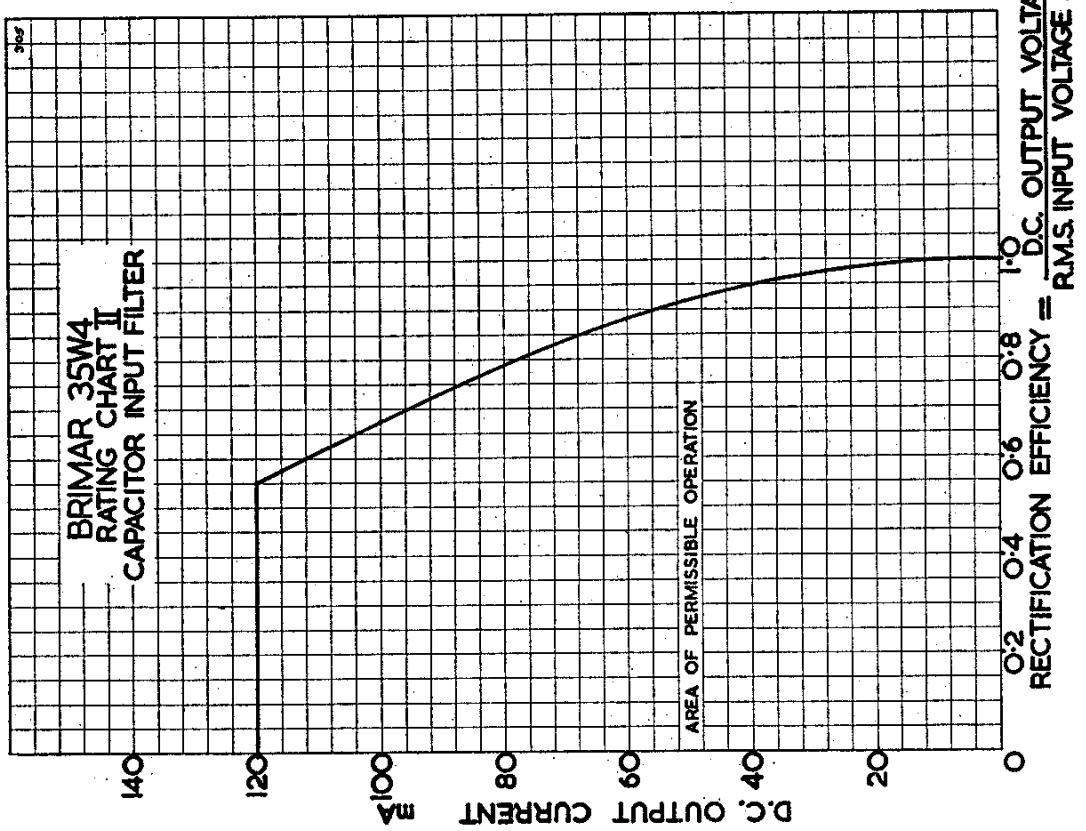
CAPACITOR INPUT

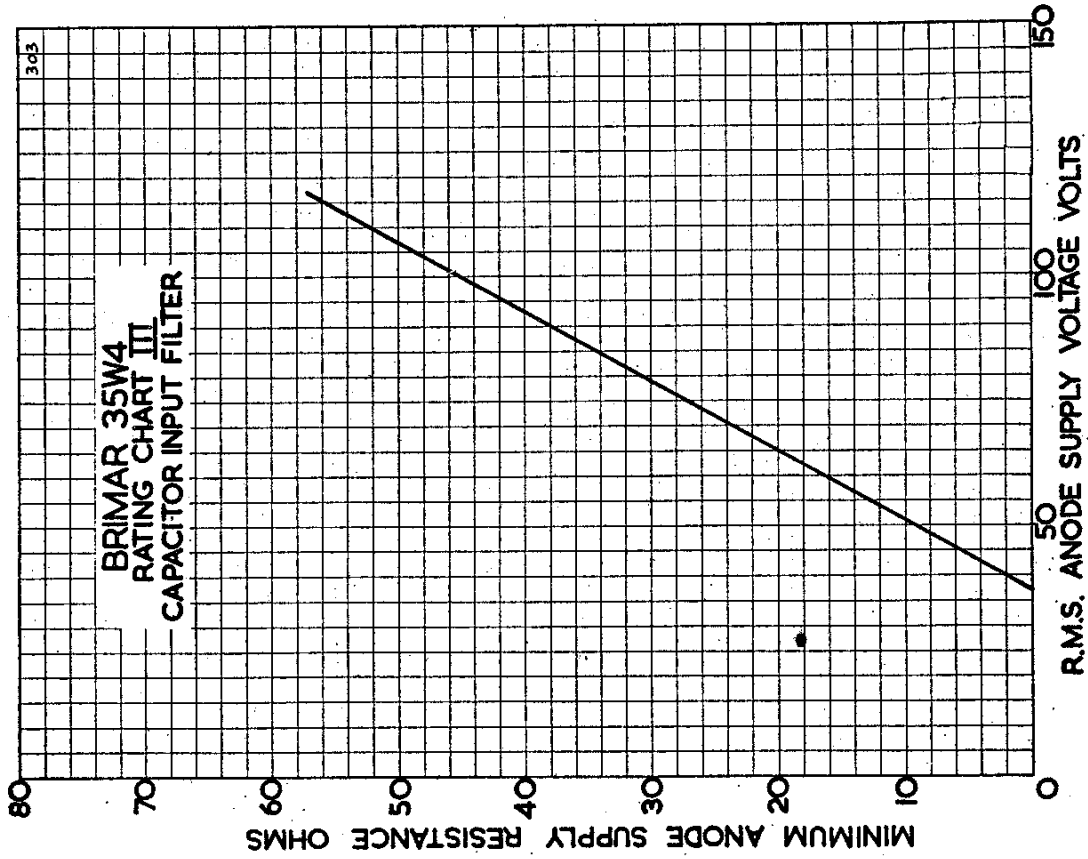
R.M.S. Input Voltage...	117 volts	Rectified Current	... 100 mA
D.C. Output Voltage...	95 volts	Supply Impedance	... 57 Ω
Reservoir Capacitor ...	32 μF		

For notes on use of rating charts, refer to " Valve Ratings " section.

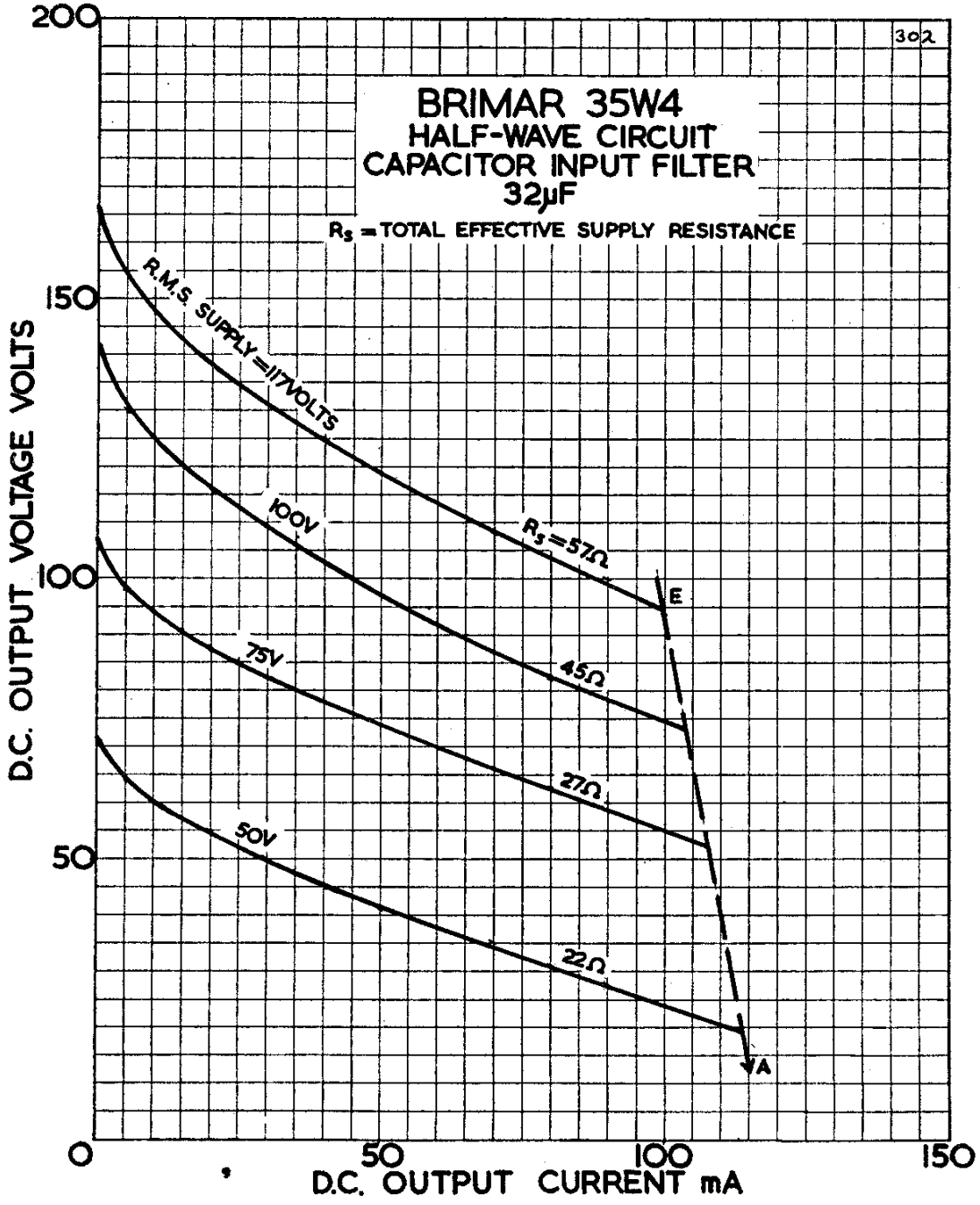


35W4

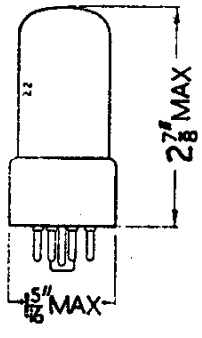

BRIMAR 35W4
RATING CHART II
CAPACITOR INPUT FILTER
AREA OF PERMISSIBLE OPERATION
D.C. OUTPUT CURRENT mA
0
20
40
60
80
100
120
140
RECTIFICATION EFFICIENCY = D.C. OUTPUT VOLTAGE / R.M.S. INPUT VOLTAGE X/2
0·2
0·4
0·6
0·8
1·0


BRIMAR 35W4
RATING CHART III
CAPACITOR INPUT FILTER
MINIMUM ANODE SUPPLY RESISTANCE OHMS
0
10
20
30
40
50
60
70
80
R.M.S. ANODE SUPPLY VOLTAGE VOLTS
50
100
150

35W4

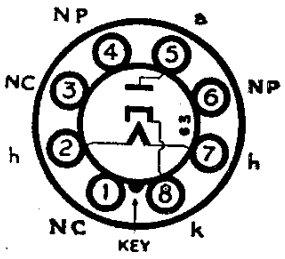

302
BRIMAR 35W4
HALF-WAVE CIRCUIT
CAPACITOR INPUT FILTER
32μF
R_S = TOTAL EFFECTIVE SUPPLY RESISTANCE
R.M.S. SUPPLY = 117VOLTS
100V
75V
50V
R_S = 57Ω
45Ω
27Ω
22Ω
E
A
200
150
100
50
0
50
100
150
D.C. OUTPUT VOLTAGE VOLTS
D.C. OUTPUT CURRENT mA

35Z4GT
42
42E



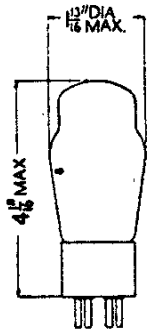
Replacement Type

TYPE 35Z4GT
(OCTAL BASE)
HALF-WAVE RECTIFIER



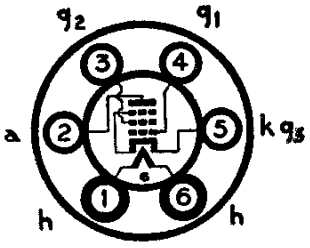
RATINGS	
Heater Voltage	35 volts
Heater Current	0.15 amp.
Peak Inverse Voltage	700 volts max.
Peak Anode Current	600 mA max.
Heater-Cathode Potential	350 volts max.

CHARACTERISTICS AS HALF-WAVE RECTIFIER		
R.M.S. Input	117	250 volts max.
Supply Impedance	15	100 ohms min.
Rectified Current	100	100 mA max.
Reservoir Condenser	40	40 μF max.



Obsolescent Types

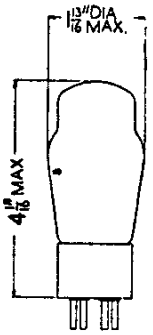
TYPES 42, 42E
(U.X. BASE)
POWER PENTODES



RATINGS	
Heater Voltage	6.3 volts
Heater Current	0.7 amp.

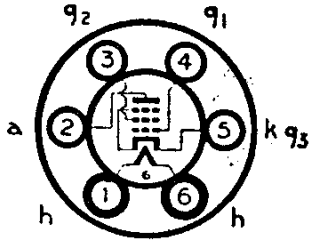
For further information refer to type 6F6G.

43
43E
50A5



Obsolescent Types

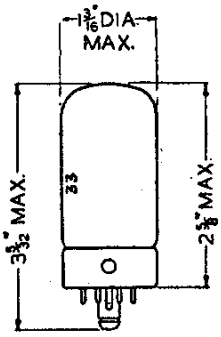
TYPES 43, 43E (U.X. BASE) POWER PENTODES



CHARACTERISTICS

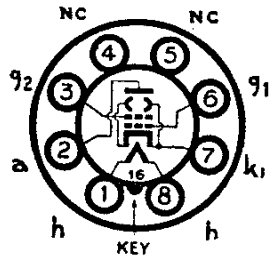
Heater Voltage		25 volts	Cathode Bias Resistor	440	440 ohms
Heater Current		0.3 amp.	Anode Impedance ...	35,000	42,000 ohms
Anode Voltage ..	135	160 volts	Mutual Conductance	2.45	2.40 mA/V
Anode Current ...	37	33 mA	Optimum Load ...	4,000	5,000 ohms
Screen (g_2) Voltage	135	120 volts	Power Output ...	2.0	2.2 watts
Screen Current ...	8.0	6.5 mA	Harmonic Distortion	9	10 per cent.
Control Grid (g_1) Voltage	−20	−18 volts			

For further information refer to type 25A6G.



Obsolescent Type

TYPE 50A5 (LOCTAL BASE) OUTPUT BEAM TETRODE



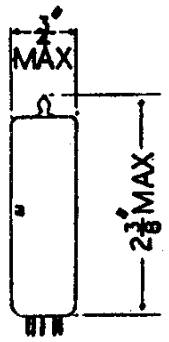
CHARACTERISTICS

Heater Voltage		50 volts
Heater Current		0.15 amp.
Anode Voltage	100	200 volts
Anode Current	49	50 mA
Screen (g_2) Voltage	110	110 volts
Screen Current	4.0	1.5 mA
Control Grid (g_1) Voltage	−7.5	−8.0 volts
Cathode Bias Resistor	150	160 ohms
Anode Impedance	13,000	35,000 ohms
Mutual Conductance	8.0	8.25 mA/V
Optimum Load	2,000	3,000 ohms
Power Output	2.1	4.3 watts
Harmonic Distortion	10	10 per cent.

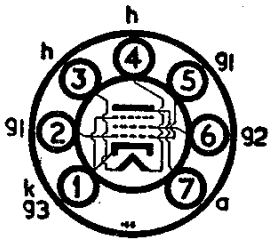
The characteristic curves of the 50A5 are similar to those of type 25L6GT.

50C5

Current Equipment Type



TYPE **50C5**
MINIATURE
OUTPUT
BEAM TETRODE



Type 50C5 is particularly suitable for operation in compact 110 Volt A.C./D.C. equipment.

RATINGS

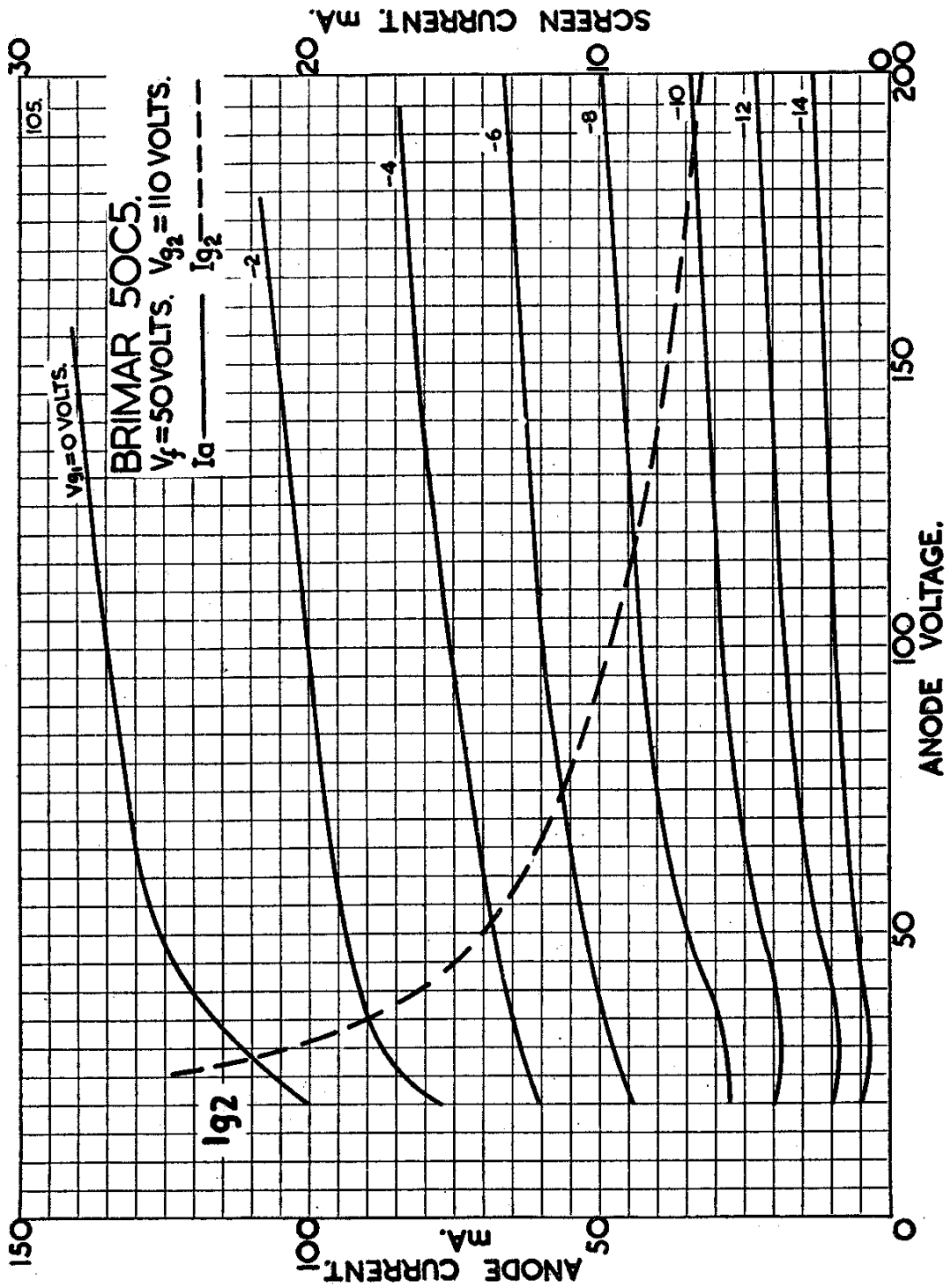
Heater Voltage	50 volts
Heater Current	0.15 amp.
Anode Voltage	135 volts max.
Anode Dissipation	5.5 watts max.
Screen (g_2) Voltage	117 volts max.
Screen Dissipation	1.25 watts max.
Heater-Cathode Potential	250 volts max.

OPERATING CHARACTERISTICS

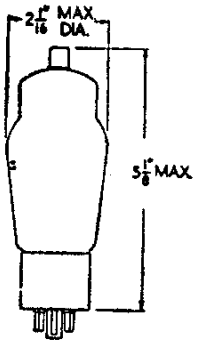
Anode Voltage	110 volts
Anode Current	49 mA
Screen Voltage	110 volts
Screen Current	4 mA
Control Grid (g_1) Voltage	—7.5 volts
Cathode Bias Resistor	140 ohms
Anode Impedance	10,000 ohms
Mutual Conductance	7.5 mA/V
Optimum Load	2,500 ohms
Power Output	1.9 watts
Harmonic Distortion	9 per cent.

Type 50C5 is a commercial equivalent of the CV1959.

5OC5

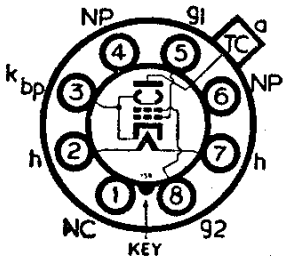

BRIMAR 5OC5.
V_f=5OVOLTS. V_{g2}=110 VOLTS.
Ia ——— Ig2 - - - - -
V_{g1}=0 VOLTS.
105.
-2
-4
-6
-8
-10
-12
-14
Ig2
ANODE CURRENT. mA.
150
100
50
0
SCREEN CURRENT mA.
30
20
10
0
ANODE VOLTAGE.
200
150
100
50
0

50CD6G



Current Equipment Type

TYPE **50CD6G** (OCTAL BASE) LINE TIME BASE OUTPUT VALVE



The BRIMAR 50CD6G is designed for television line time base output service in receivers using series connected heaters. It is capable of scanning wide angle cathode ray tubes when supplied from relatively low H.T. rails, and features high anode current at low anode voltage, and a high ratio of anode to screen current.

RATINGS

Heater Voltage	50 volts
Heater Current	0.3 amp.
Direct Anode Voltage	700 volts max.
*Peak Positive Anode Pulse Voltage	6,600 volts max.
Anode Dissipation	15 watts max.
Direct Screen (g_2) Voltage	175 volts max.
Screen Dissipation	3 watts max.
Direct Control Grid (g_1) Voltage	—50 volts max.
*Peak Negative Control Grid Voltage	—200 volts max.
Heater to Cathode Potential	250 volts max.
Direct Cathode Current	200 mA max.
Peak Cathode Current	700 mA max.

OPERATING CHARACTERISTICS

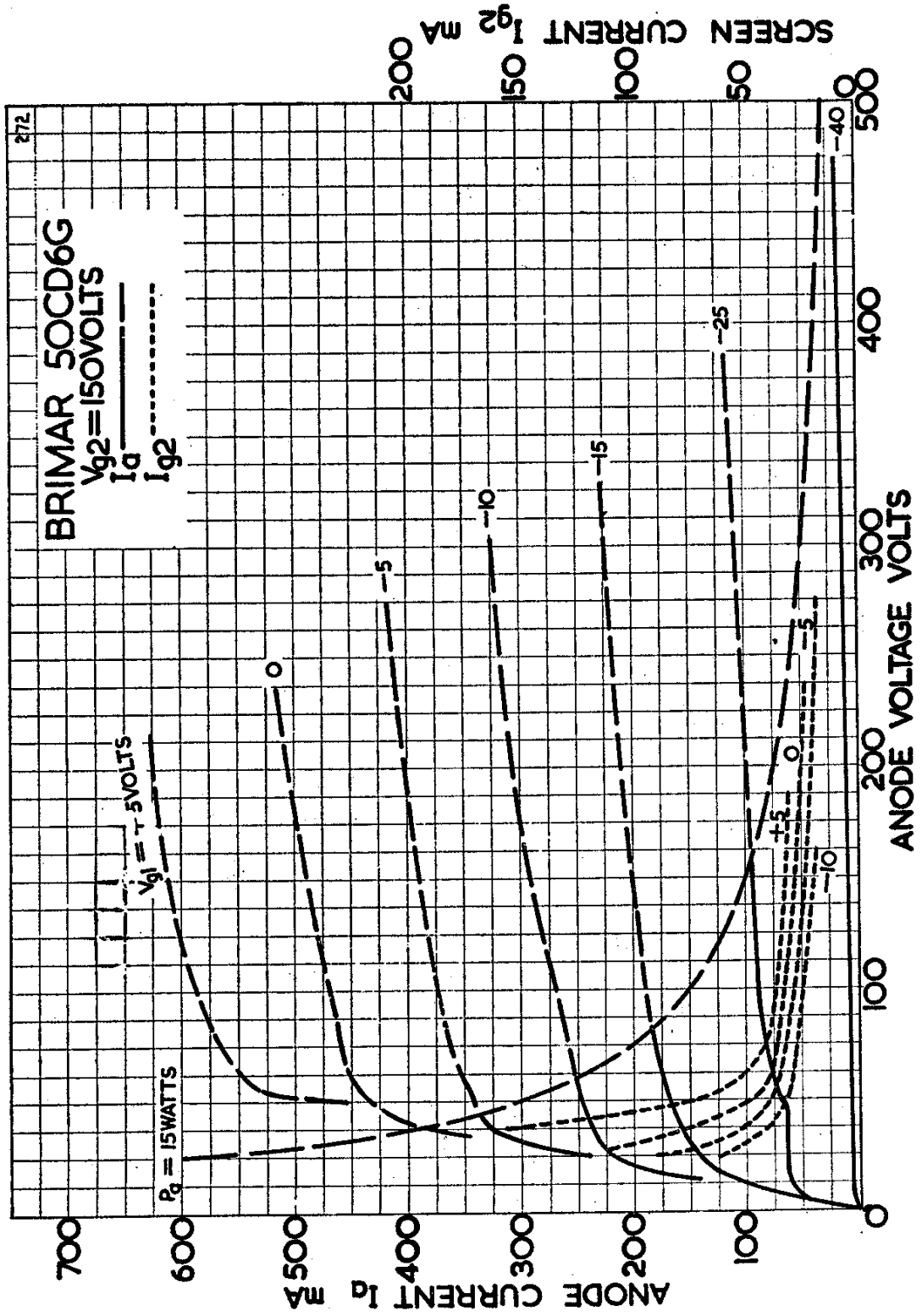
Anode Voltage	200 volts
Anode Current	64 mA
Screen Voltage	150 volts
Screen Current	3 mA
Control Grid Voltage	—30 volts
Mutual Conductance	6.7 mA/V
Inner Amplification Factor ($\mu_{g1, g2}$)	3.5

INTER-ELECTRODE CAPACITANCES

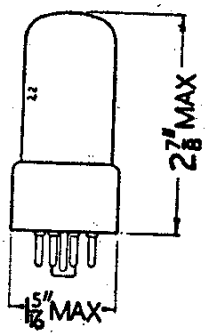
Input (C_{in})	26 pF
Output (C_{out})	10 pF
Anode to Grid ($C_{g_1, a}$)	1.0 pF

* *The duty cycle must not exceed 15 per cent. of the scanning cycle, and its duration must not exceed 15μ seconds.*

50CD6G

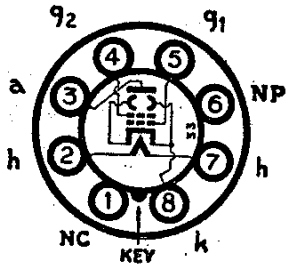

BRIMAR 50CD6G
Vg2=150VOLTS
Ia
Ig2
Vg1=+5VOLTS
Pa=15WATTS
ANODE CURRENT Ia mA
SCREEN CURRENT Ig2 mA
ANODE VOLTAGE VOLTS
0
-5
-10
-15
-25
-40
+5
-3
-10

50L6GT
75
77
77E



Replacement Type

TYPE 50L6GT (OCTAL BASE) OUTPUT BEAM TETRODE



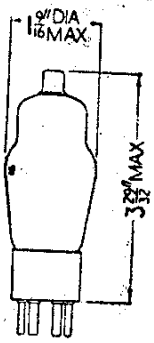
RATINGS

Heater Voltage	50 volts.	Anode Dissipation ...	10 watts max.
Heater Current	0.15 amp.	Screen (g_2) Voltage ...	117 volts max.
Anode Voltage	200 volts max.	Screen Dissipation ...	1.25 watts max.

OPERATING CHARACTERISTICS

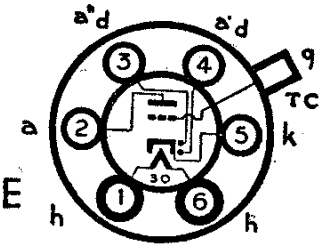
Anode Voltage	110	200	volts
Anode Current	49	50	mA
Screen Voltage	110	110	volts
Screen Current (Zero Signal)	4.0	2.0	mA
Screen Current (Max. Signal)	11.0	7.0	mA
Control Grid (g_1) Voltage	—7.5	—8.0	volts
Cathode Bias Resistor	150	160	ohms
Anode Impedance	13,000	30,000	ohms
Mutual Conductance	9.0	9.5	mA/V
Optimum Load	2,000	3,000	ohms
Power Output	2.1	4.3	watts
Harmonic Distortion	11	10	per cent.

For characteristic curve refer to type 25L6GT.



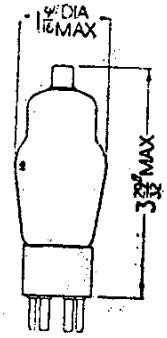
Replacement Type

TYPE 75 (U.X. BASE) DOUBLE DIODE TRIODE



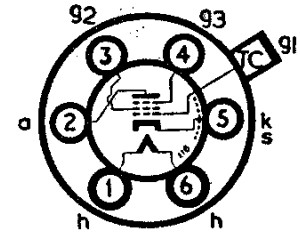
CHARACTERISTICS

Heater Voltage	6.3 volts	Grid Voltage	−2 volts
Heater Current	0.3 amp.	Anode Impedance	91,000 ohms
Anode Voltage	250 volts	Mutual Conductance ...	1.1 mA/V
Anode Current	0.9 mA	Amplification Factor	100



Replacement Types

TYPES 77, 77E (U.X. BASE) R.F. PENTODES

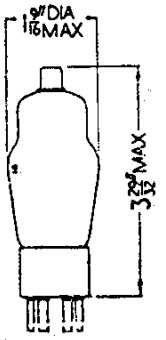


CHARACTERISTICS

Heater Voltage	6.3 volts	Control Grid (g_1) Voltage ...	−3 volts
Heater Current	0.3 amp.	Suppressor (g_3) Voltage ...	0 volts
Anode Voltage	250 volts	Anode Impedance	1.5 meg.
Anode Current	2.3 mA	Mutual Conductance ...	1.2 mA/V
Screen (g_2) Voltage ...	100 volts	Control Grid Voltage ...	−7.5 volts
Screen Current	0.5 mA	(For Anode Current cut-off)	

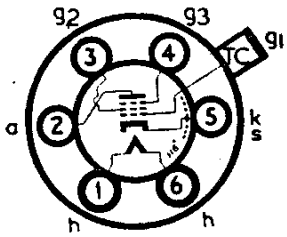
For further information refer to type 6J7G.

78
78E
80
80s



Replacement Types

TYPES 78, 78E (U.X. BASE) VARI-MU R.F. PENTODES

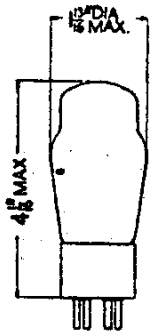


CHARACTERISTICS

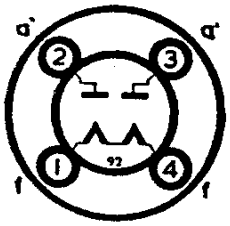
Heater Voltage	... ...	6.3 volts	Control Grid (g_1) Voltage	...	-3 volts
Heater Current	... ...	0.3 amp.	Cathode Bias Resistor	...	330 ohms
Anode Voltage	... ...	250 volts	Anode Impedance	... ...	0.8 meg.
Anode Current	... ...	7.0 mA	Mutual Conductance	...	1.45 mA/V
Screen (g_2) Voltage	... ...	100 volts	Control Grid Voltage	...	-42 volts
Screen Current	... ...	1.7 mA	(For Mutual Conductance of 0.002 mA/V)		

For further information refer to type 6K7G.

Replacement Type



TYPE 80 (U.X. BASE) FULL-WAVE RECTIFIER

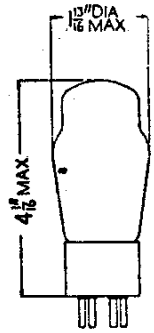


CHARACTERISTICS

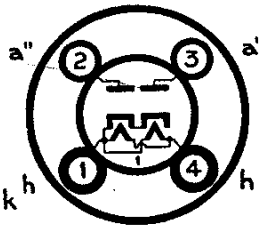
Filament Voltage	... ...	5.0 volts	Filament Current	... ...	2.0 amp.

For further information refer to type 5Y3GT.

Replacement Type



TYPE 80s (U.X. BASE) FULL-WAVE RECTIFIER

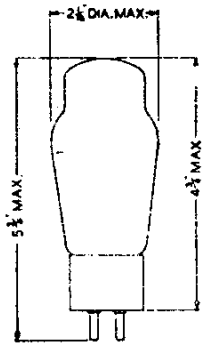


CHARACTERISTICS

Heater Voltage	... ...	5.0 volts	R.M.S. Input per Anode	...	350 volts max
Heater Current	... ...	2.0 amp.	Rectified Current	...	125 mA max.

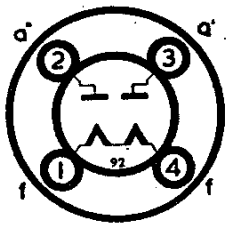
For further information refer to type 5Z4G.

83
807



Replacement Type

TYPE 83
(U.X. BASE)
FULL-WAVE RECTIFIER
(MERCURY VAPOUR)

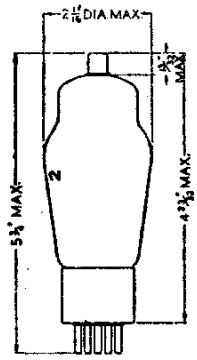


RATINGS

Filament Voltage	...	5.0 volts	Peak Current per Anode		1.0 amp. max.
Filament Current	...	3.0 amp.	Condensed Mercury Temperature	... ...	20-60° C.
Peak Inverse Voltage	...	1,550 volts max.			

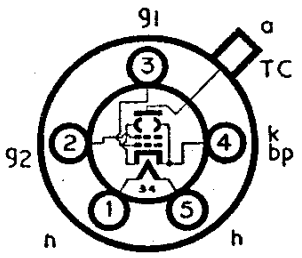
OPERATION AS FULL-WAVE RECTIFIER

CONDENSER INPUT			CHOKE INPUT		
R.M.S. Input per Anode...		450 volts max.	R.M.S. Input per Anode...		550 volts max.
Supply Impedance per Anode		50 ohms min.	Input Choke Inductance...		3 Henries min.
Rectified Current	...	225 mA max.	Rectified Current	...	225 mA max.



Replacement Type

TYPE 807
(U.X. BASE)
OUTPUT BEAM
TETRODE



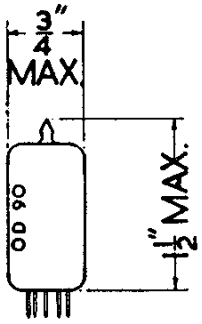
RATINGS

Heater Voltage	6.3 volts	
Heater Current	0.9 amp.	
Anode Voltage	600 volts	Absolute Maximum
Anode Dissipation	25 watts	Absolute Maximum
Screen (g_2) Voltage	300 volts	Absolute Maximum
Screen Dissipation	3.5 watts	Absolute Maximum

OPERATING CHARACTERISTICS (CLASS "A")

Anode Voltage	300	500	volt
Anode Current	83	50	mA
Screen Voltage	250	200	volts
Screen Current	8.0	1.6	mA
Control Grid (g_1) Voltage	—12.5	—14.5	volts
Cathode Bias Resistor	140	280	ohms
Anode Impedance	24,000	39,000	ohms
Mutual Conductance	6.5	5.7	mA/V
Optimum Load	3,000	6,000	ohms
Power Output	6.4	11.5	watts
Harmonic Distortion	6	12	per cent

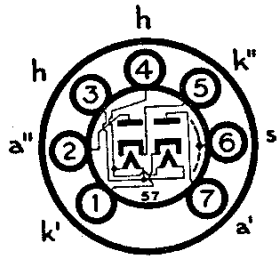
5726



B7G Base

Current Equipment Type

TYPE **5726** MINIATURE TRUSTWORTHY DOUBLE DIODE



The BRIMAR 5726 is a trustworthy miniature double diode designed for reliable operation under severe conditions of vibration and shock.

Heater Voltage	6.3 volts
Heater Current	0.3 amp.

RATINGS

Peak Inverse Voltage	330 volts max.
Peak Anode Current (each Anode)	54 mA max.
Shock (Intermittent service)	500g abs. max.
Vibration (Continuous service)...	2.5g abs. max.

OPERATION AS HALF-WAVE RECTIFIER

R.M.S. Input per Anode	117 volts max.
Supply Impedance per Anode	300 ohms min.
Rectified Current per Anode	9 mA max.

INTER-ELECTRODE CAPACITANCES

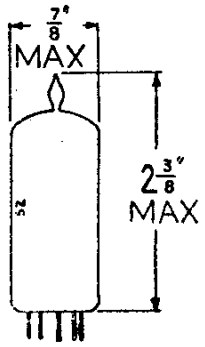
	Diode 1	Diode 2
Anode to Cathode *	3.2	3.2 pF
Cathode to Anode *	3.9	3.9 pF
Anode 1 to Anode 2 **	0.026 pF max.	

* *With heater, internal and external screens connected to this electrode.*

** *With external and internal screens earthed.*

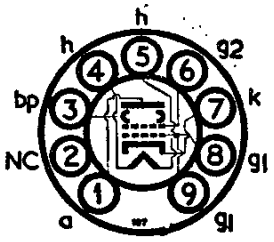
Type 5726 is a commercial equivalent to the CV4007.

Current Equipment Type



B9A (Noval) Base

TYPE 5763
MINIATURE V.H.F. BEAM POWER AMPLIFIER



The BRIMAR type 5763, owing to its small size and comparatively high ratings, is very suitable for use in portable V.H.F. equipment. Sufficient ventilation must be provided to ensure that the bulb temperature never exceeds 250°C.

RATINGS

Heater Voltage	6.0 volts	
Heater Current	0.75 amp.	
Anode Voltage	300 volts	Absolute Maximum
Anode Dissipation	12 watts	
Screen (g_2) Voltage	250 volts	
Screen Dissipation	2.0 watts	
Control Grid (g_1) Current	5.0 mA D.C.	
Hot Spot Bulb Temperature	250° C.	
Heater to Cathode Potential	100 volts max.	
D.C. Cathode Current	65 mA max.	

Frequency for above ratings 175 Mc/s max.

OPERATION AS CLASS "A" AMPLIFIER

Anode Voltage	250 volts	Control Grid Voltage	−7.25 volts
Anode Current	45 mA	Anode Impedance	27,000 ohms
Screen Voltage	250 volts	Mutual Conductance	7.0 mA/V
Screen Current	4.7 mA	Amp. Factor (μg_1-g_2)	16

OPERATION AS OSCILLATOR OR POWER AMPLIFIER (CLASS "C" TELEGRAPHY) AT 50 Mc/s

Anode Voltage	300 volts
Anode Current	50 mA
Screen Voltage	250 volts
Screen Current	5.0 mA
Control Grid Voltage	−60 volts
Control Grid Resistor	22,000 ohms
Control Grid Current	3 mA
Peak R.F. Grid Voltage	80 volts
Input Driving Power	0.35 watts
Output Power	8.0 watts

OPERATION AS FREQUENCY MULTIPLIER

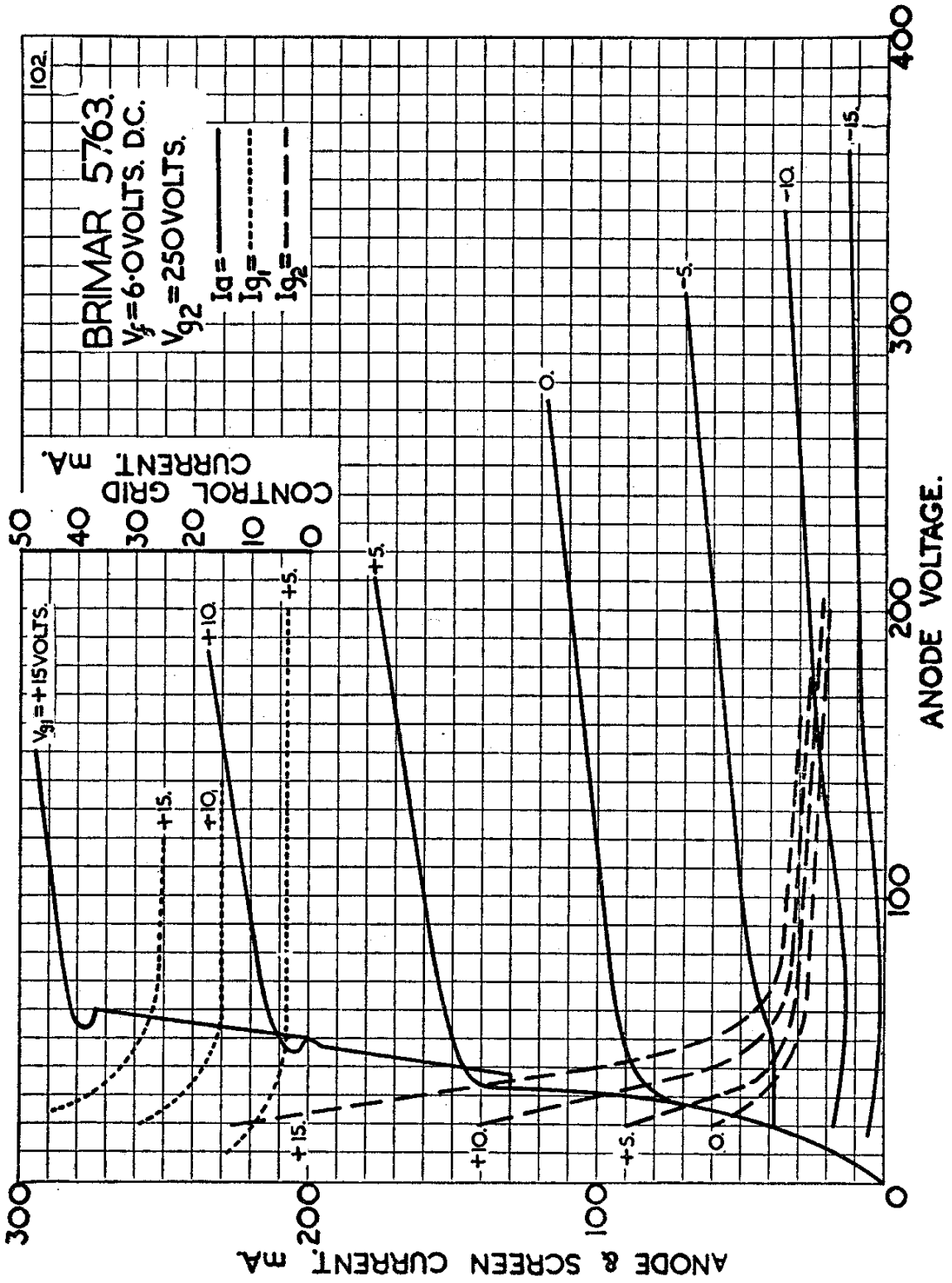
	Doubler to 175 Mc/s	*Tripler to 175 Mc/s*	
Anode Voltage	300	300	volts
Anode Current	40	35	mA
Screen Supply Voltage	300	300	volts
Series Screen Resistor	12,500	12,500	ohms
Screen Current	4.0	5.0	mA
Control Grid Voltage	−75	−100	volts
Control Grid Resistor	75,000	100,000	ohms
Peak R.F. Grid Voltage	95	120	volts
Control Grid Current	1.0	1.0	mA
Input Driving Power	0.6	0.6	watts
Output Power	3.6	2.8	watts

INTER-ELECTRODE CAPACITANCES (No External Shield)

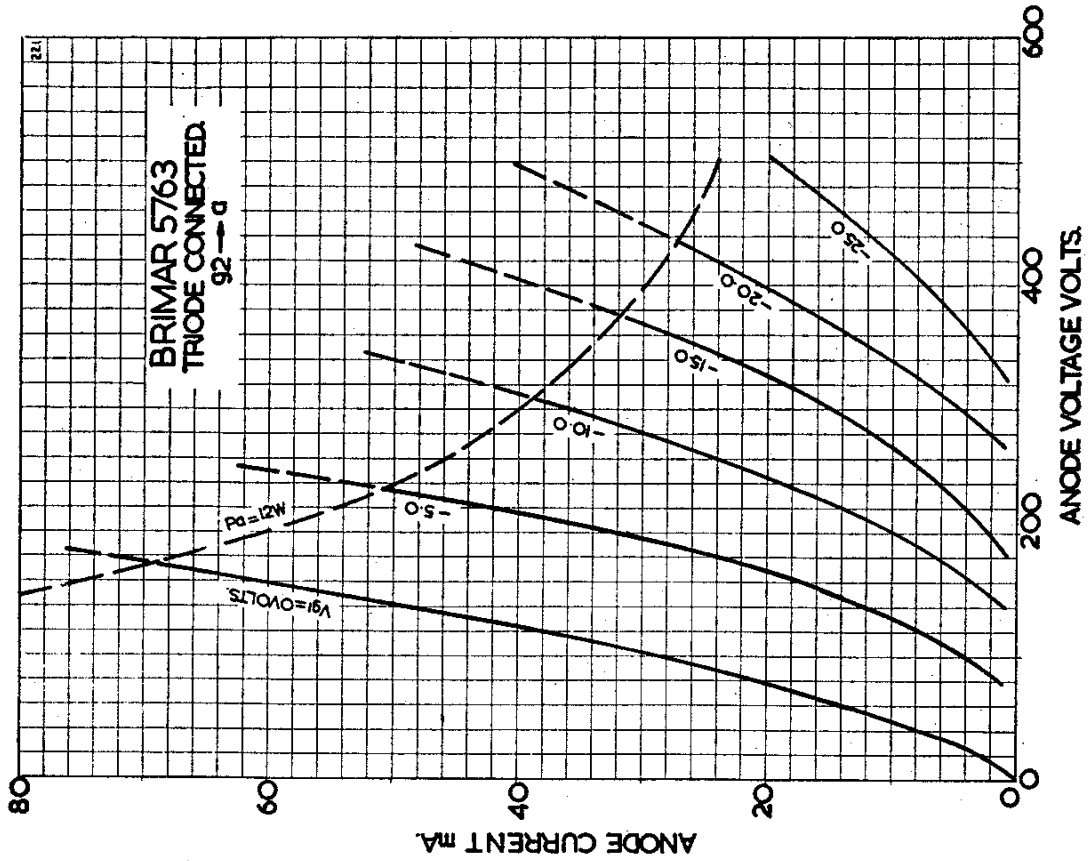
Input	9.5 pF
Output	4.5 pF
Control Grid to Anode	0.3 pF max.

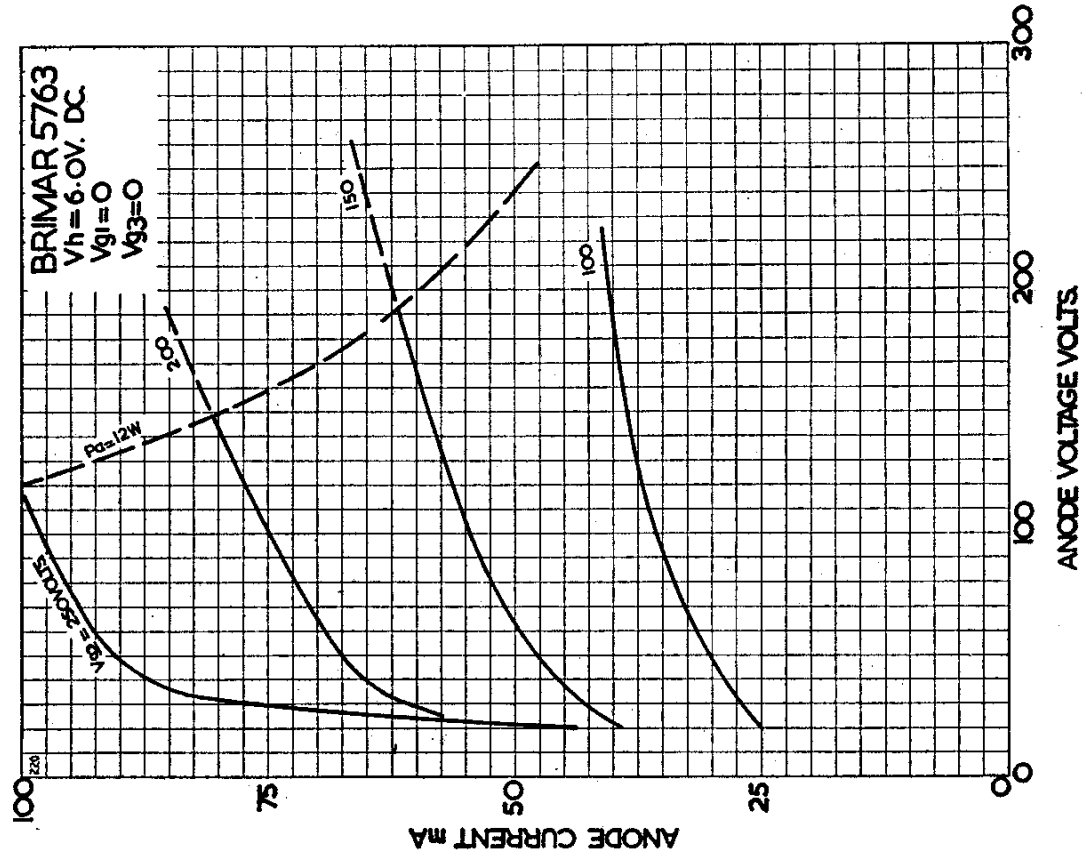
Type 5763 is a commercial equivalent of the CV2129.

5763


BRIMAR 5763.
V_f=6·0VOLTS. D.C.
V_{g2}=250VOLTS.
Ia=
Ig_1=
Ig_2=
102.
CONTROL GRID CURRENT. mA.
50 40 30 20 10 0
V_{g1}=+1SVOLTS.
+15.
+10.
+5.
0.
-5.
-10.
-15.
ANODE & SCREEN CURRENT. mA.
300 200 100 0
ANODE VOLTAGE.
400 300 200 100 0

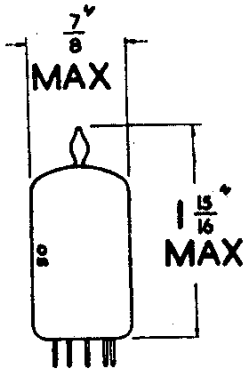
5763


BRIMAR 5763
TRIODE CONNECTED
g2 — a
Pa=12W
Vg1=0VOLTS
-5·0
-10·0
-15·0
-20·0
-25·0
ANODE CURRENT mA.
ANODE VOLTAGE VOLTS.
0
20
40
60
80
200
400
600


BRIMAR 5763
Vh=6·0V. DC.
Vg1=0
Vg3=0
Pa=12W
Vg2=250VOLTS
150
100
ANODE CURRENT mA
ANODE VOLTAGE VOLTS.
0
25
50
75
100
100
200
300

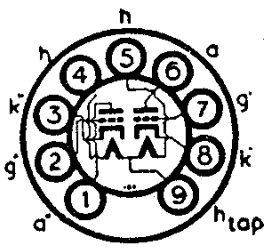
5965

Current Equipment Type



B9A Base

TYPE 5965 MINIATURE DOUBLE TRIODE



The BRIMAR 5965 is a miniature double triode designed for use in high-speed digital computers and other switching applications. Each triode section features a high zero-bias anode current, a sharp cut-off characteristic, and a separate cathode connection. In addition, the balance of the cut-off characteristic between the two sections is controlled. The heater-cathode construction is designed for dependable service under conditions of intermittent operation. When used in "on-off" control applications, the 5965 will maintain its emission capabilities after long periods of operation under cut-off conditions.

RATINGS (Absolute Maximum)

Heater Voltage (A.C. or D.C.)	6.3	or 12.6 volts
Heater Current	0.45	or 0.225 amp.
Anode Voltage		330 volts max.
Positive D.C. Grid Voltage		0 volts max.
Anode Dissipation		2.4 watts max.
Cathode Current		16.5 mA max.
Heater Cathode Voltage		100 volts max.
Grid Circuit Resistance—With Fixed Bias		0.1 megohm max.
With Cathode Bias		0.5 megohm max.

OPERATING CHARACTERISTICS (Each Section)

Anode Voltage	150 volts
Cathode Bias Resistor	220 ohms
Amplification Factor	47
Anode Resistance, approximate	7,250 ohms
Mutual Conductance	6.5 mA/V
Anode Current	8.2 mA

TYPICAL OPERATION (Computer Service, Each Section)

	On Condition	Off Condition	
Anode Supply Voltage	150	150	volts
Anode Load Resistor	7,200	7,200	ohms
Grid Voltage	0†	—	volts
Anode Current, approximate	10.5	—	mA
Grid Voltage for I_a = 150μA approx.‡	—	−5.5	volts

DIRECT INTER-ELECTRODE CAPACITANCES *

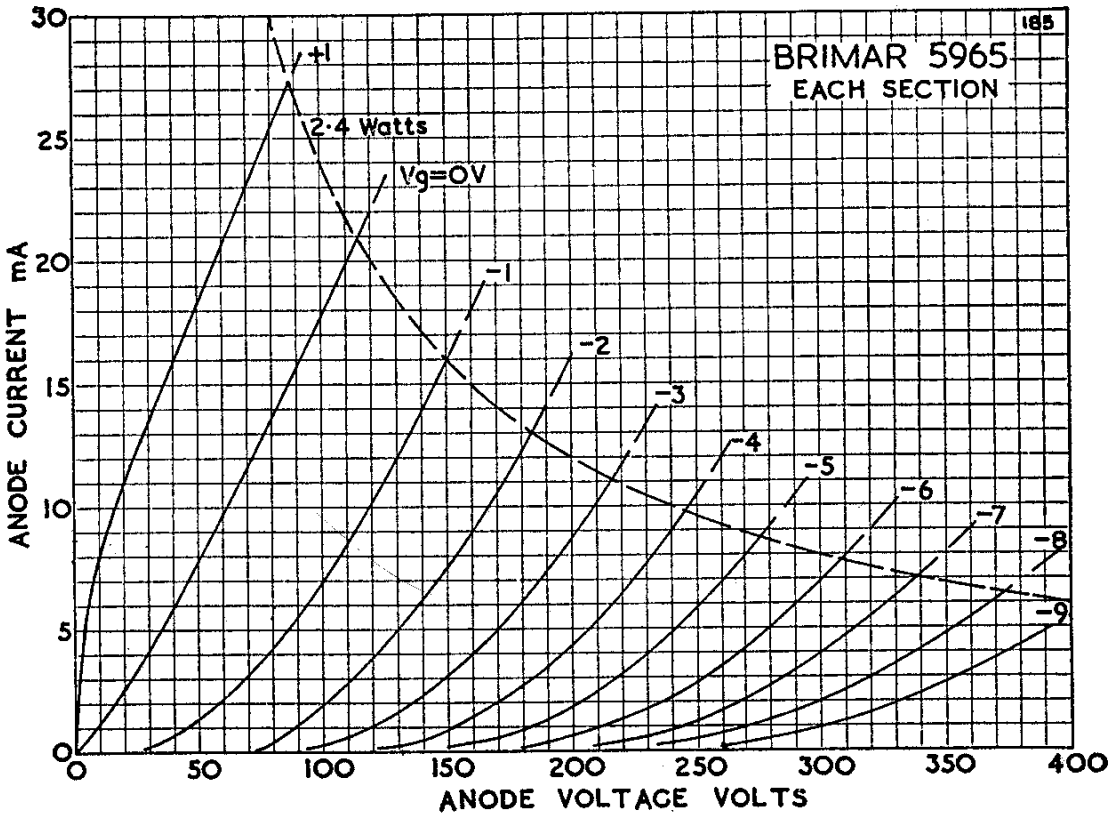
Grid to Anode (Each Section)	3.0 pF
Input (Each Section)	3.8 pF
Output (Section 1)	0.5 pF
Output (Section 2)	0.38 pF
Anode to Anode	0.5 pF

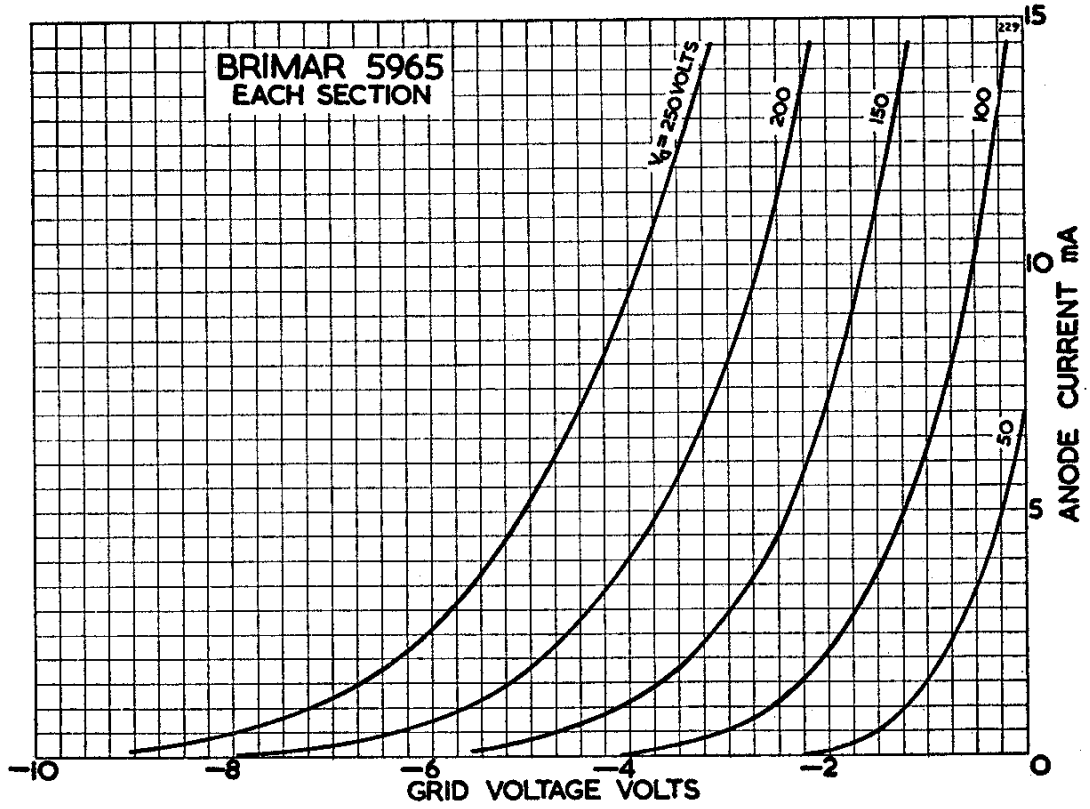
* *Without external shield.*

† *Approximate value of grid voltage with grid current adjusted for approximately 140μA.*

‡ *The grid voltage required to produce 150μA in one section normally will not differ by more than 1.5 volts from the grid voltage required to produce 150μA in the other section with an anode supply voltage of 150 volts and an anode load resistor of 7,200 ohms.*

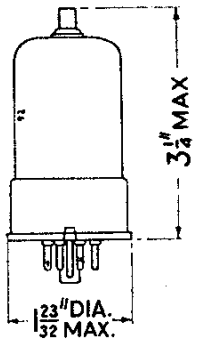
5965


BRIMAR 5965
EACH SECTION
185
+1
2·4 Watts
Vg=0V
-1
-2
-3
-4
-5
-6
-7
-8
-9
ANODE CURRENT mA
ANODE VOLTAGE VOLTS
0
5
10
15
20
25
30
50
100
150
200
250
300
350
400

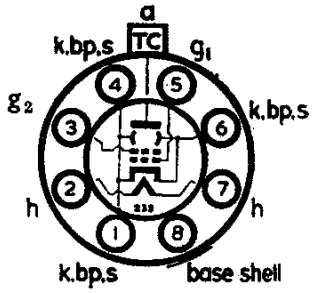

BRIMAR 5965
EACH SECTION
229
Va = 250 VOLTS
200
150
100
50
ANODE CURRENT mA
GRID VOLTAGE VOLTS
0
5
10
15
-10
-8
-6
-4
-2

6146

Current Equipment Type



TYPE 6146 (OCTAL BASE) R.F. POWER AMPLIFIER



The BRIMAR 6146 is an octal based beam tetrode for use as an R.F. power amplifier up to 175 Mc/s or as an A.F. power amplifier or modulator.

RATINGS (Absolute Maximum)

Heater Voltage	6.3 volts
Heater Current	1.25 amps.
Anode Voltage	600 volts max.
Anode Dissipation	20 watts max.
Screen Voltage	250 volts max.
Screen Dissipation	3 watts max.
Control Grid Voltage	—150 volts max.
Control Grid Current	3.5 mA max.
Control Grid Circuit Resistance—Fixed Bias	100 kilohms
Cathode Bias	500 kilohms
R.F. Amplifier or Oscillator	30 kilohms
Peak Heater to Cathode Voltage	135 volts max.
Hot Spot Bulb Temperature	220° C. max.

OPERATING CHARACTERISTICS

Anode Voltage	200 volts
Screen Voltage	200 volts
Anode Current	100 mA
Control Grid Voltage for Ia = 100mA	—29.5 volts approx.
Mutual Conductance	7 mA/V
Inner Amplification Factor (μg_1-g_2)	4.5

OPERATION AS A POWER AMPLIFIER (CLASS "C" TELEGRAPHY)

Operating Frequency	60	175	Mc/s
Anode Voltage	600	320	volts
Screen Voltage	150 *	180 †	volts
Control Grid Voltage	—58‡	—51 §	volts
Peak R.F. Drive Voltage	73	64	volts
Anode Current	112	140	mA
Screen Current	9	10	mA
Control Grid Current	2.8	2.0	mA
Drive Power	0.2	3	watts
Power Output	52	25	watts

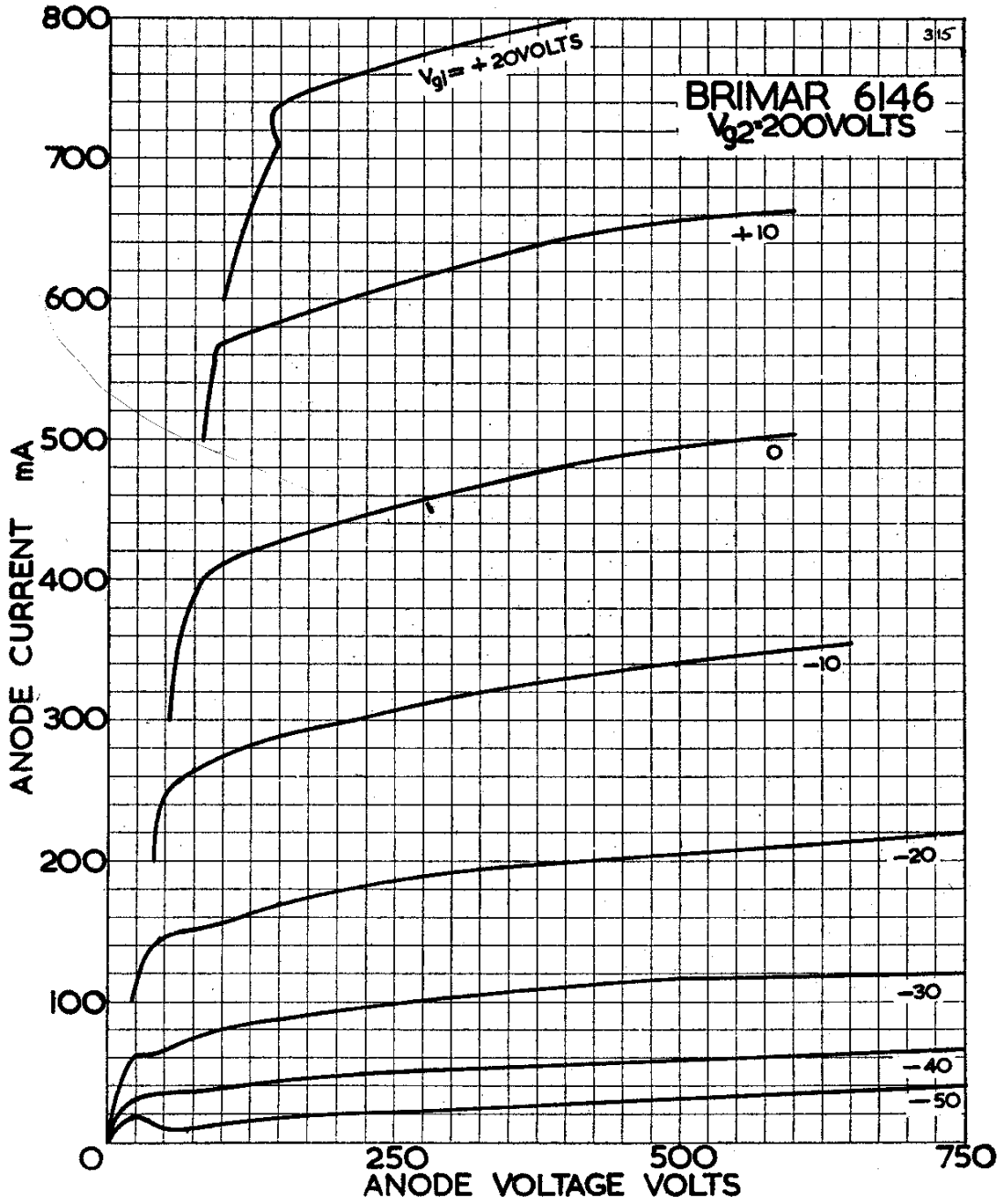
* *Grid No. 2 voltage must not exceed 400 volts under key up conditions.*
† *Derived from the 320 volt supply through a series resistor of 15.5 kilohms.*
‡ *Derived from a grid resistor of 20 kilohms or a cathode resistor of 470 ohms.*
§ *Derived from a grid resistor of 27 kilohms or a cathode resistor of 330 ohms.*

INTER-ELECTRODE CAPACITANCES

Input	13.5 pF
Output	9 pF
Control Grid to Anode	0.22 pF max.

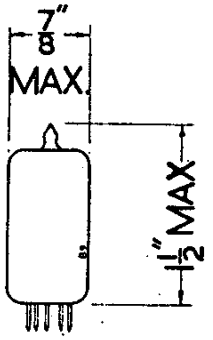
Type 6146 is a commercial equivalent of the CV3523.

6146


BRIMAR 6146
V_{g2}=200VOLTS
V_{g1}= +20VOLTS
+10
0
-10
-20
-30
-40
-50
ANODE CURRENT mA
800
700
600
500
400
300
200
100
0
250
500
750
ANODE VOLTAGE VOLTS

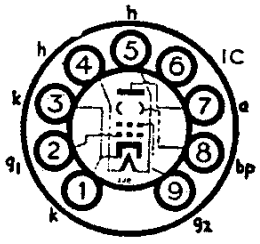
6688

Current Equipment Type



B9A Base

TYPE 6688 MINIATURE BEAM TETRODE WIDE-BAND AMPLIFIER



The BRIMAR 6688 is an indirectly-heated beam tetrode developed for general-purpose wide-band applications. It has a high mutual conductance, and a high ratio of mutual conductance to capacitance.

Heater Voltage	6.3 volts
Heater Current...	0.3 amp.

ABSOLUTE MAXIMUM RATINGS

Anode Voltage	210 volts max.
Anode Voltage (Ia = 0)	400 volts max.
Anode Dissipation	3 watts max.
Screen Voltage	175 volts max.
Screen Voltage (I_{g_2} = 0)	400 volts max.
Screen Dissipation	0.9 watts max.
Positive Control Grid Voltage	0 volts max.
Negative Control Grid Voltage	50 volts max.
Negative Peak Control Grid Voltage	100 volts max.
Cathode Current	25 mA max.
Control Grid Circuit Resistance (with fixed bias)	0.25 MΩ max.
Control Grid Circuit Resistance (with auto bias)	0.5 MΩ max.
Heater Cathode Potential	60 volts max.
Hot Spot Bulb Temperature	155°C max.

CHARACTERISTICS

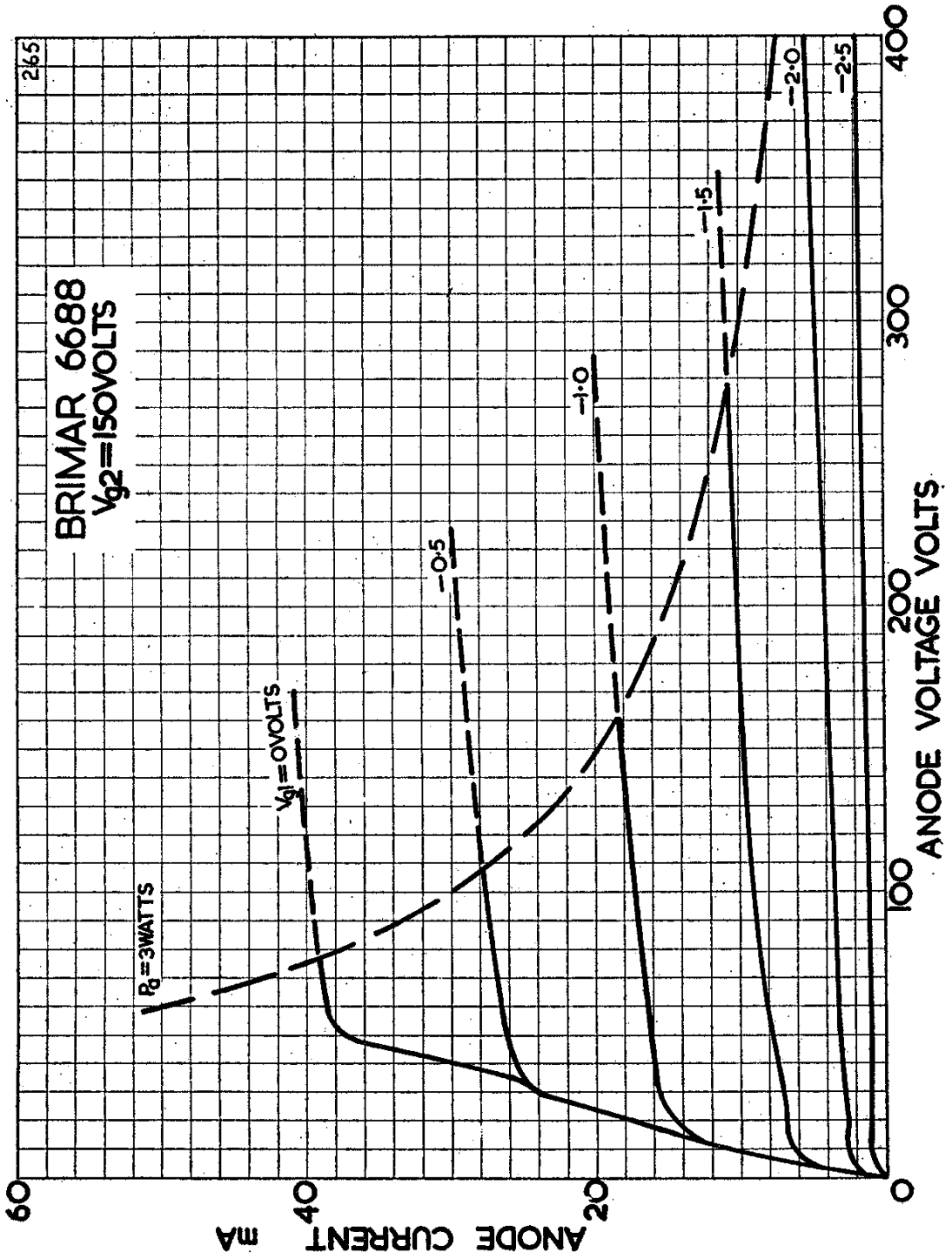
Anode Supply Voltage	190 volts
Screen Supply Voltage	160 volts
Anode Current	13 mA
Screen Current	3.3 mA
Control Grid Voltage	+9 volts
Cathode Resistor	630 Ω
Mutual Conductance	16.5 mA/V
Inner Amplification Factor (μg_1—g_2)	50
Anode Impedance	90 KΩ
Equivalent Noise Resistance (RF)	460 Ω

INTER-ELECTRODE CAPACITANCES*

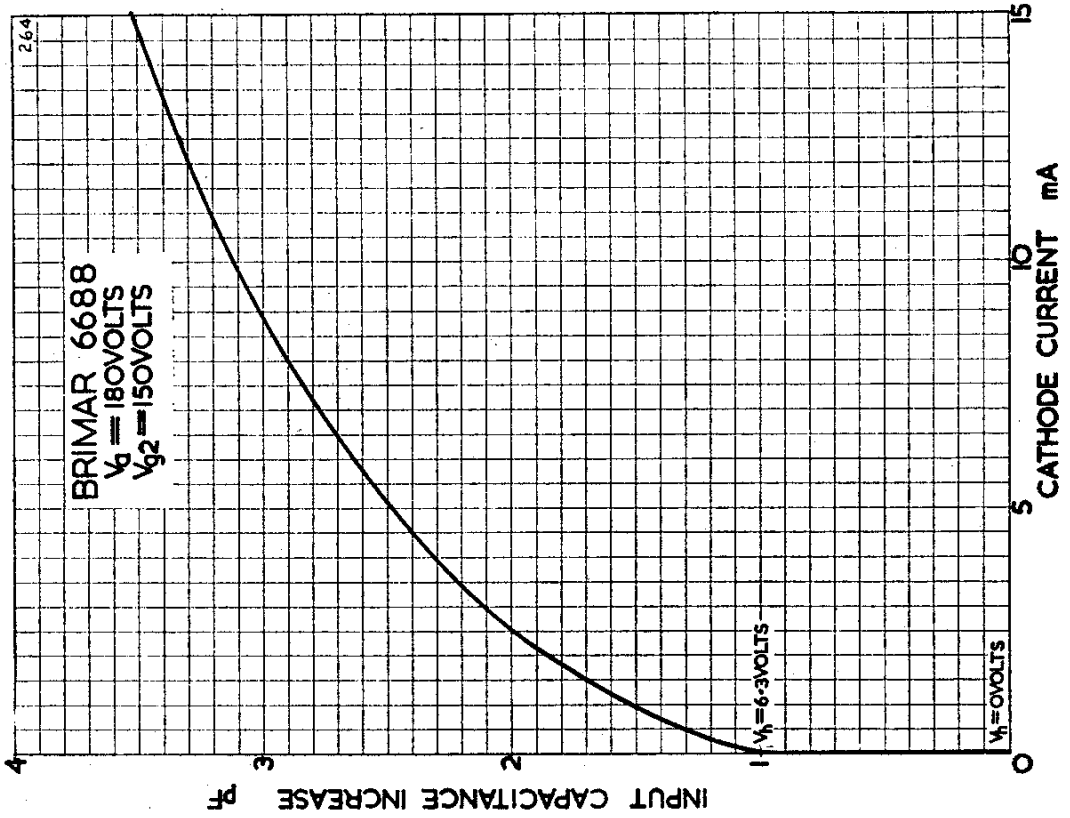
Control Grid to all	7.5 pF
Anode to all	3.0 pF
Anode to Control Grid	0.018 pF
Control Grid to all (I_k = 16.3 mA)	11.1 pF

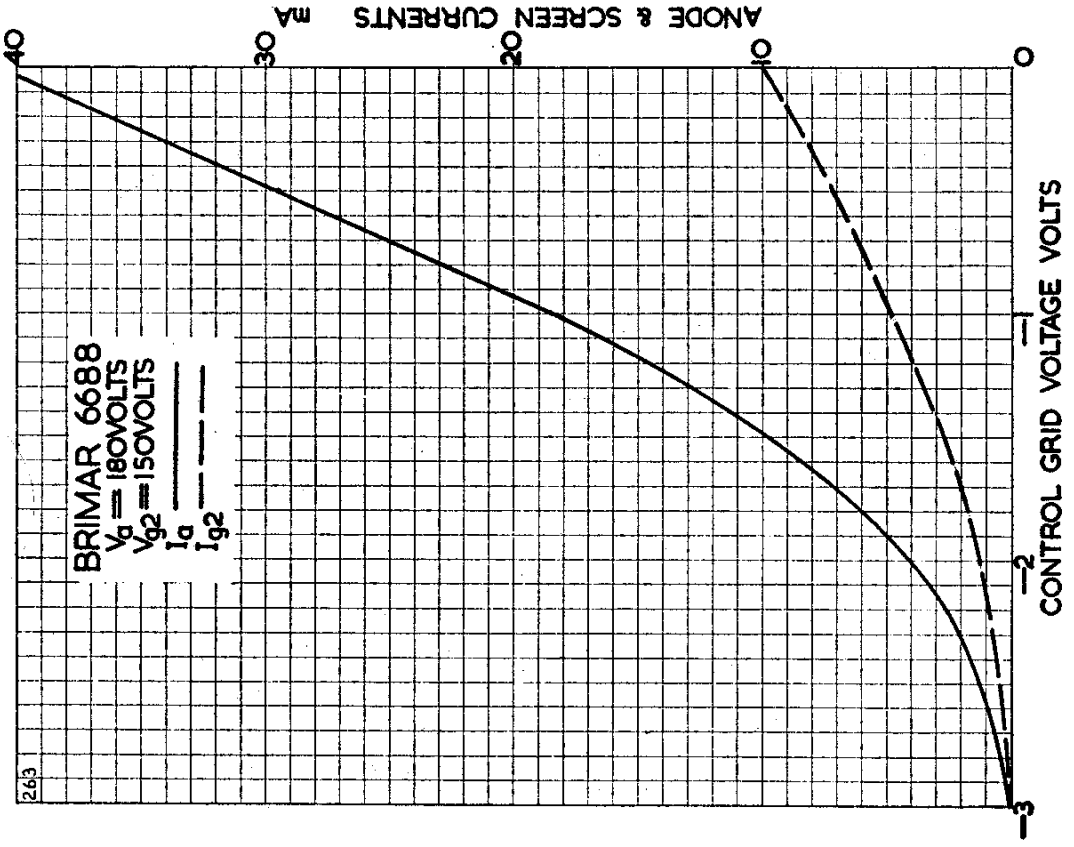
** Measured with external shield.*

6688

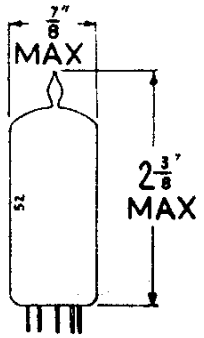

BRIMAR 6688
V_{g2}=150VOLTS
P_g=3WATTS
V_{g1}=0VOLTS
-0·5
-1·0
-1·5
-2·0
-2·5
2·65
ANODE CURRENT mA
60
40
20
0
100
200
300
400
ANODE VOLTAGE VOLTS

6688


264
BRIMAR 6688
Vb = 180VOLTS
Vg2 = 150VOLTS
Vh=6·3VOLTS
Vh=0VOLTS
INPUT CAPACITANCE INCREASE pF
CATHODE CURRENT mA
0
1
2
3
4
5
10
15


263
BRIMAR 6688
Vb = 180VOLTS
Vg2 = 150VOLTS
Ia
Ig2
ANODE & SCREEN CURRENTS mA
CONTROL GRID VOLTAGE VOLTS
0
10
20
30
40
-1
-2
-3

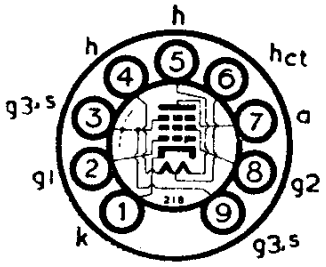
6870



B9A Base

Current Equipment Type

TYPE 6870 MINIATURE TRUSTWORTHY R.F. AND VIDEO PENTODE



The BRIMAR 6870 is a Trustworthy high slope pentode for use as a small transmitting valve or as a video valve giving a larger output with low anode loads than an ordinary R.F. amplifying pentode.

RATINGS

Heater Voltage	6.3 or 12.6 volts
Heater Current	0.6 or 0.3 amp.
Anode Voltage	300 volts max.
Anode Voltage ($I_a = 0$)	500 volts max.
Anode Dissipation	6.3 watts max.
Screen Voltage	250 volts max.
Screen Voltage ($I_{g2} = 0$)	500 volts max.
Screen Dissipation	2.0 watts max.
Control Grid Current (D.C.)	3 mA max.
Control Grid Circuit Resistance—Fixed bias	0.1 MΩ max.
Auto bias	0.5 MΩ max.
Cathode Current	50 mA max.
Frequency of Operation	150 Mc/s. max.
Shock (Intermittent Service)	550 g
Vibration (Continuous Service)	2.5 g

OPERATING CHARACTERISTICS (CLASS "A")

Anode Voltage	180	250 volts
Screen Voltage	180	250 volts
Autobias Resistor	56	120 Ω
Anode Current	25	25 mA
Screen Current	3.5	3.5 mA
Mutual Conductance	9.0	8.5 mA/V
Anode Impedance	170	230 kΩ
Inner Amplification Factor (μg_1—g_2)	35	35
Control Grid Voltage for $I_a = 100\mu A$	—9	—13.5V

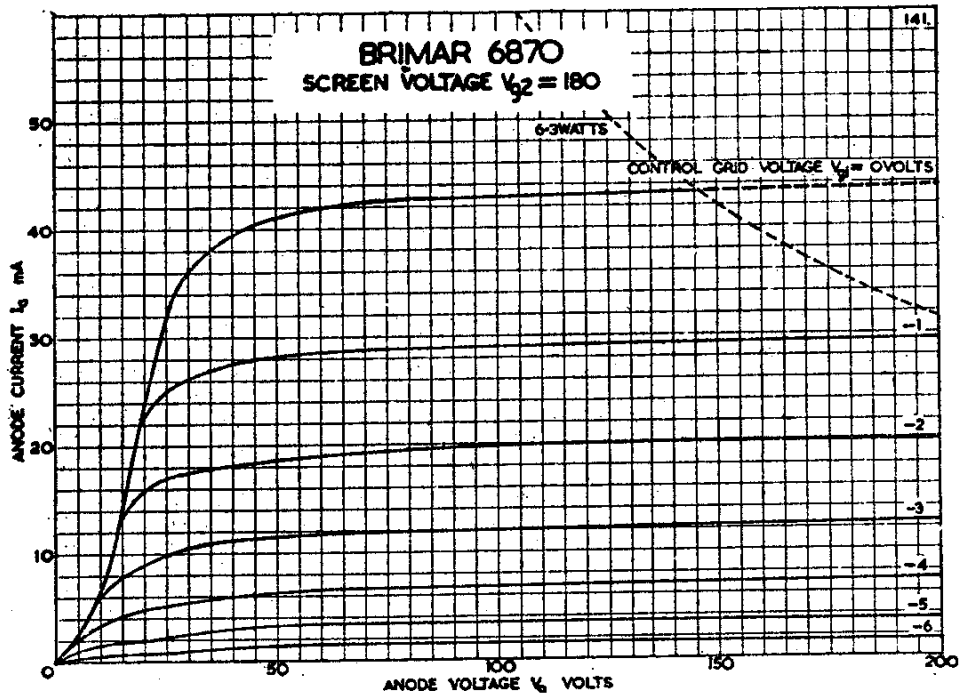
INTER-ELECTRODE CAPACITANCES *

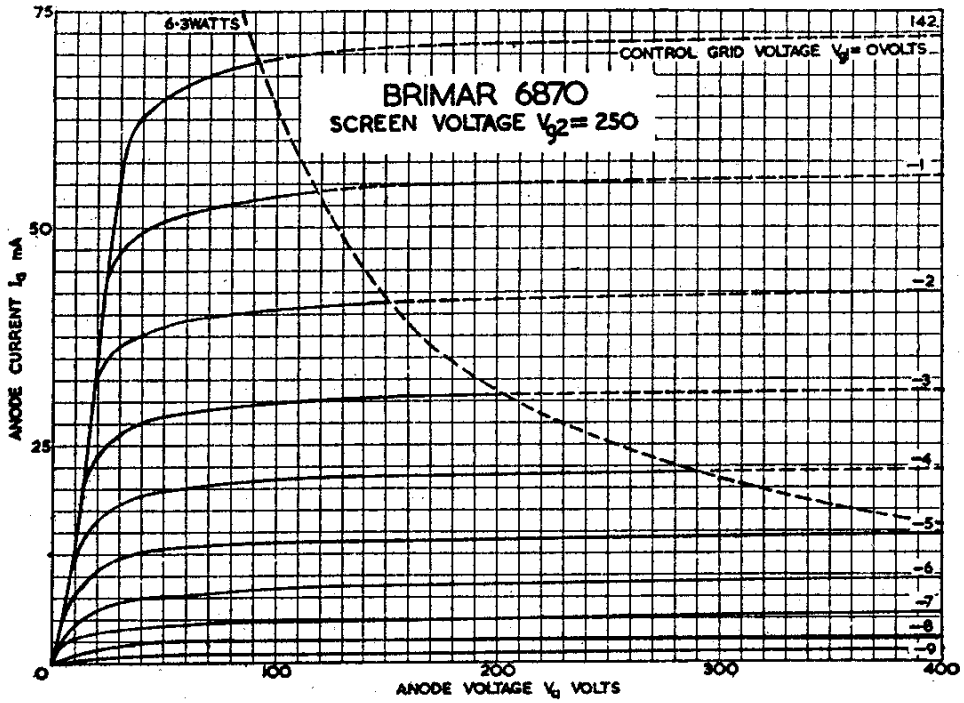
Input	8.5 pF
Output	7.0 pF
Control Grid to Anode	0.025 pF max.

Type 6870 is a commercial equivalent of the CV5121.

** With no external shield.*

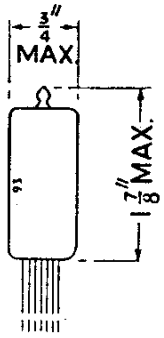
6870


141
BRIMAR 6870
SCREEN VOLTAGE V_{g2} = 180
6·3WATTS
CONTROL GRID VOLTAGE V_g = OVOLTS
-1
-2
-3
-4
-5
-6
ANODE CURRENT I_a mA
0
10
20
30
40
50
50
100
150
200
ANODE VOLTAGE V_a VOLTS

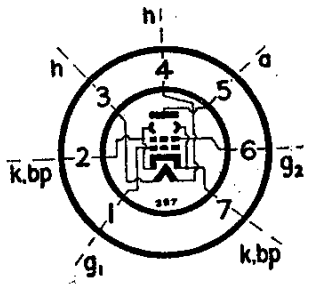

142
6·3WATTS
CONTROL GRID VOLTAGE V_g = OVOLTS
BRIMAR 6870
SCREEN VOLTAGE V_{g2} = 250
-1
-2
-3
-4
-5
-6
-7
-8
-9
ANODE CURRENT I_a mA
0
25
50
75
100
200
300
400
ANODE VOLTAGE V_a VOLTS

F/7001

Current Equipment Type



TYPE F/7001
MINIATURE TRUSTWORTHY FLYING-LEAD BEAM TETRODE



The BRIMAR F/7001 is a miniature beam tetrode intended primarily for use as an R.F. amplifier up to 50 Mc/s in mobile equipment. It is a trustworthy valve and has been designed for use under adverse conditions of vibration and shock.

RATINGS

Heater Voltage	6.3 volts
Heater Current	0.45 amps
Anode Voltage	250 volts abs. max.
Anode Voltage (Ia = 0)	550 volts abs. max.
Anode Dissipation	5.5 watts abs. max.
Screen Voltage	250 volts abs. max.
Screen Voltage (I_{g_2} = 0)	550 volts abs. max.
Screen Dissipation	1.1 watts abs. max.
Grid-Cathode Circuit Resistance—Fixed bias	100 kilohms max.
Cathode bias	500 kilohms max.
Cathode Current	55 mA abs. max.
Heater to Cathode Voltage	175 volts abs. max.
Bulb Temperature	210° C. abs. max.
Shock (short duration)	500 g abs. max.
Continuous Vibration	2.5 g abs. max.
Operating Frequency	50 Mc/s max.

OPERATING CHARACTERISTICS

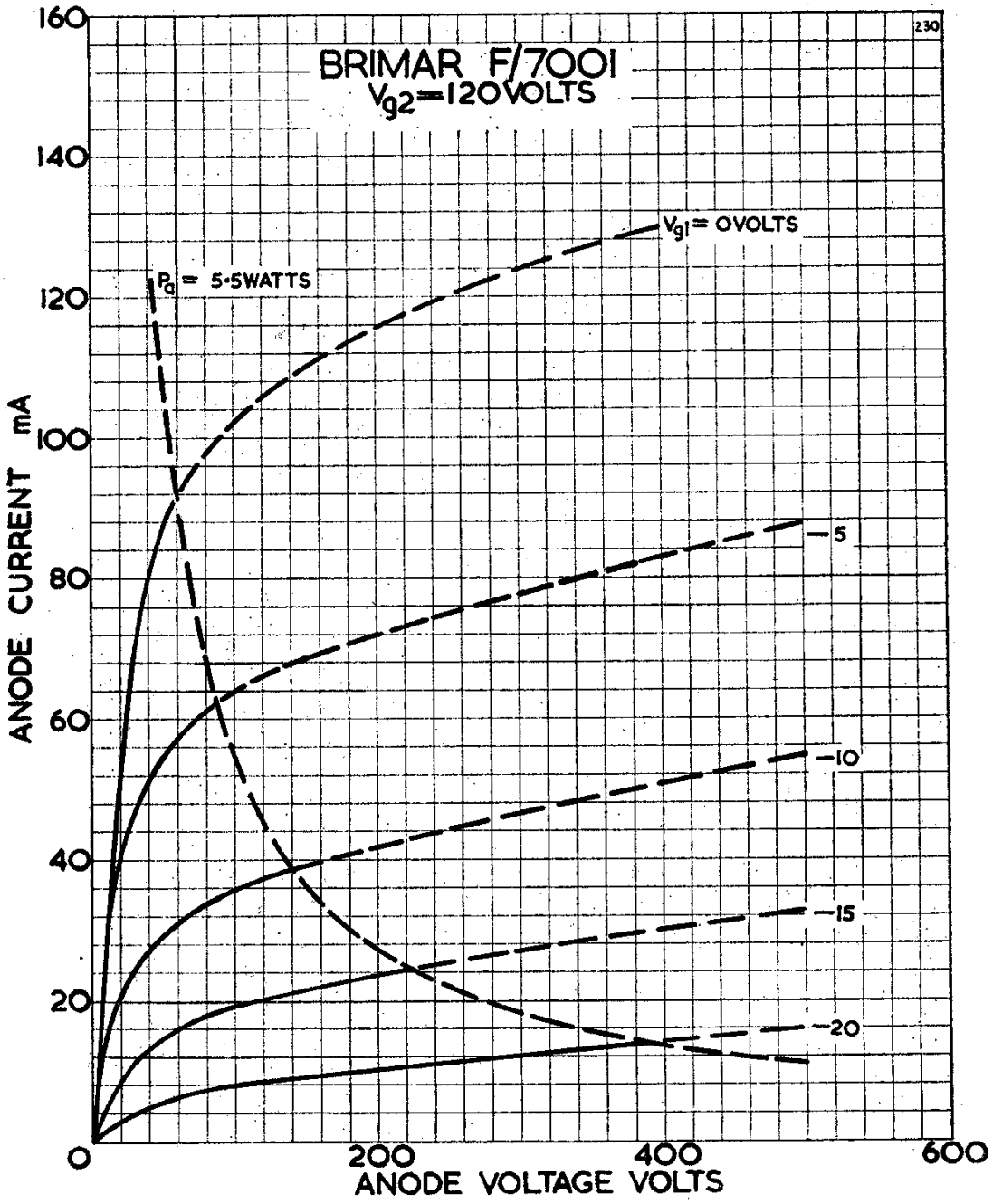
Anode Voltage	120 volts
Screen Voltage	120 volts
Control Grid Voltage	0 volts
Cathode Bias Resistor	250 ohms
Anode Current	35 mA
Screen Current	4 mA
Mutual Conductance	4.8 mA/V
Anode Impedance	15 kilohms
Inner Amplification Factor ($\mu g_1, g_2$)	5.5 approx.

INTER-ELECTRODE CAPACITANCES *

Input	7.0 pF
Output	8.75 pF
Grid to Anode	0.1 pF max.

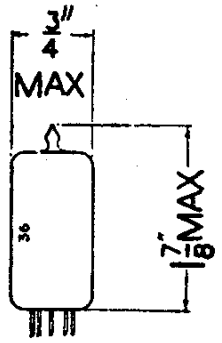
* *Measured with close fitting external shield.*

F/7001


BRIMAR F/7001
V_{g2}=120VOLTS
230
P_a = 5·5WATTS
V_{g1}= 0VOLTS
-5
-10
-15
-20
ANODE CURRENT mA
160
140
120
100
80
60
40
20
0
200
400
600
ANODE VOLTAGE VOLTS

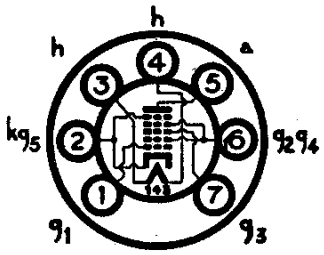
7032

Current Equipment Type



B7G Base

TYPE 7032
MINIATURE TRUSTWORTHY GATING HEPTODE



The BRIMAR 7032 is a long life miniature heptode with short grid base characteristics on grid 1 and grid 3. It is intended for use in computers as a gating amplifier or in variable time delay circuits. The indirectly heated cathode is designed to give good life and reliability when used for long periods under cut-off conditions. The valve is mounted on a B7G base and is of trustworthy construction to ensure satisfactory operation under conditions of vibration and shock.

HEATER

Heater Voltage ... ... 6.3 volts Heater Current ... ... 0.3 amp.

To ensure satisfactory life performance the heater voltage should be maintained within ±5 per cent. of the nominal value.

RATINGS (Absolute)

Anode Voltage	250 volts max.
Anode Dissipation	1.1 watts max.
Screen Supply Voltage	160 volts max.
Screen Voltage	See Curve
Screen Dissipation	1.1 watts max.
Grid 3 Voltage: Negative bias value	—100 volts max.
Positive bias value	0 volts max.
Grid 1 Voltage: Negative bias value	—50 volts max.
Positive bias value	0 volts max.
D.C. Cathode Current	20 mA max.
Peak Cathode Current	70 mA max.
Peak Heater to Cathode Potential	±100 volts max.
Grid 1 or Grid 3 circuit resistance: Fixed bias operation	0.5 M Ω max.
Cathode bias operation	1.0 M Ω max.
Shock (Intermittent service)	500 g max.
Vibration (Continuous service)	2.5 g max.

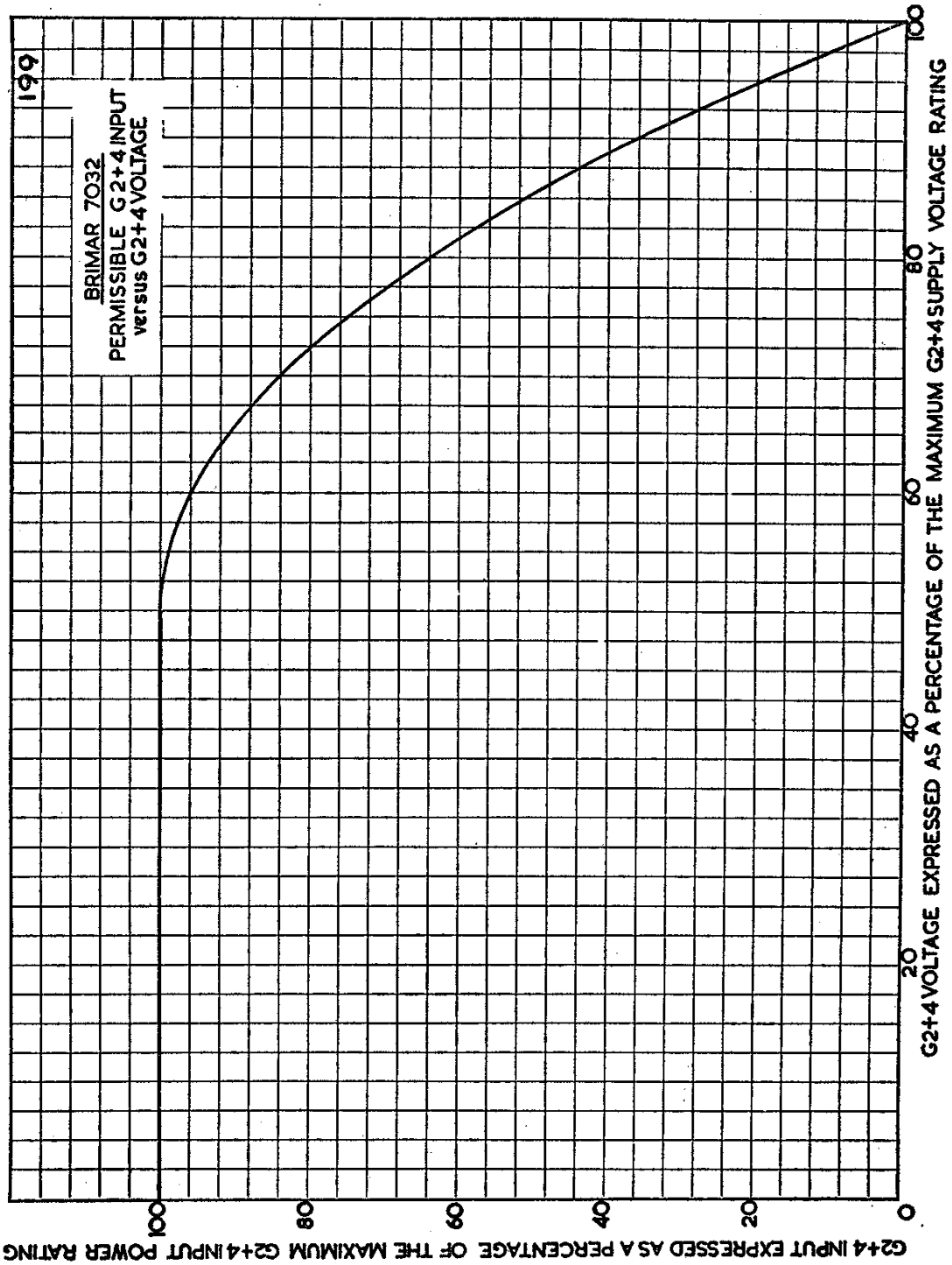
TYPICAL OPERATION

	Cut-off Conditions: Grid 1 control	Cut-off Conditions: Grid 3 control	Zero-bias condition	
Anode Voltage	150	150	150	volts
Screen Voltage	75	75	75	volts
Grid 1 Voltage	—6	0	0	volts
Grid 3 Voltage	0	—6	0	volts
Grid 1 Circuit Resistance	470	470	470	k Ω
Grid 3 Circuit Resistance	470	470	470	k Ω
Anode Current	< 100μA	< 100μA	3.5	mA
Screen Current	< 300μA	8.8 mA	6.0	mA
Mutual Conductance (g_1 — a)	—	—	1.4	mA/Volt
Mutual Conductance (g_3 — a)	—	—	0.65	mA/Volt

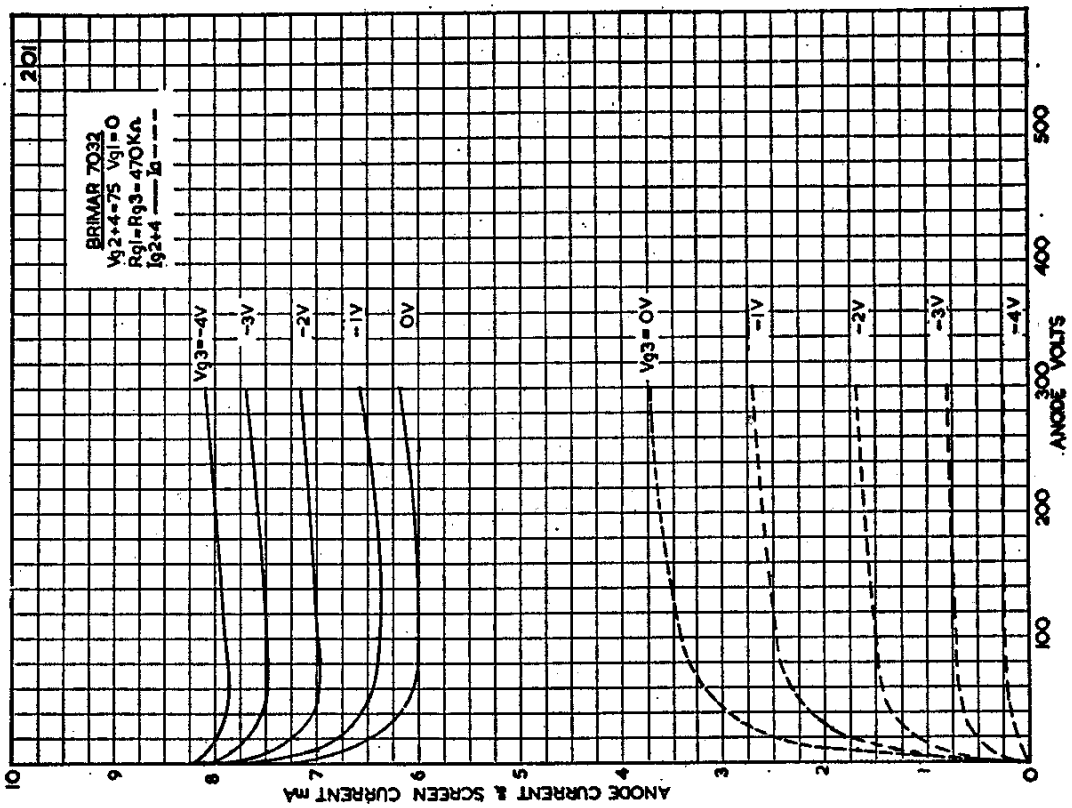
INTER-ELECTRODE CAPACITANCES
(Measured with external shielding)

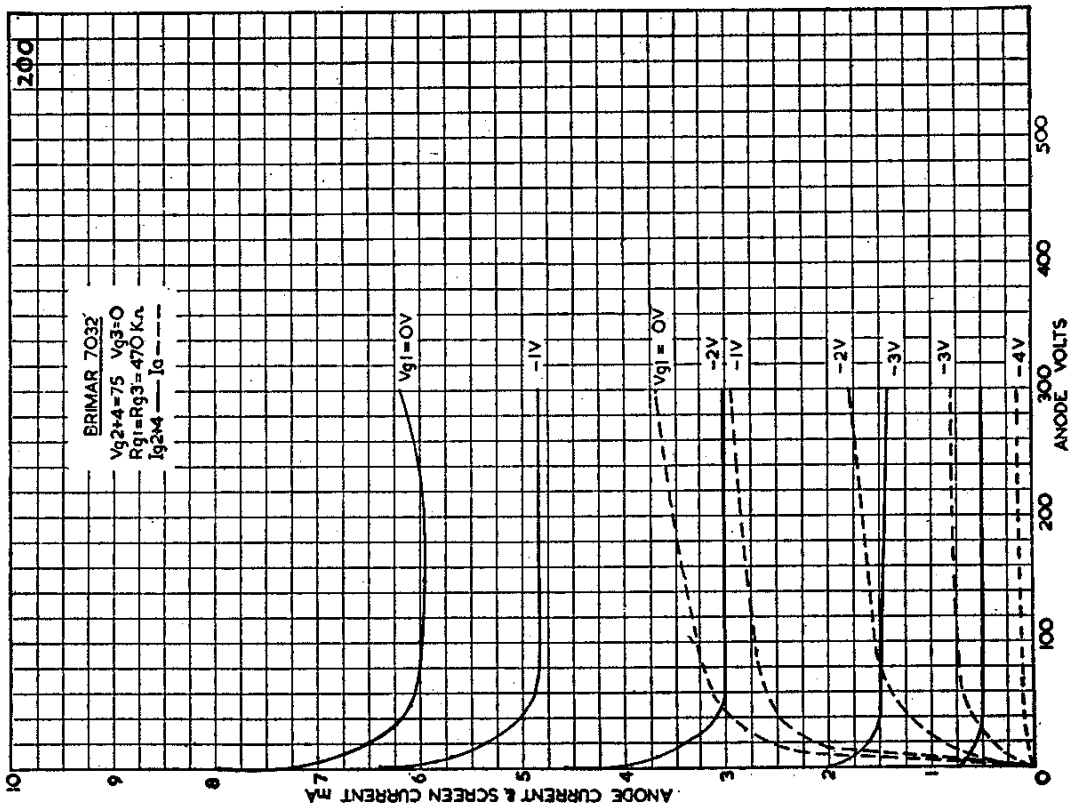
Grid 3 to Anode	0.35 pF max.	Grid 1 to Grid 3	0.15 pF max.
Grid 1 to Anode	0.05 pF max.	Anode to All	12.5 pF
Grid 3 to All	8.0 pF	Heater to Cathode	5.5 pF
Grid 1 to All	5.8 pF		

7032

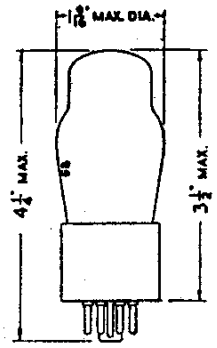

199
BRIMAR 7032
PERMISSIBLE G2+4 INPUT
versus G2+4 VOLTAGE
G2+4 INPUT EXPRESSED AS A PERCENTAGE OF THE MAXIMUM G2+4 INPUT POWER RATING
G2+4 VOLTAGE EXPRESSED AS A PERCENTAGE OF THE MAXIMUM G2+4 SUPPLY VOLTAGE RATING
0
20
40
60
80
100

7032


BRIMAR 7032
Vg2+4=75 Vg1=0
Rg1=Rg3=470K.Ω.
Ig2+4 ——— Ia - - -
Vg3=-4V
-3V
-2V
-1V
0V
Vg3=0V
-1V
-2V
-3V
-4V
ANODE CURRENT & SCREEN CURRENT mA
ANODE VOLTS
0
1
2
3
4
5
6
7
8
9
10
100
200
300
400
500

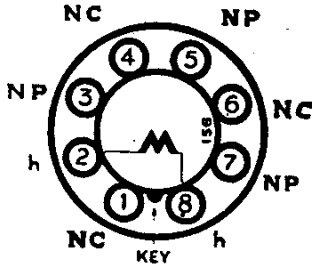

BRIMAR 7032
Vg2+4=75 Vg3=0
Rg1=Rg3=470K.Ω.
Ig2+4 ——— Ia - - -
Vg1=0V
-1V
Vg1=0V
-2V
-1V
-2V
-3V
-3V
-4V
ANODE CURRENT & SCREEN CURRENT mA
ANODE VOLTS
0
1
2
3
4
5
6
7
8
9
10
100
200
300
400
500

D15



Replacement Type

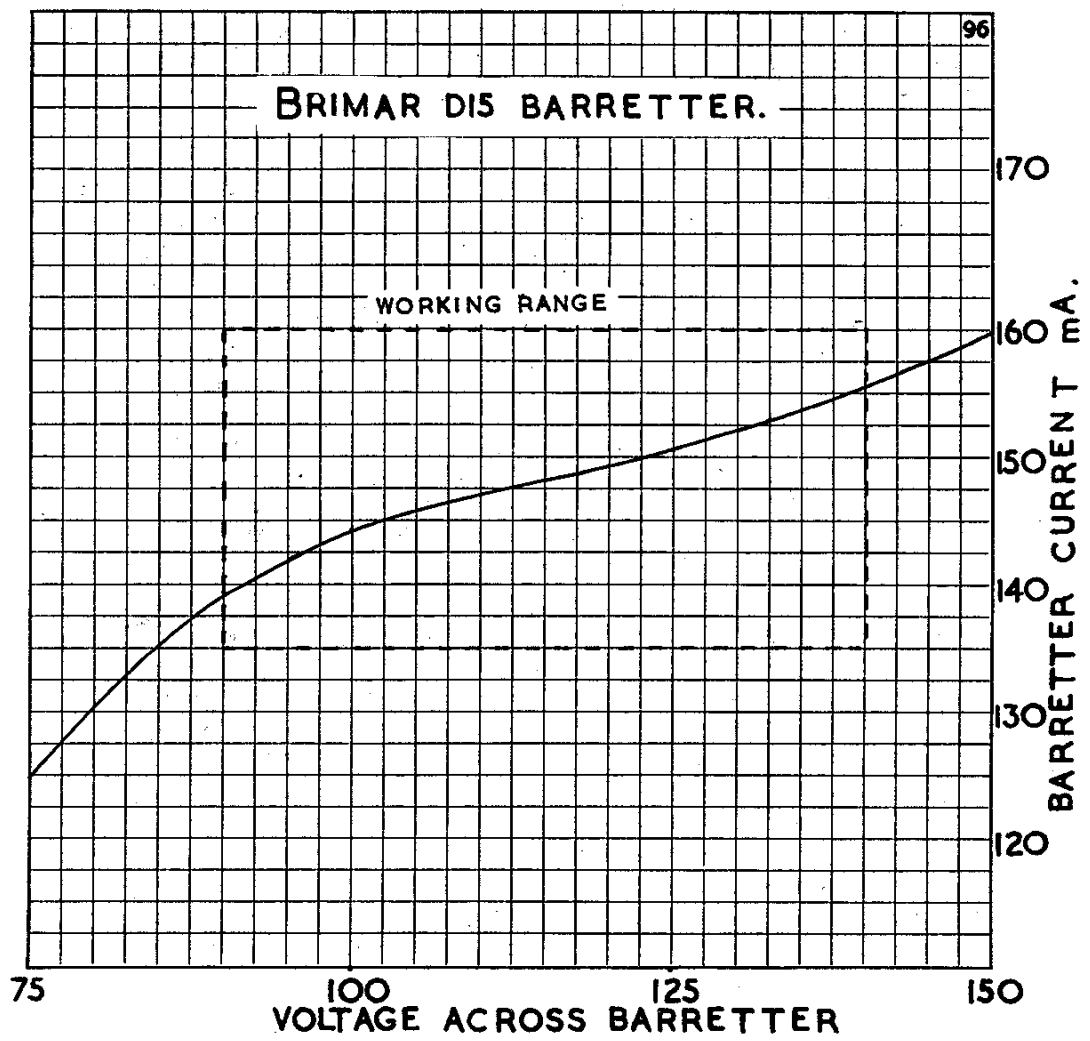
TYPE D15 (OCTAL BASE) CURRENT STABILISER



BRIMAR type D15 is a barretter suitable for use with the 0.15 amp. series of valves.

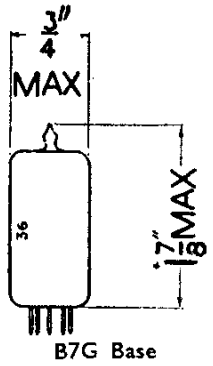
CHARACTERISTICS

Voltage Range ... ... 90-140 volts Operating Current ... 0.15 amp.

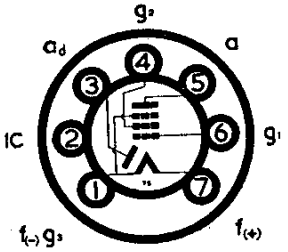


DAF96

Current Equipment Type



TYPE **DAF96**
MINIATURE BATTERY DIODE PENTODE



RATINGS

Filament Voltage	1.4 volts
Filament Current	0.025 amp.
Anode Voltage	90 volts max.
Screen (g_2) Voltage	90 volts max.
Cathode Current	0.25 mA max.

CHARACTERISTICS

Anode Voltage	67.5 volts
Screen Voltage	67.5 volts
Control Grid Voltage	—1.5 volts
Anode Current	170 μA
Screen Current	55 μA
Mutual Conductance	170 μA/V

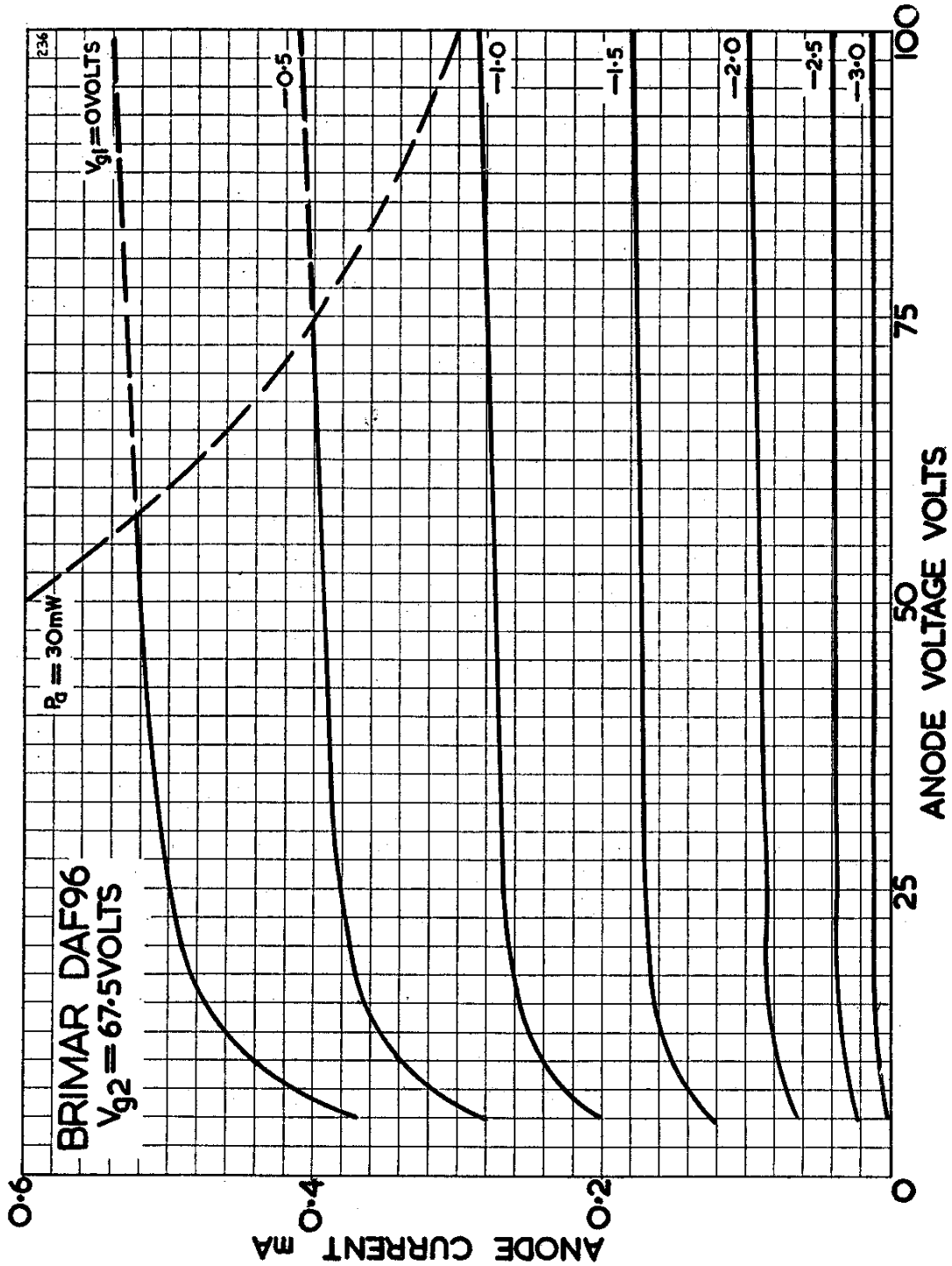
RESISTANCE CAPACITY COUPLED OPERATION

Anode and Screen Supply Voltage	85	64	volts
Anode Load Resistor	1	1	MΩ
Screen Series Resistor	2.7	2.7	MΩ
Control Grid Resistor	10	10	MΩ
Peak Output	7	7	volts pk.
Voltage Gain	60	52	

INTER-ELECTRODE CAPACITANCES (with no external Shield)

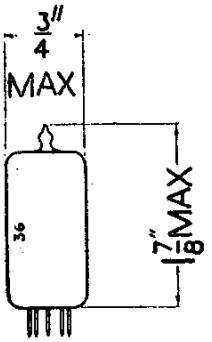
Input	1.8 pF
Output	2.7 pF
Control Grid to Anode	0.3 pF max.
Diode to all other Electrodes	1.1 pF

DAF96

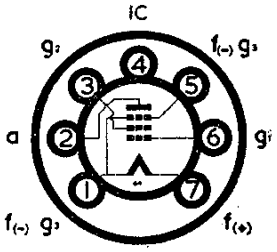

BRIMAR DAF96
V_{g2} = 67·5VOLTS
P_g = 30mW
V_{g1} = 0VOLTS
-0·5
-1·0
-1·5
-2·0
-2·5
-3·0
0·6
0·4
0·2
0
ANODE CURRENT mA
0
25
50
75
100
ANODE VOLTAGE VOLTS

DF96

Current Equipment Type



TYPE **DF96**
MINIATURE BATTERY VARI-MU PENTODE



RATINGS

Filament Voltage	1.4 volts
Filament Current	0.025 amp.
Anode Voltage	120 volts max.
Screen (g_2) Voltage	90 volts max.
Cathode Current	2.2 mA max

CHARACTERISTICS

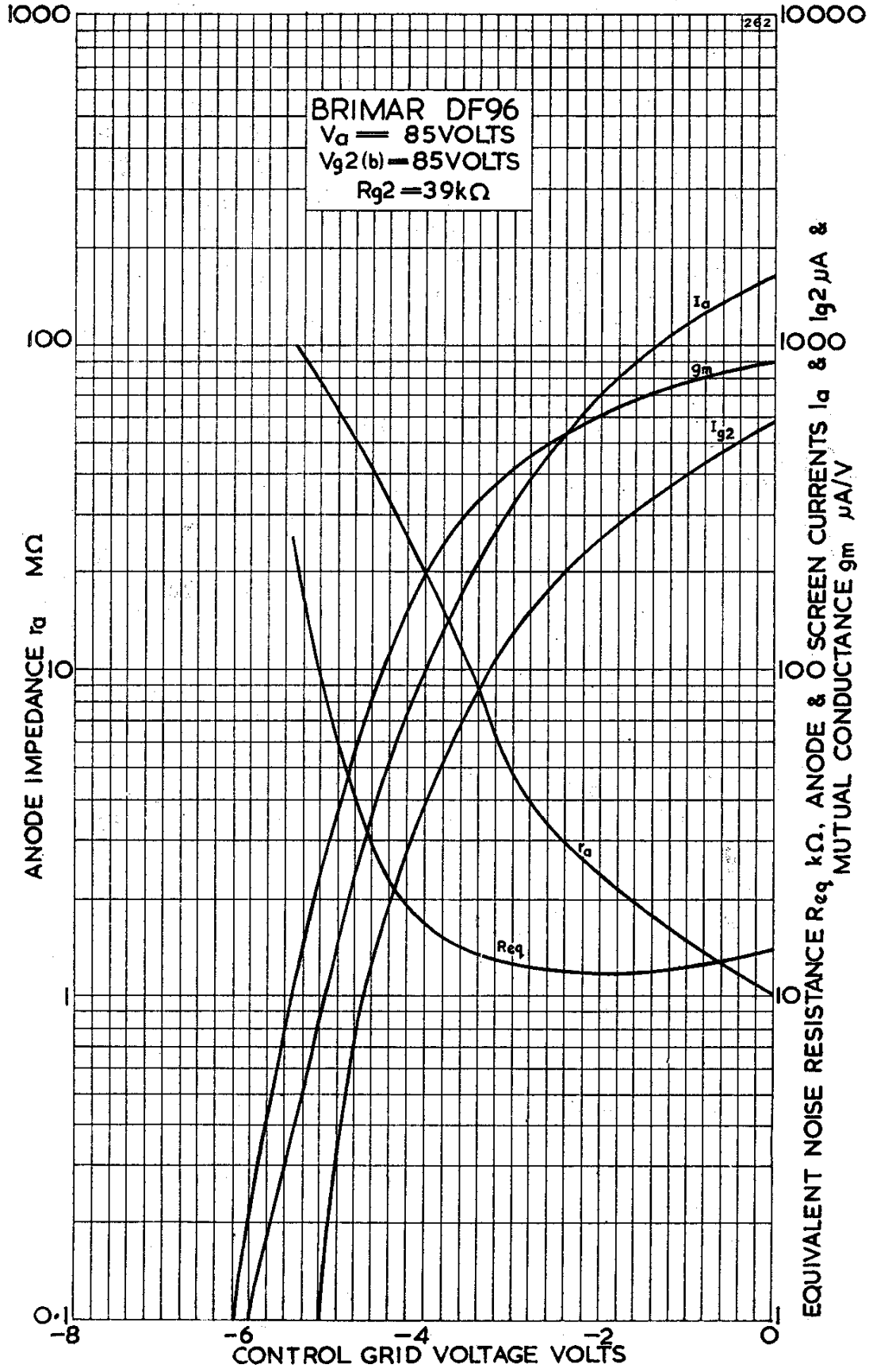
Anode Voltage	64	85	volts
Screen Series Resistor	0	39	kΩ
Control Grid Voltage	0	0	volts
Anode Current	1.65	1.65	mA
Screen Current	0.55	0.55	mA
Mutual Conductance	0.85	0.85	mA/V
Anode Impedance	0.7	1.0	MΩ
Inner μ (μ_{g1-g2})	18	18	
Control Grid Bias for g_m = 0.01 mA/V	—4.1	—5.5	volts

INTER-ELECTRODE CAPACITANCES *

Input	3.3 pF
Output	7.8 pF
Control Grid to Anode	0.01 pF max.

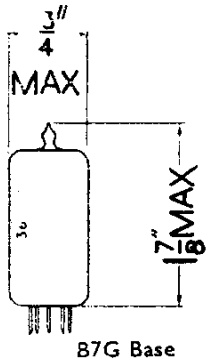
* *With no external shield.*

DF96

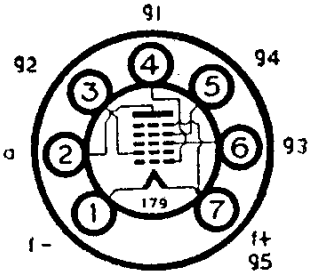

BRIMAR DF96
Va = 85VOLTS
Vg2(b) = 85VOLTS
Rg2 = 39kΩ
262
1000
100
10
1
0·1
10000
1000
100
10
1
Ia
gm
Ig2
ra
Req
ANODE IMPEDANCE ra MΩ
EQUIVALENT NOISE RESISTANCE Req kΩ, ANODE & SCREEN CURRENTS Ia & Ig2 µA & MUTUAL CONDUCTANCE gm µA/V
−8
−6
−4
−2
0
CONTROL GRID VOLTAGE VOLTS

DK96

Current Equipment Type



TYPE **DK96**
MINIATURE BATTERY HEPTODE FREQUENCY CHANGER



RATINGS

Filament Voltage	1.4 volts
Filament Current	0.025 amp.
Anode Voltage	90 volts max.
Screen (g_4) Voltage	90 volts max.
Oscillator Anode (g_2) Voltage	60 volts max.
Cathode Current	2.6 mA max.

CHARACTERISTICS

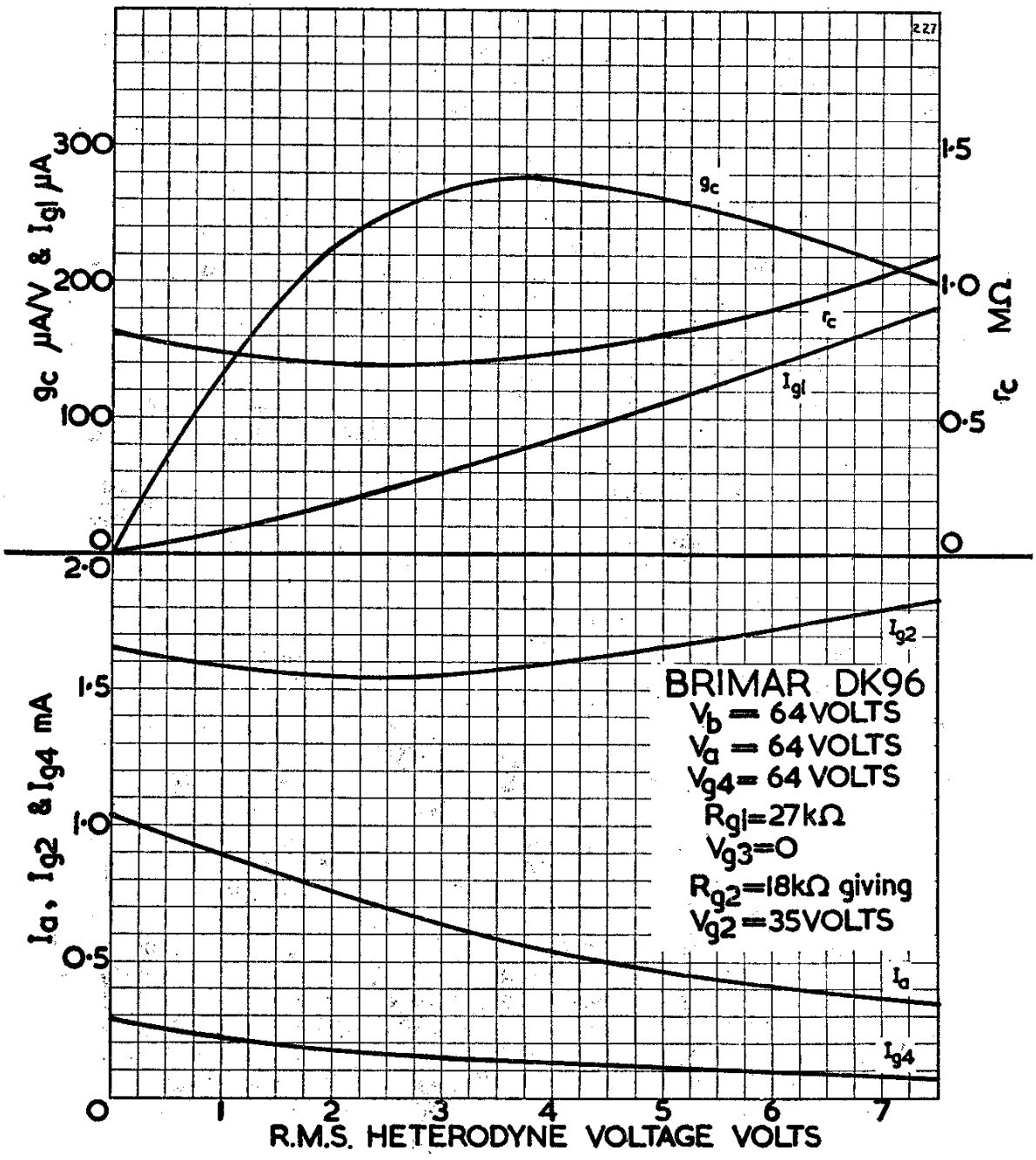
Anode Voltage	64	85	volts
Screen (g_4) Series Resistor	0	120	kΩ
Anode Current	0.55	0.6	mA
Screen (g_4) Current	0.12	0.14	mA
Oscillator Anode (g_2) Voltage	35	35	volts
Oscillator Anode Current	1.6	1.5	mA
Oscillator Grid Resistor	27	27	kΩ
Oscillator Grid Current	85	85	μA
Conversion Conductance	275	300	μA/V
Anode Impedance	0.75	0.8	MΩ
Control Grid Bias for $\frac{g_c}{100}$	—4.5	—6.5	volts

INTER-ELECTRODE CAPACITANCES *

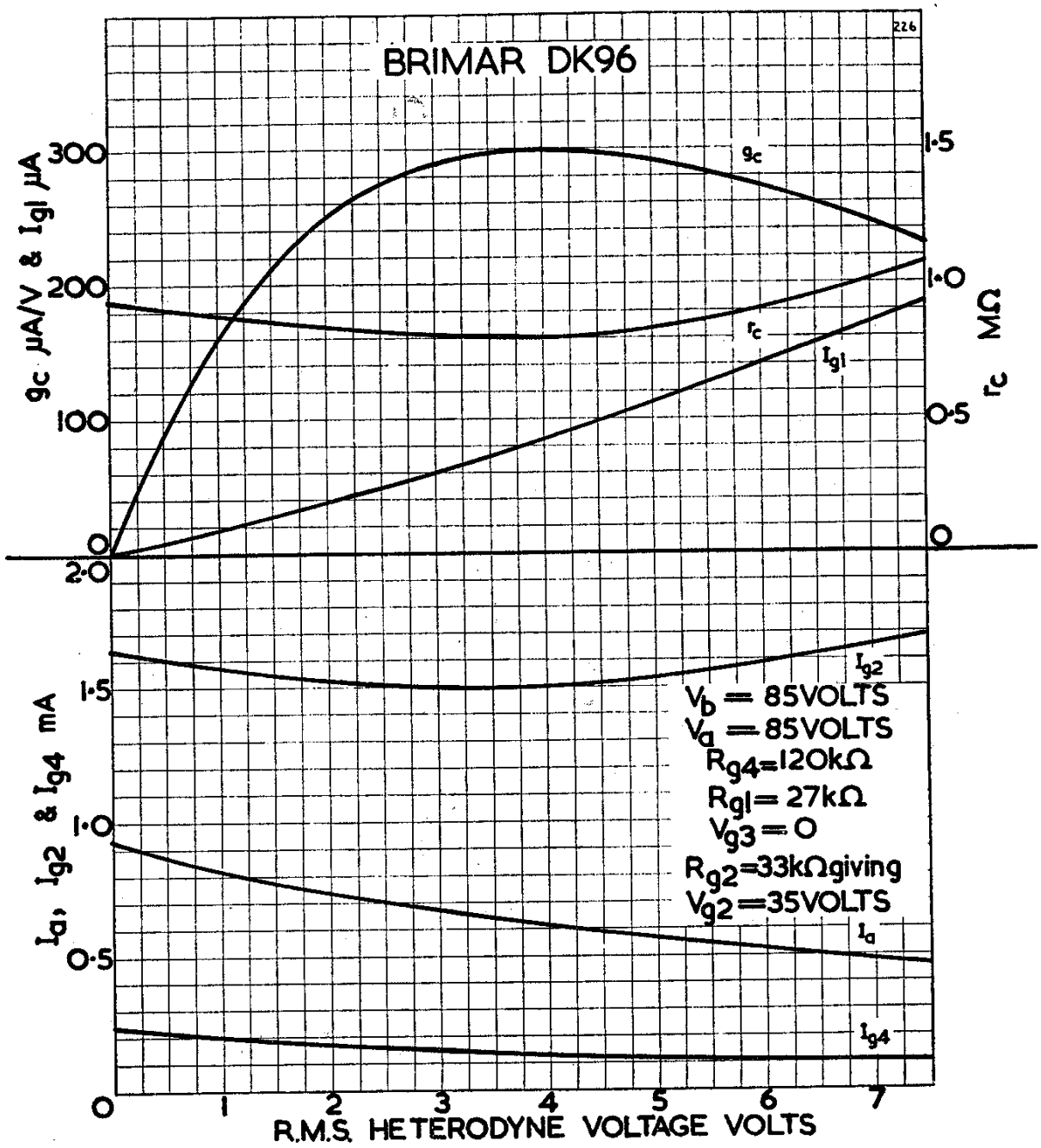
Oscillator Grid (g_1) to all	3.9 pF
Oscillator Anode (g_2) to all	4.8 pF
R.F. Input (g_3) to all	7.4 pF
I.F. Output (a) to all	8.1 pF
Oscillator Grid (g_1) to Anode	0.11 pF max.
Oscillator Anode (g_2) to Anode	0.3 pF max.
Control Grid (g_3) to Anode	0.36 pF max.
Oscillator Grid (g_1) to Osc. Anode (g_2)	3 pF
Oscillator Grid (g_1) to Control Grid (g_3)	0.2 pF max.
Oscillator Anode (g_2) to Control Grid (g_3)	1.6 pF

**With no external shield.*

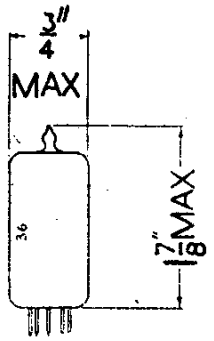
DK96


227
g_c μA/V & I_{g1} μA
300
200
100
0
g_c
r_c
I_{g1}
1·5
1·0
0·5
0
MΩ
r_c
2·0
1·5
1·0
0·5
0
I_a, I_{g2} & I_{g4} mA
I_{g2}
I_a
I_{g4}
BRIMAR DK96
V_b = 64 VOLTS
V_a = 64 VOLTS
V_{g4} = 64 VOLTS
R_{g1} = 27kΩ
V_{g3} = 0
R_{g2} = 18kΩ giving
V_{g2} = 35 VOLTS
0
1
2
3
4
5
6
7
R.M.S. HETERODYNE VOLTAGE VOLTS

DK96


226
BRIMAR DK96
gc μA/V & Igl μA
300
200
100
0
gc
rc
Igl
1·5
1·0
0·5
0
rc MΩ
2·0
1·5
1·0
0·5
0
Ia, Ig2 & Ig4 mA
Ig2
Vb = 85VOLTS
Va = 85VOLTS
Rg4=120kΩ
Rgl= 27kΩ
Vg3 = 0
Rg2=33kΩgiving
Vg2=35VOLTS
Ia
Ig4
0
1
2
3
4
5
6
7
R.M.S. HETERODYNE VOLTAGE VOLTS

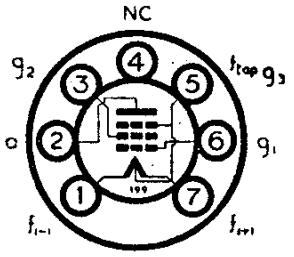
DL96



B7G Base

Current Equipment Type

TYPE **DL96**
MINIATURE BATTERY OUTPUT PENTODE



RATINGS

Filament Voltage	1.4	or 2.8 volts
Filament Current	0.05	or 0.025 mA
Cathode Current	6	4.5 mA max.
Anode Voltage		90 volts max.
Screen Voltage		90 volts max.

CHARACTERISTICS
(Filament parallel-connected)

Anode Voltage	64	85	volts
Screen Voltage	64	85	volts
Control Grid Voltage	—3.3	—5.2	volts
Anode Current	3.5	5	mA
Screen Current	0.65	0.9	mA
Mutual Conductance	1.3	1.4	mA/V
Anode Impedance	170	150	k Ω
Inner μ ($\mu g_1 - g_2$)	7	7	

OPERATING CHARACTERISTICS

	Parallel Filament		* Series Filament	
Anode Voltage	64	85	90	volts
Screen Voltage	64	85	90	volts
Control Grid Voltage	—3.3	—5.2	—6.3	volts
Anode Current	3.5	5	3.7	mA
Screen Current	0.65	0.9	0.7	mA
Anode Load Impedance	15	13	20	k Ω
Power Output (D_{tot} = 10%)	100	200	150	mW

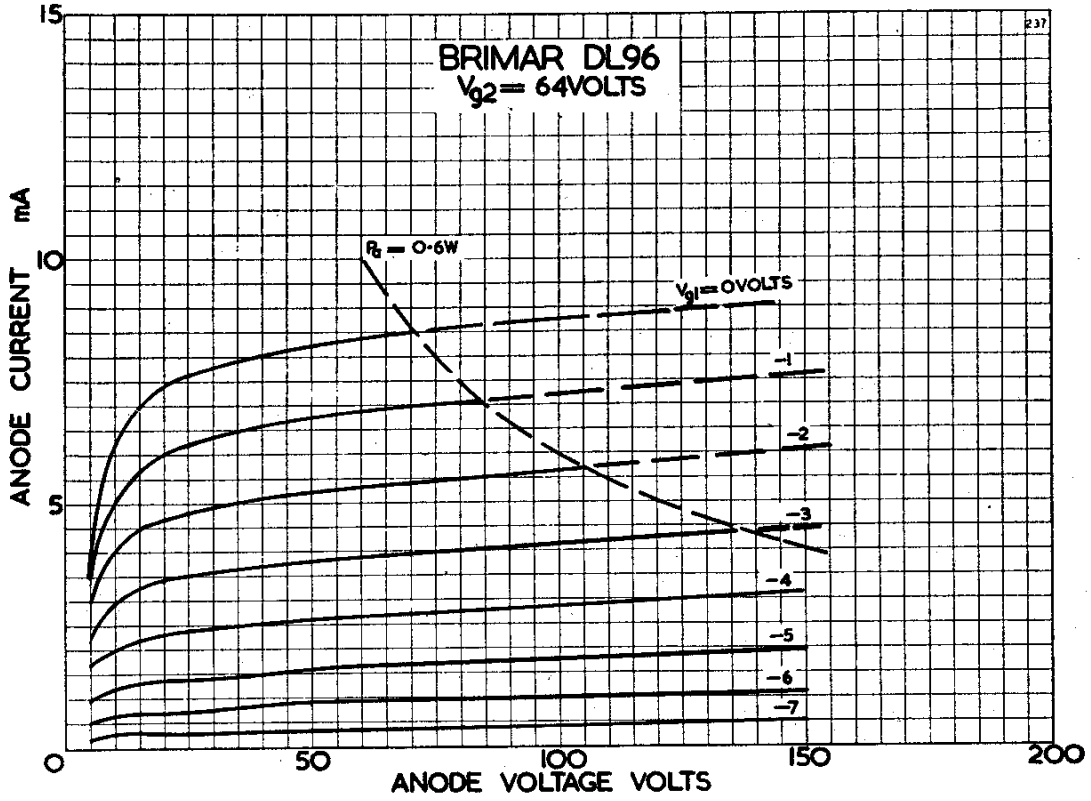
** Under these conditions a 680 Ω resistor should be connected between f_- and f_{tap}.*

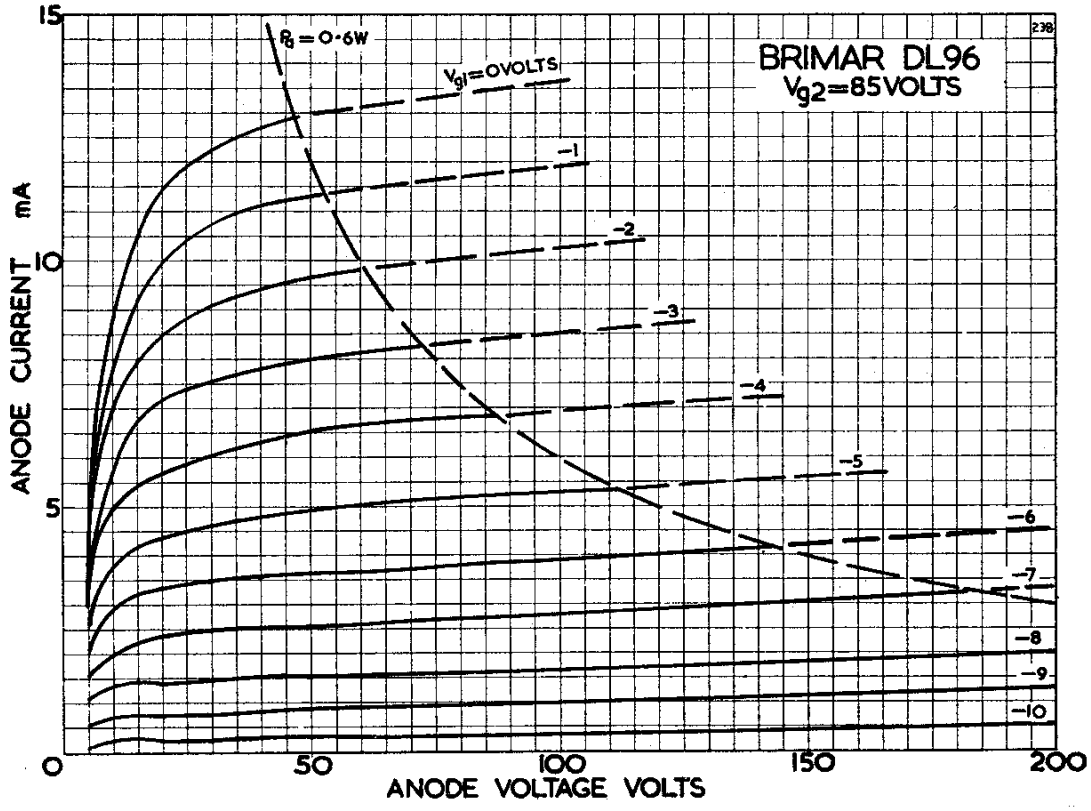
INTER-ELECTRODE CAPACITANCES *

Input	4.9 pF
Output	4.4 pF
Control Grid to Anode	0.4 pF max.

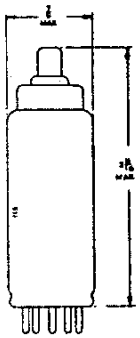
** With no external shield.*

DL96


237
BRIMAR DL96
V_{g2} = 64VOLTS
P_a = 0·6W
V_{g1} = 0VOLTS
-1
-2
-3
-4
-5
-6
-7
ANODE CURRENT mA
15
10
5
0
50
100
150
200
ANODE VOLTAGE VOLTS


238
BRIMAR DL96
V_{g2} = 85VOLTS
P_a = 0·6W
V_{g1} = 0VOLTS
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
ANODE CURRENT mA
15
10
5
0
50
100
150
200
ANODE VOLTAGE VOLTS

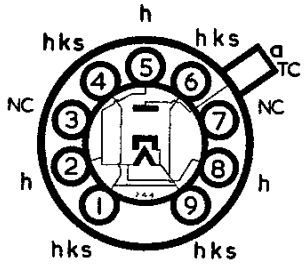
DY86



Current Equipment Type

TYPE **DY86**

MINIATURE HIGH VOLTAGE RECTIFIER



The BRIMAR DY86 is a noval based indirectly-heated half-wave rectifier for use in television receivers employing line fly-back EHT.

Heater Voltage 1.4 volts — Heater Current 0.55 amp.

RATINGS

Peak Inverse Voltage*	22	kV max
Peak Anode Current†	40	mA max
D.C. Anode Current	0.8	mA max

INTER-ELECTRODE CAPACITANCES

Anode to heater, cathode and screen	1.7 pF approx.

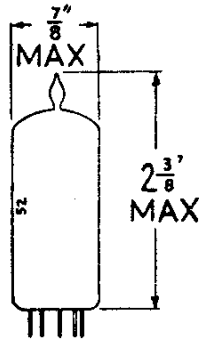
* Maximum duration 18 per cent of a line scanning cycle with a maximum of 18μ sec.

† Maximum duration 10 per cent of a line scanning cycle with a maximum of 10μ sec.

NOTE.—Precautions must be taken to prevent corona discharge from the connections to this valve by ensuring that no sharp points or bends occur in the wiring and adequate spacing must be left between the valve and surrounding components.

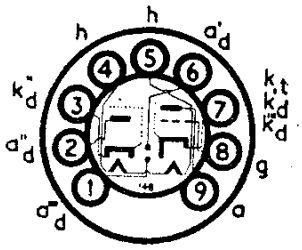
Pins 3 and 7 may be connected to points in the heater circuit only and must not be earthed. No low potential circuits should be connected to any base pins.

EABC80 EBF80



Current Equipment Type

TYPE EABC80
MINIATURE
TRIPLE DIODE TRIODE



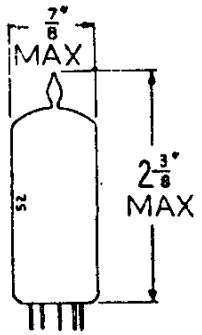
B9A Base

The type EABC80 is primarily intended for use as the demodulator/1st A.F. Amplifier in A.M./F.M. Receivers, one diode having a separate cathode, Diodes 2 and 3 should be used for discriminator circuits, Diode 1 for A.M. demodulator and A.G.C. circuits.

RATINGS

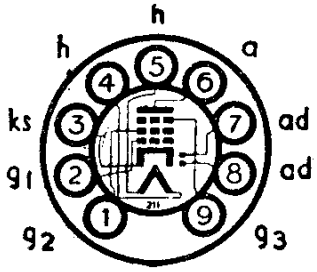
Heater Voltage	6.3 volts	Diode 1 Current	1 mA max.
Heater Current	0.45 amp.	Diode 2 Current	10 mA max.
		Diode 3 Current	10 mA max.

For characteristics of Triode Section refer to type 6AT6.



Replacement Type

TYPE EBF80
MINIATURE
DOUBLE DIODE
VARI-MU PENTODE



B9A Base

RATINGS

Heater Voltage	6.3 volts
Heater Current	0.3 amp.
Anode Voltage	300 volts max.
Anode Voltage ($I_a = 0$)	500 volts max.
Screen Voltage	300 volts max.
Screen Voltage ($I_{g_2} = 0$)	500 volts max.
Anode Dissipation	1.5 watts max.
Screen Dissipation	0.3 watts max.
Cathode Current	10 mA max.
Heater-Cathode Voltage	100 volts max.
Diode Current	0.8 mA max.

OPERATING CHARACTERISTICS (PENTODE SECTION)

Anode Voltage	250 volts
Screen Voltage	85 volts
Control Grid Voltage	−2 volts
Anode Current	5 mA
Screen Current	1.75 mA
Mutual Conductance	2.2 mA/V
Anode Impedance	1.5 MΩ
Inner Amplification Factor ($\mu_{g_1-g_2}$)	18

OPERATION AS RESISTANCE COUPLED A.F. AMPLIFIER

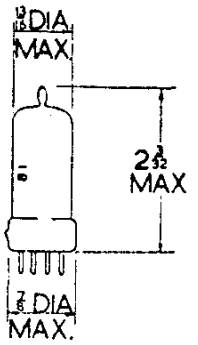
Anode and Screen Supply Voltage	250	250	250	250 volts
Anode Resistor	220	100	220	100kΩ
Screen Series Resistor	680	270	680	270kΩ
Control Grid Resistor	1	1	10	10MΩ
Control Grid Resistor (following stage)	680	330	680	330kΩ
Cathode Bias Resistor	1200	560	0	0Ω
Stage Gain	150	100	185	125

INTER-ELECTRODE CAPACITANCES*

Pentode Section:	
Input	4.2 pF
Output	4.9 pF
Grid to Anode	0.0025 pF max.
Diode Section:	
Diode 1 Anode to Cathode	2.2 pF
Diode 2 Anode to Cathode	2.35 pF
Diode 1 Anode to Pentode Control Grid	0.0008 pF max.
Diode 2 Anode to Pentode Control Grid	0.001 pF max.

** With no external shield.*

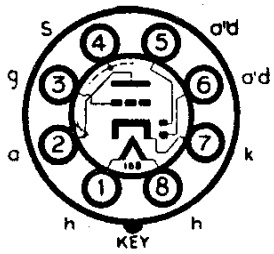
EBC41
ECC81 (see type 12AT7)
ECC82 (see type 12AU7)
ECC83 (see type 12AX7)
ECC84



B8A Base

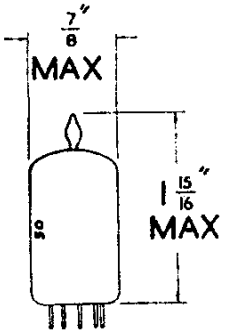
Replacement Type

TYPE **EBC41**
MINIATURE
DOUBLE DIODE TRIODE



CHARACTERISTICS

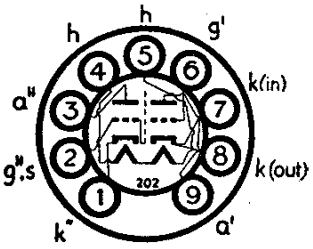
Heater Voltage	6.3 volts
Heater Current	0.23 amp.
Anode Voltage	250 volts
Grid Voltage	—3 volts
Anode Current	1 mA
Amplification Factor	70
Mutual Conductance	1.3 mA/V
Anode Impedance	54 k Ω



B9A Base

Current Equipment Type

TYPE **ECC84**
MINIATURE
HIGH SLOPE
DOUBLE TRIODE



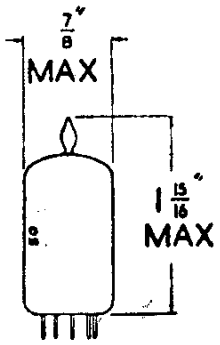
The BRIMAR ECC84 consists of two separate high slope triode units designed for use in V.H.F. cascode amplifiers. Normally, triode 1 is operated as a grounded cathode stage directly coupled to triode 2 which is connected as a grounded grid stage. This gives a low noise input amplifier for use in television receivers for Band III. The shield connected to the grid of triode 2 keeps coupling between the two units to a minimum.

Heater Voltage	6.3 volts
Heater Current	0.335 amp.

For further information refer to type PCC84.

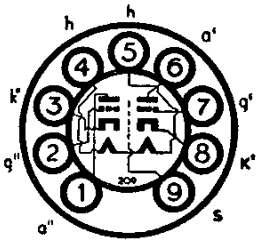
ECC85

Current Equipment Type



B9A Base

TYPE **ECC85**
MINIATURE
HIGH SLOPE
DOUBLE TRIODE



BRIMAR type ECC85 is a Noval based double triode intended primarily as an R.F. amplifier and frequency changer in F.M. receivers.

RATINGS

Heater Voltage	6.3 volts
Heater Current	0.435 amp.
Anode Voltage ($I_a = 0$)	550 volts max.
Anode Voltage	300 volts max.
Anode Dissipation	2.5 watts max.
Anode Dissipation ($p_a' + p_a''$)	4.5 watts max.
Cathode Current	15 mA max
Grid Voltage	—100 volts. max.
Grid Resistance	1 MΩ max.
Heater-Cathode Voltage	90 volts max.

OPERATING CHARACTERISTICS AS R.F. AMPLIFIER

Anode Supply Voltage	250 volts
Anode Resistor	1.8 kΩ
Anode Voltage	230 volts
Grid Voltage	—2 volts
Bias Resistor	200 Ω
Anode Current	10 mA
Mutual Conductance	6 mA/V
Anode Impedance	9.7 kΩ
Input Impedance at 100 Mc/s	6 kΩ
Equivalent Noise Resistance	500 Ω

OPERATING CONDITIONS AS SELF-OSCILLATING MIXER

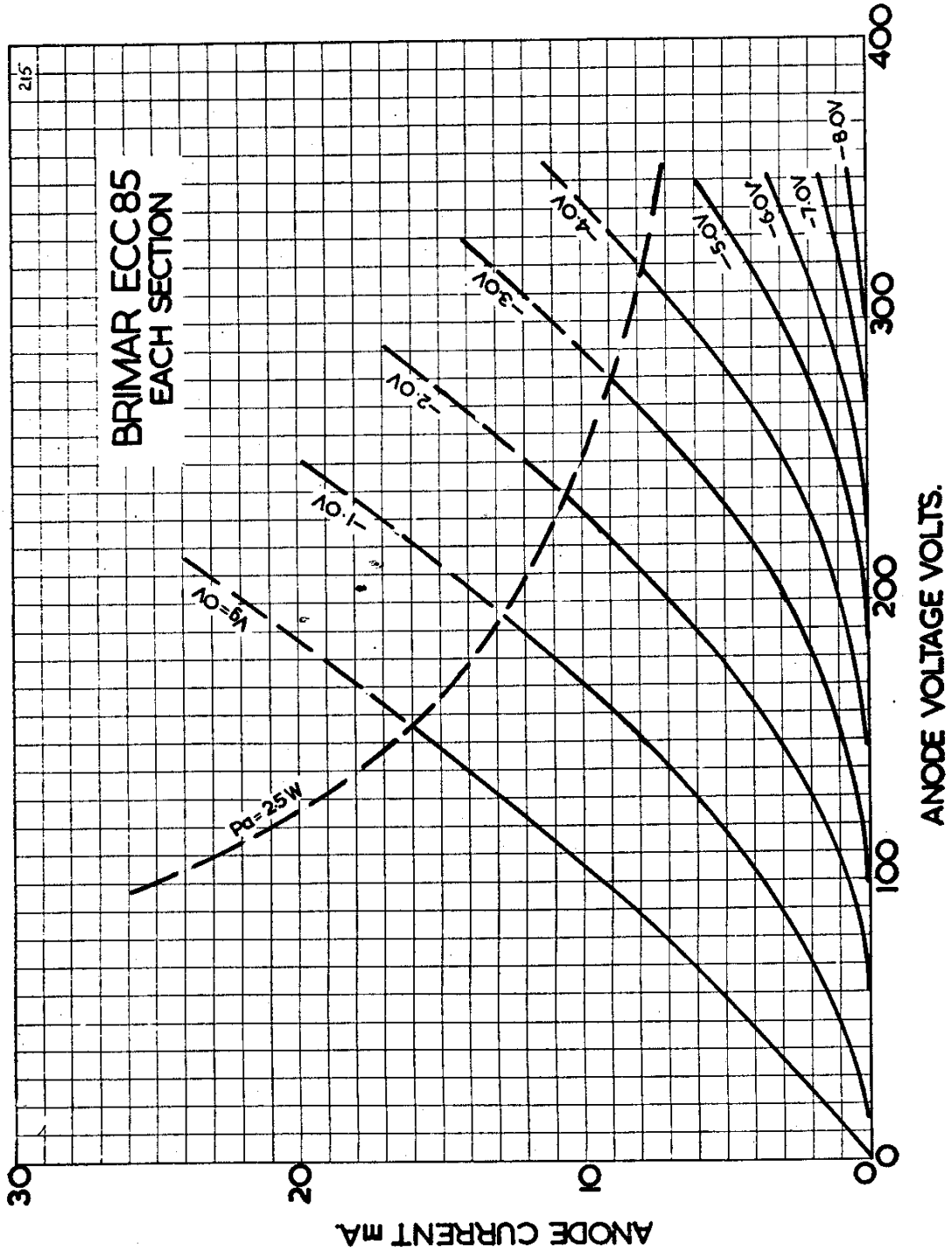
Anode Supply Voltage	250 volts
Anode Resistor	12 kΩ
Grid Resistor	1 MΩ
Oscillatory Voltage	3 volts r.m.s.
Anode Current	5.2 mA
Conversion Conductance	2.3 mA/V
Anode Impedance	22 kΩ
Input Impedance at 100 Mc/s	15 kΩ

INTER-ELECTRODE CAPACITANCES*

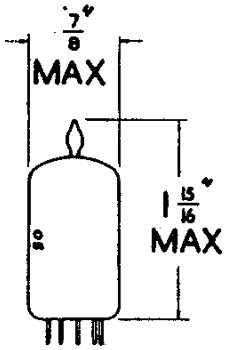
Anode to Grid (each section)	1.5 pF
Anode to Cathode (each section)	0.18 pF
Anode to Anode	0.04 pF max.
Grid to Grid	0.003 pF max.
Input (each section)	3 pF
Output (each section)	1.2 pF
Output (with external shield)	1.9 pF

** With no external shield.*

ECC85


BRIMAR ECC85
EACH SECTION
215
-8.0V
-7.0V
-6.0V
-5.0V
-4.0V
-3.0V
-2.0V
-1.0V
Vg=0V
Pa=2.5W
400
300
200
100
0
0
10
20
30
ANODE VOLTAGE VOLTS.
ANODE CURRENT mA.

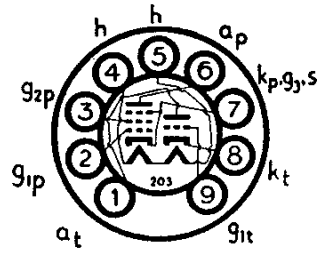
ECF80
ECF82
ECH42



B9A (Noval) Base

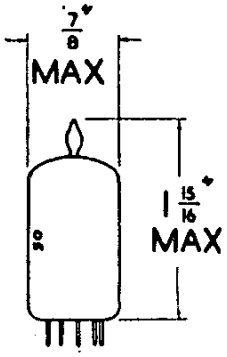
Replacement Type

TYPE **ECF80**
MINIATURE
TRIODE PENTODE
FREQUENCY
CHANGER



Heater Voltage ... ... 6.3 volts Heater Current ... ... 0.43 amp.

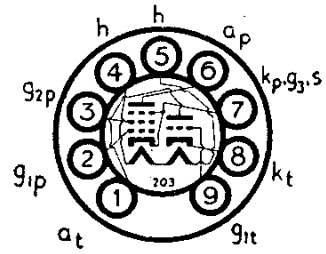
For further information and characteristics refer to type PCF80.



B9A Base

Current Equipment Type

TYPE **ECF82**
MINIATURE
TRIODE PENTODE
FREQUENCY CHANGER

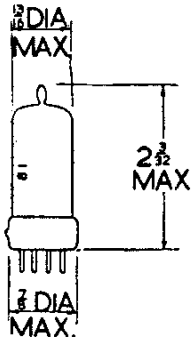


The BRIMAR ECF82 is a triode pentode with separate cathodes designed for use as a frequency changer in television equipment up to 220 Mc/s.

Heater Voltage ... ... 6.3 volts
Heater Current ... ... 0.45 amp.

For further information and characteristics refer to type PCF82.

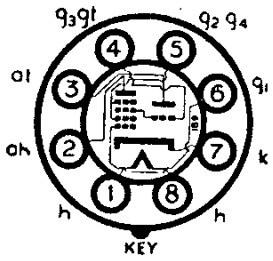
Type ECF82 *is a commercial equivalent of the* CV5063.



B8A Base

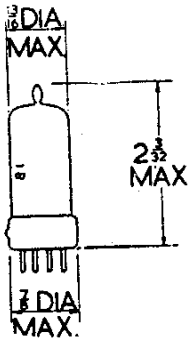
Replacement Type

TYPE **ECH42**
TRIODE HEXODE
FREQUENCY CHANGER



Heater Voltage	6.3 volts	Hexode Screen Current ...	3 mA
Heater Current	0.23 amp.	Triode Anode Supply Voltage ...	250 volts
Hexode Anode Voltage... ...	250 volts	Triode Anode Resistor	33 k Ω
Hexode Screen Voltage ...	85 volts	Triode Grid Resistor	47 k Ω
Hexode Grid Voltage	—2 volts	Triode Grid Current	200 μA
Hexode Anode Current ...	3 mA	Conversion Conductance ...	750 μA/V

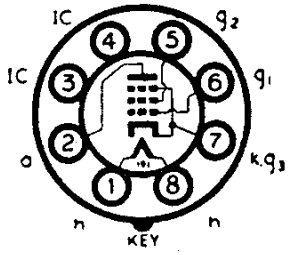
EF41
ECL80



B8A Base

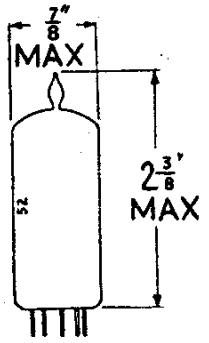
Replacement Type

TYPE **EF41**
VARI-MU
R.F. PENTODE



CHARACTERISTICS

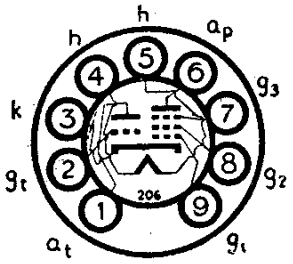
Heater Voltage	6.3 volts	Anode Current	6 mA
Heater Current	0.2 amp.	Screen Current	1.7 mA
Anode Voltage	250 volts	Anode Impedance	1 M Ω
Screen Resistor	90 k Ω	Mutual Conductance	2.2 mA/V
Grid Voltage	—2.5 volts	Grid Voltage for $g_m/100$ ...	—39 volts



B9A Base

Replacement Type

TYPE **ECL80**
MINIATURE
TRIODE PENTODE



RATINGS

Heater Voltage	6.3 volts	Heater Current	0.3 amp.
Heater Cathode Potential	150 volts max.	Heater-Cathode Resistor	20 k ohms max.

	Triode	*Pentode*
Anode Voltage (I_a=0)	550	550 volts max.
Anode Voltage (Peak)	—	1,200 volts max.
Anode Voltage	200	400 volts max.
Screen Voltage (I_{g_2}=0)	—	550 volts max.
Screen Voltage	—	250 volts max.
Anode Dissipation	1.0	3.5 watts max.
Screen Dissipation	—	1.2 watts max.
Cathode Current	8	25 mA max.
Peak Cathode Current *	200	350 mA max.
Grid Resistor (I_{kp}=12 mA) (Frame output stage)	3.0	2.2 MΩ max.
(I_{kp}=20 mA) (Audio output stage)	—	1.0 MΩ max.

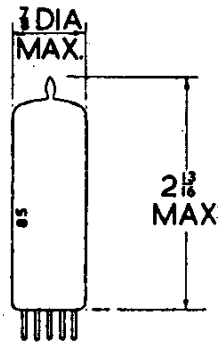
** Maximum pulse duration of 10% of one cycle, with a maximum of 2m. secs.*

CHARACTERISTICS

	Triode	*Pentode*	
Anode Voltage	100	170	200 volts
Suppressor Voltage	0	0	0 volts
Screen Voltage	—	170	200 volts
Grid Voltage	—2.3	—6.7	—8.0 volts
Anode Current	4.0	15.0	17.5 mA
Screen Current	—	2.8	3.3 mA
Mutual Conductance	1.4	3.2	3.3 mA/V
Anode Impedance	12.5	150	150 kilohms
Amplification Factor	17.5	—	—
Inner Amplification Factor	—	14	14

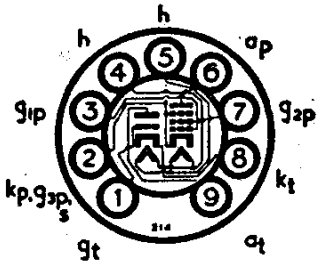
ECL82
EF80

Current Equipment Type



B9A Base

TYPE **ECL82**
MINIATURE
TRIODE PENTODE

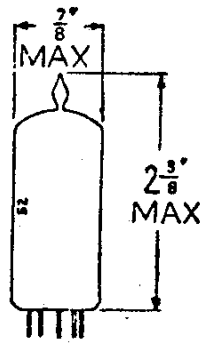


The BRIMAR ECL82 is a noval triode-pentode for use in frame time-base circuits and as a sound amplifier and output valve.

Heater Voltage ... 6.3 volts Heater Current ... 0.78 amp.

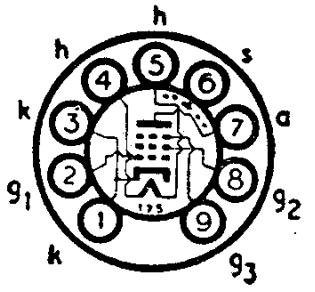
For further information and characteristics refer to type PCL82.

Current Equipment Type



B9A Base

TYPE **EF80**
MINIATURE
HIGH SLOPE
R.F. PENTODE



RATINGS

Heater Voltage	6.3 volts
Heater Current	0.3 amp.
Anode Voltage	300 volts max.
Screen Voltage	300 volts max.
Anode Dissipation	2.5 watts max.
Screen Dissipation	0.7 watts max.

OPERATING CHARACTERISTICS

Anode Voltage	170	200	250 volts
Anode Current	10	10	10 mA
Screen Voltage	170	200	250 volts
Screen Current	2.5	2.6	2.8 mA
Mutual Conductance	7.4	7.1	6.8 mA/V
Anode Impedance	0.5	0.55	0.65 MΩ
Input Impedance at 50 Mc/s.	10	12	15 kΩ

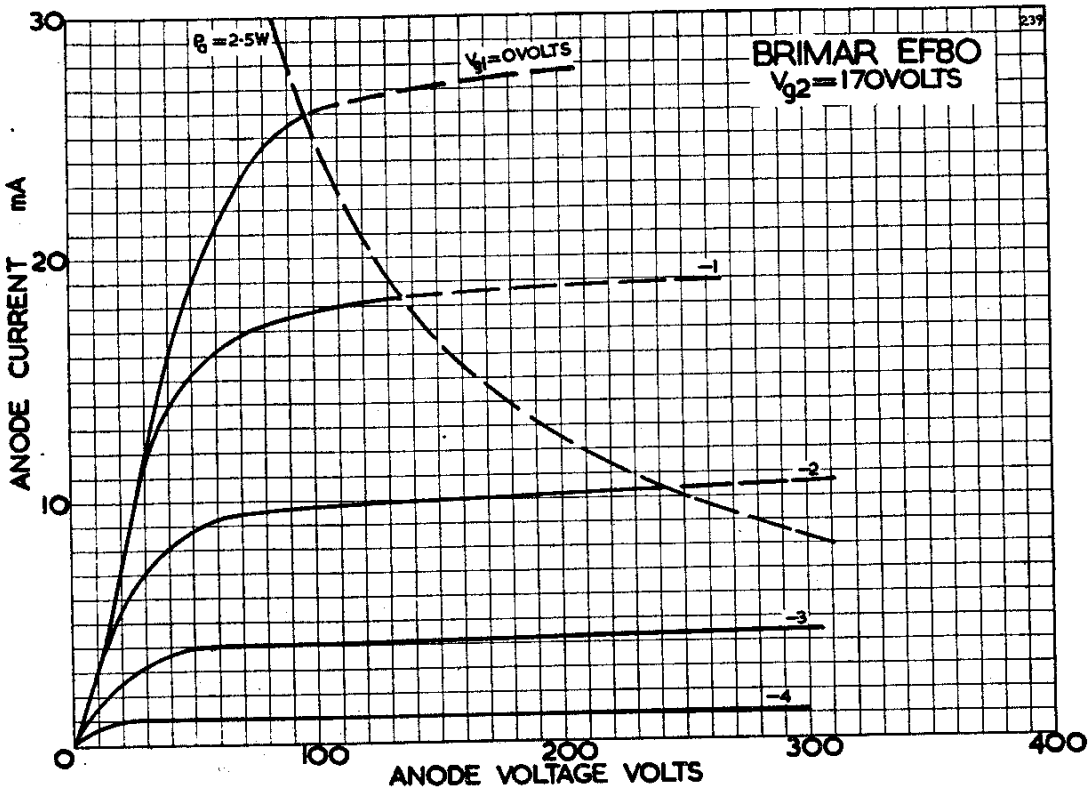
INTER-ELECTRODE CAPACITANCES*

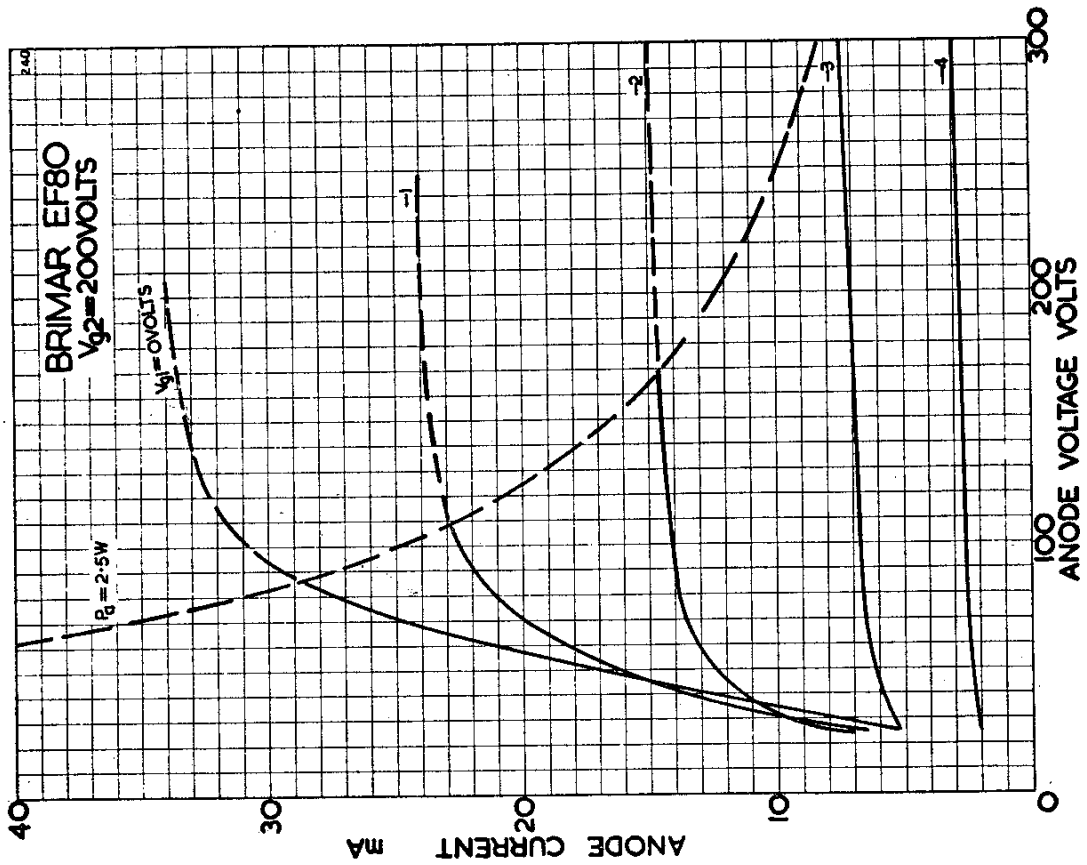
Input	7.5 pF
Output	3.3 pF
Control Grid to Anode	0.007 pF max.

* *With no external shield.*

Type EF80 *is a commercial equivalent of the* CV1736.

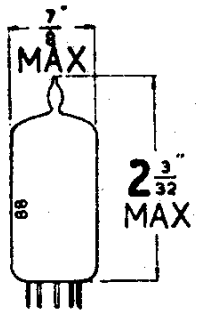
EF80


239
BRIMAR EF80
V_{g2}=170VOLTS
P_g=2·5W
V_{g1}=0VOLTS
-1
-2
-3
-4
ANODE CURRENT mA
30
20
10
0
100
200
300
400
ANODE VOLTAGE VOLTS


240
BRIMAR EF80
V_{g2}=200VOLTS
V_{g1}=0VOLTS
P_g=2·5W
-1
-2
-3
-4
300
200
100
0
ANODE VOLTAGE VOLTS
40
30
20
10
0
mA
ANODE CURRENT

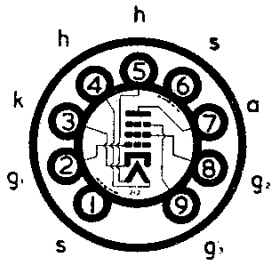
EF89
EL41

Replacement Type



B9A Base

TYPE EF89
MINIATURE
HIGH SLOPE VARI-MU
R.F. PENTODE



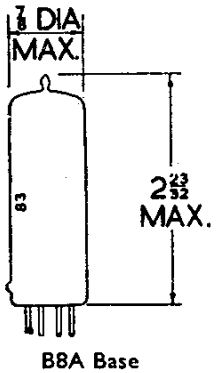
RATINGS

Heater Voltage	6.3 volts
Heater Current	0.2 amp.
Anode Voltage	300 volts max.
Anode Voltage (I_a=0)	500 volts max.
Anode Dissipation	2.25 watts max.
Screen Voltage	300 volts max.
Screen Voltage (I_{g2}=0)	500 volts max.
Screen Dissipation	0.45 watts max.
Cathode Current	16.5 mA max.

OPERATING CHARACTERISTICS

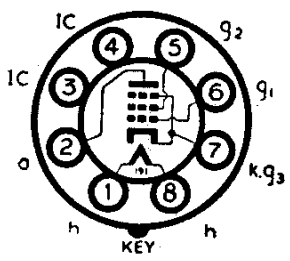
	With Cathode Bias	With Grid Leak Bias	
Anode Voltage	200	200	volts
Screen Series Resistor	24	33	kΩ
Cathode Bias Resistor	130	0	ohms
Grid Voltage	—1.95	0	volts
Anode Current	11.1	11.25	mA
Screen Current	3.8	3.9	mA
Mutual Conductance	3.85	5.15	mA/V
Anode Impedance	0.6	0.55	MΩ

Replacement Type



B8A Base

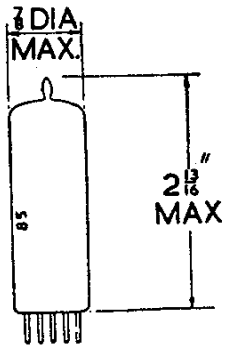
TYPE EL41
POWER PENTODE



CHARACTERISTICS

Heater Voltage	6.3 volts	Anode Current	36 mA
Heater Current	0.7 amp.	Screen Current	5.2 mA
Anode Voltage	250 volts	Mutual Conductance	10 mA/V
Screen Voltage	250 volts	Anode Load Impedance	7,000 Ω
Grid Voltage	—7 volts	Power Output (D_{tot} = 10%)	4.2 watts

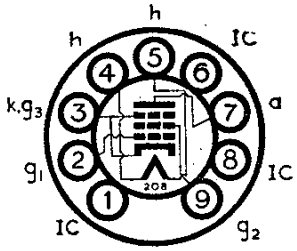
EL84



B9A Base

Current Equipment Type

TYPE **EL84**
MINIATURE
OUTPUT PENTODE



The BRIMAR type EL84 is a miniature indirectly heated high slope output pentode. The heater is intended for operation in parallel with other valves in A.C. operated or mobile equipment. The valve is primarily designed as an audio output stage in receivers or amplifiers, either singly or in push-pull.

Heater Voltage	6.3 volts
Heater Current	0.76 amp.

RATINGS

Anode Voltage	300 volts max.
Anode Dissipation	12 watts max.
Screen Voltage	300 volts max.
Screen Dissipation (Zero Signal)	2 watts max.
Screen Dissipation (Max. Signal)	4 watts max.
Cathode Current	65 mA max.

OPERATING CHARACTERISTICS

	Single Valve Class A		Push Pull Class AB1 (2 Valves)	
Anode Voltage	200	250	300	volts
Anode Current (Zero Signal)	50	48	80	mA
Anode Current (Max. Signal)	—	—	92.5	mA
Screen Voltage	200	250	300	volts
Screen Current (Zero Signal)	5.65	5.5	8.5	mA
Screen Current (Max. Signal)	—	—	20	mA
Control Grid Voltage	— 4.6	— 7.3	— 10.4	volts
Cathode Bias Resistor	82	140	130	ohms
Anode Impedance	—	38	—	k Ω
Mutual Conductance	—	11.3	—	mA/V
Optimum Load	4	5.2	8	k Ω
Power Output	3.3	5.7	17	watts
Harmonic Distortion	6.5	10	3.18	per cent.

OPERATION AS A TRIODE (Anode and Screen Strapped) CLASS AB1 PUSH PULL (2 Valves)

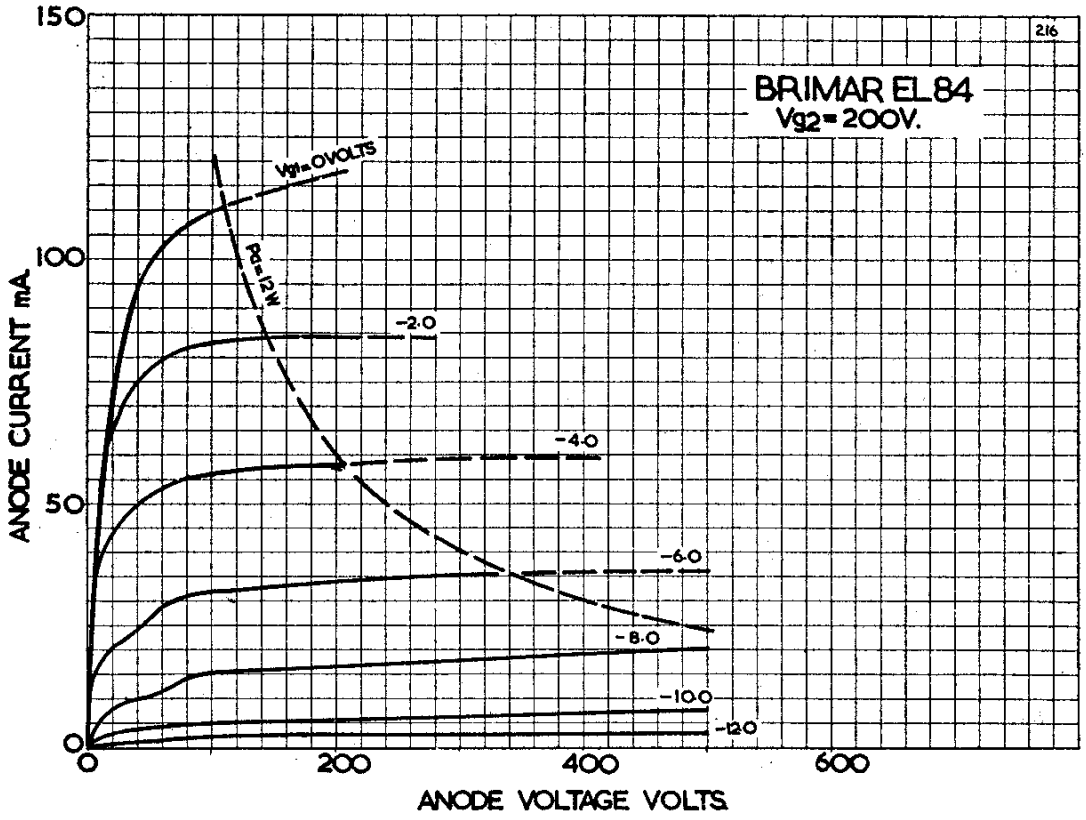
Anode Voltage	250	300	volts
Anode Current (Zero Signal)	41	49	mA
Anode Current (Max. Signal)	45	54	mA
Cathode Bias Resistor	270	270	ohms
Optimum Load (anode to anode)	10	10	k Ω
Power Output	3.4	5.2	watts
Total Distortion	1.8	2.0	per cent.

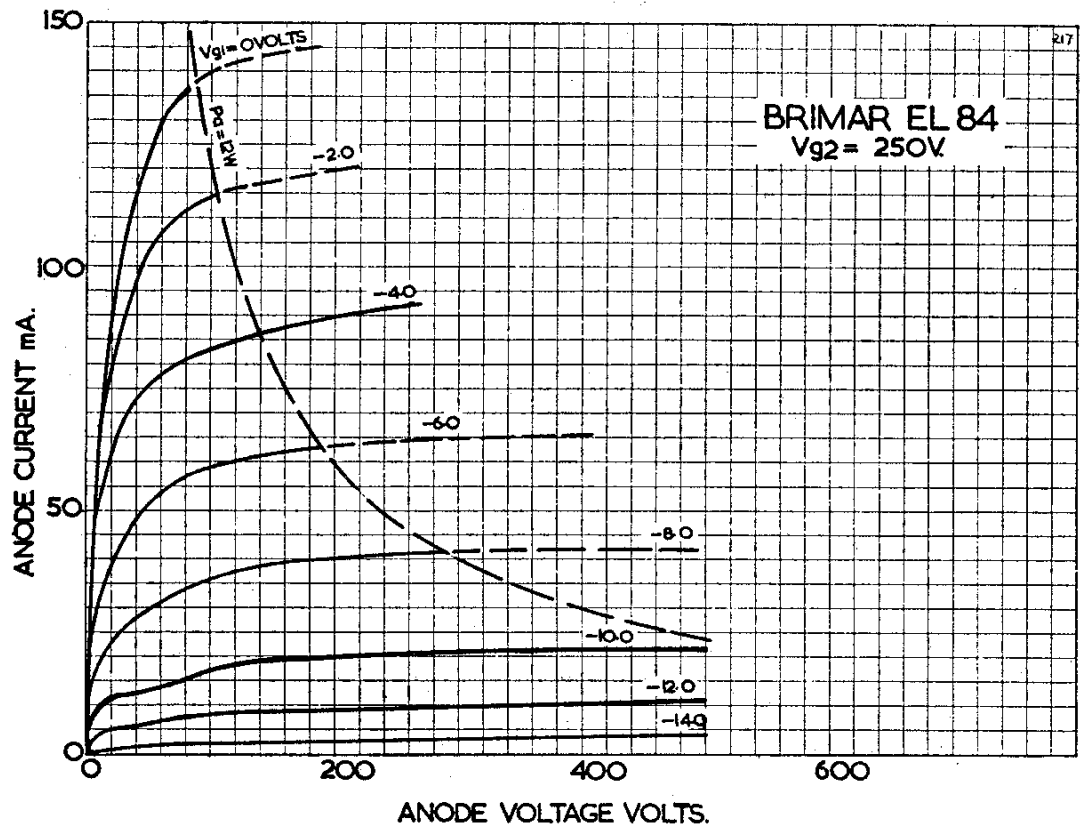
INTER-ELECTRODE CAPACITANCES*

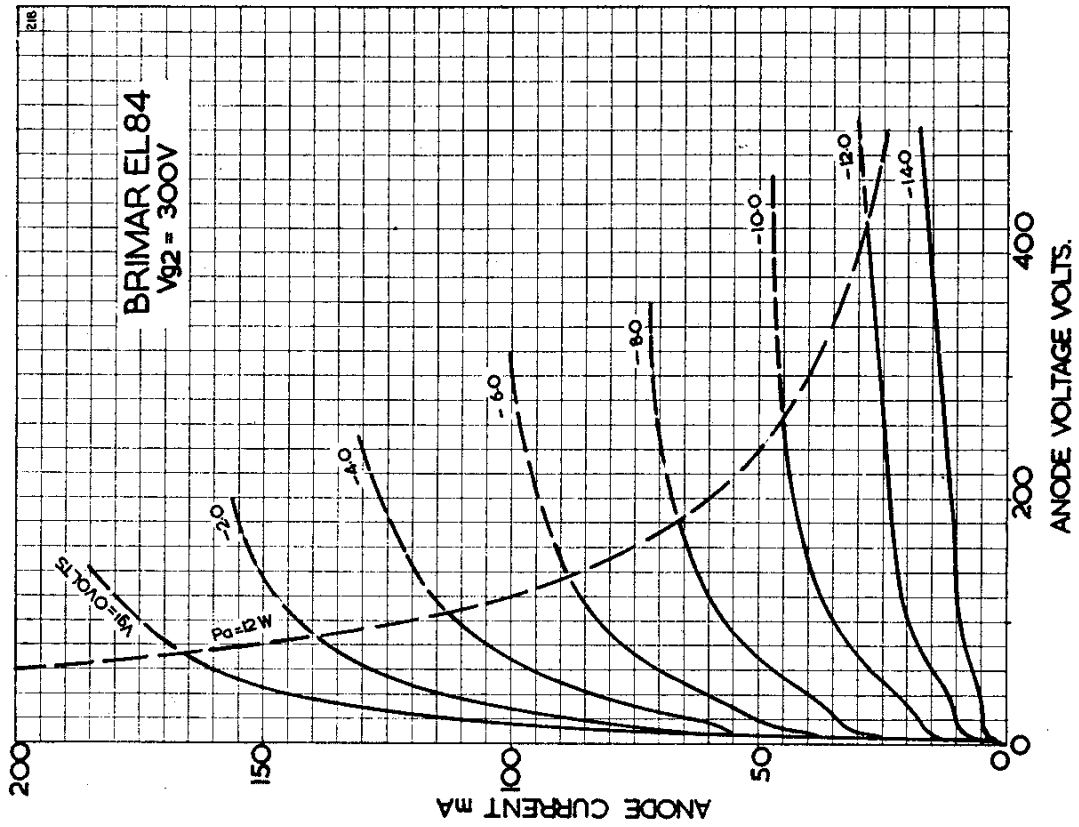
Input	11.0 pF
Output	6.0 pF
Anode to Control Grid	0.5 pF max.
Heater to Control Grid	0.25 pF max.

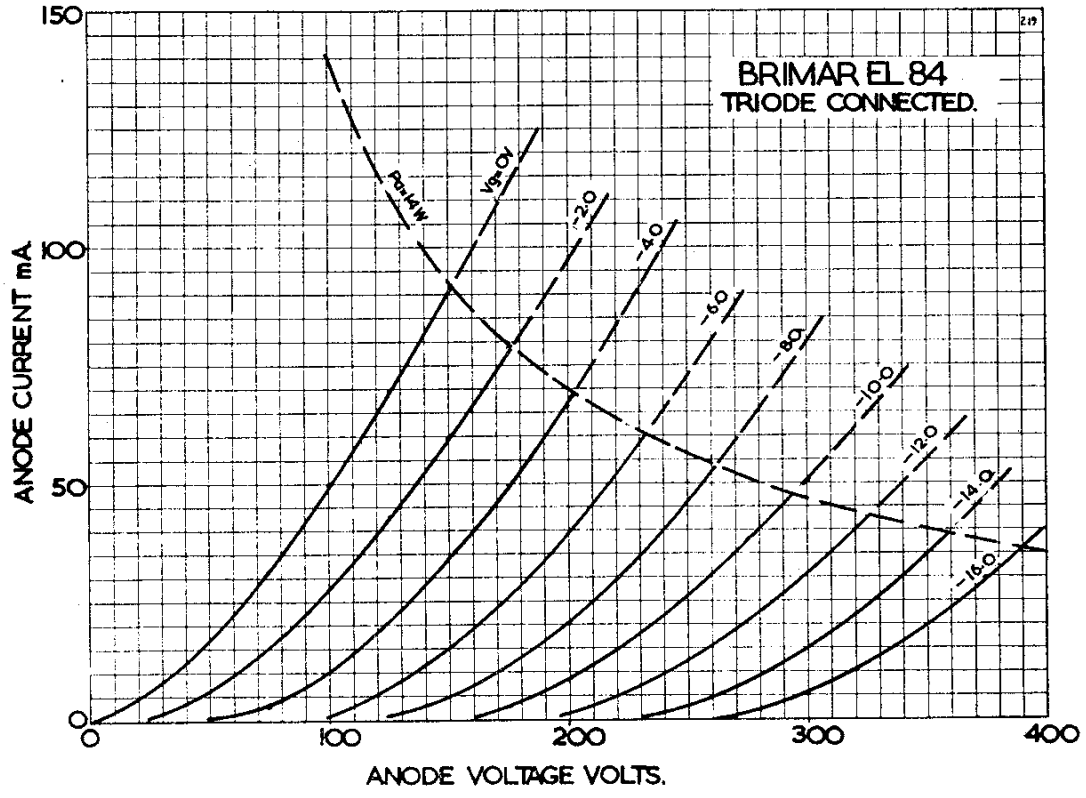
** With no external shield.*

EL84

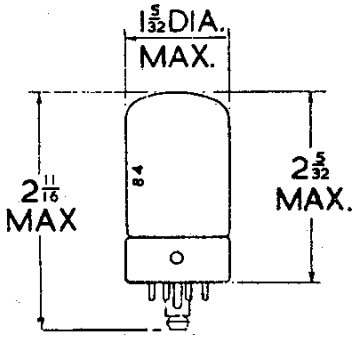

216
BRIMAR EL84
Vg2=200V.
Vg1=0VOLTS
Pa=12W
-2·0
-4·0
-6·0
-8·0
-10·0
-12·0
150
100
50
0
0
200
400
600
ANODE CURRENT mA.
ANODE VOLTAGE VOLTS.


217
BRIMAR EL84
Vg2= 250V.
Vg1=0VOLTS
Pa=12W
-2·0
-4·0
-6·0
-8·0
-10·0
-12·0
-14·0
150
100
50
0
0
200
400
600
ANODE CURRENT mA.
ANODE VOLTAGE VOLTS.


BRIMAR EL84
Vg2 = 300V
Pa=12W
Vg1=0VOLTS
-2·0
-4·0
-6·0
-8·0
-10·0
-12·0
-14·0
200
150
100
50
0
ANODE CURRENT mA
400
200
0
ANODE VOLTAGE VOLTS.

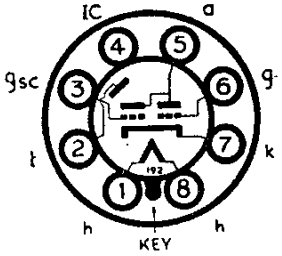

BRIMAR EL84
TRIODE CONNECTED.
Pa=14W
Vg=0V
-2·0
-4·0
-6·0
-8·0
-10·0
-12·0
-14·0
-16·0
150
100
50
0
ANODE CURRENT mA.
0
100
200
300
400
ANODE VOLTAGE VOLTS.

EM71
EM85



Replacement Type

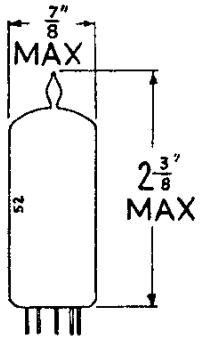
TYPE **EM71**
(LOCTAL BASE)
TUNING
INDICATOR



OPERATING CHARACTERISTICS

Heater Voltage	6.3 volts	Anode Current (max. shadow)...	0.5 mA
Heater Current	0.3 amp.	Target Voltage	250 volts
Anode Supply Voltage ...	250 volts	Target Current (max. shadow)...	2.5 mA
Anode Load Resistor ...	0.5 MΩ	Grid Voltage (zero shadow) ...	—20 volts

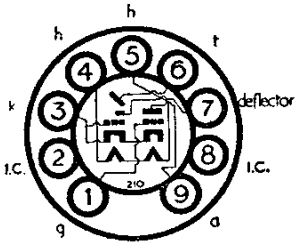
---



B9A Base

Replacement Type

TYPE **EM85**
MINIATURE
" MAGIC EYE "
TUNING INDICATOR



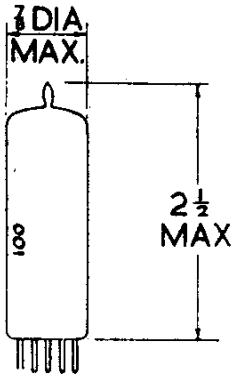
BRIMAR type EM85 is a Noval based " Magic Eye " with the screen viewed through the side of the bulb. The display is green with a dark fan-shaped area in the centre.

OPERATING CHARACTERISTICS

Heater Voltage	6.3 volts	Heater Current				0.3 amp.
Anode Supply Voltage			200		250	volts
Target Voltage			200		250	volts
Anode Load Resistor			470		470	kΩ
Grid Voltage			0	—14	0 —18	volts
Anode Current			0.4	0.10	0.5 0.12	mA
Target Current			1.4		2.1	mA
Shadow Angle			100°	0°	100° 0°	

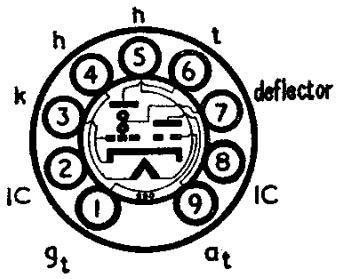
EM84

Current Equipment Type



B9A Base

TYPE EM84
MINIATURE
TUNING
INDICATOR



The BRIMAR EM84 is a noval based tuning indicator with the luminous target deposited on the glass itself in the form of a vertical strip. Each end of this strip is luminous and on the application of a control voltage, the luminous areas extend inwards to the centre from the ends.

RATINGS

Heater Voltage	6.3 volts
Heater Current	0.27 amp.
Anode Voltage	300 volts max.
Anode Supply Voltage	550 volts max.
Anode Dissipation	0.5 watt max.
Target Voltage	300 volts max.
Target Voltage	150 volts min.
Target Supply Voltage	550 volts max.
Cathode Current	3.0 mA max.
Heater-Cathode Voltage	100 volts max.
Triode Grid Resistance	3.0 megohms max.
Bulb temperature of luminous area	150° C. max.

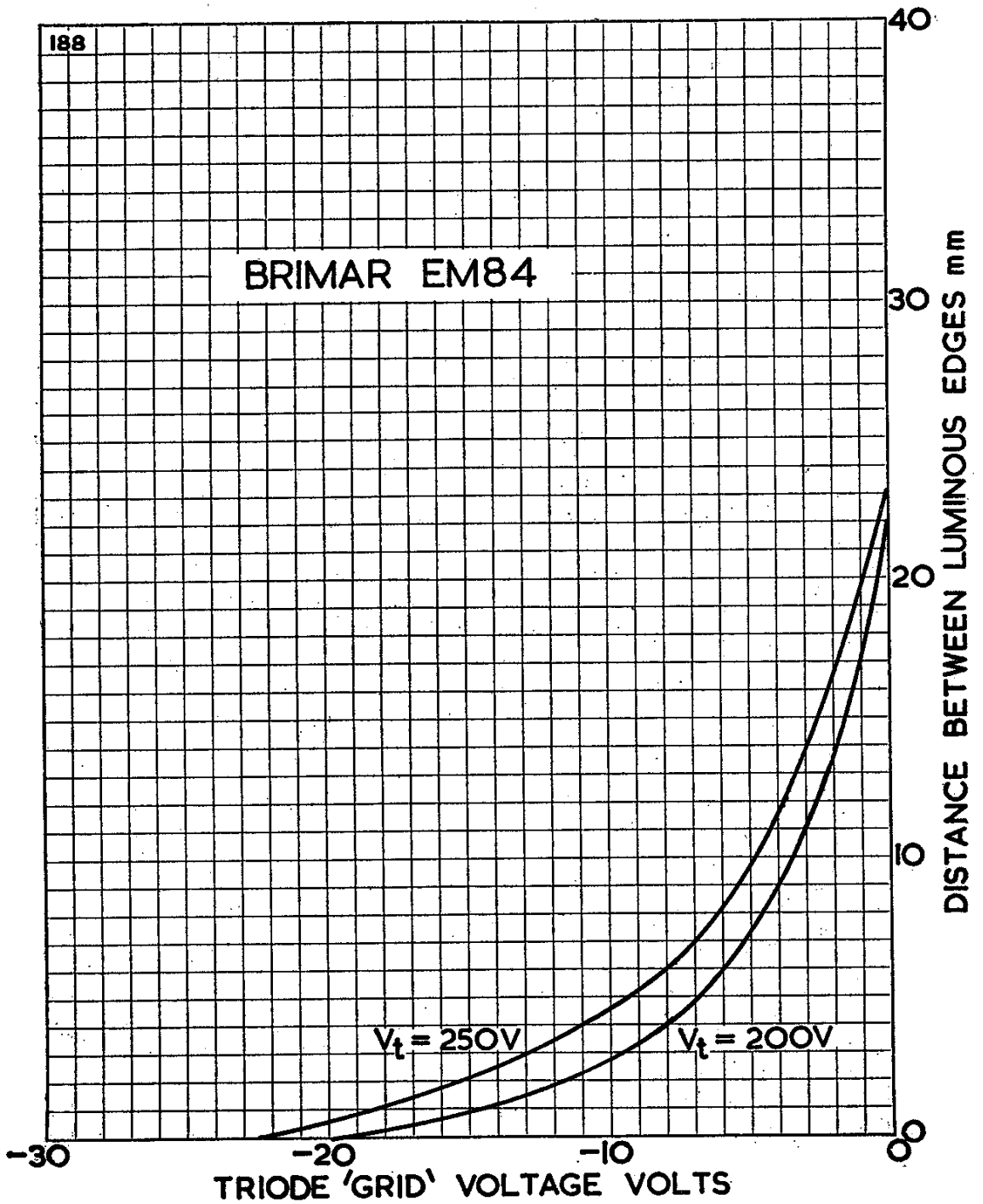
OPERATING CHARACTERISTICS

Target Voltage	250 volts	
Anode Supply Voltage	250 volts	
Anode Resistor	470 kΩ	
Triode Grid Voltage	0	—22 volts
Anode Current	0.45	0 mA
Target Current	0.7	1 mA
Length of Shadow	$\frac{13}{16}$	0 inch

NOTE. The deflectors should be connected to the triode anode for normal use.

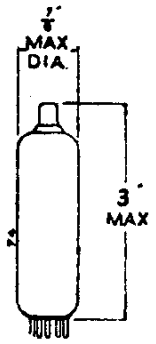
The indicator has a vari-μ characteristic and is, therefore, sensitive to weak signals, a change in shadow length of approximately $\frac{1}{4}$ inch long is produced by changing the control voltage from 0 to —2 volts.

EM84


188
BRIMAR EM84
40
30
20
10
0
DISTANCE BETWEEN LUMINOUS EDGES mm
V_t = 250V
V_t = 200V
-30
-20
-10
0
TRIODE 'GRID' VOLTAGE VOLTS

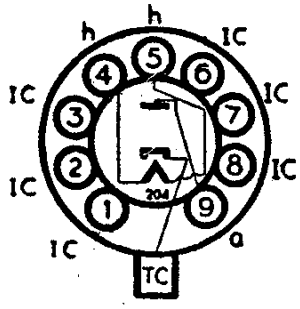
EY83
EY86

Replacement Type



B9A (Noval) Base

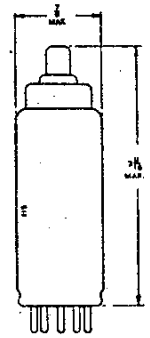
TYPE **EY83**
MINIATURE
BOOSTER DIODE



Heater Voltage ... ... 6.3 volts Heater Current ... ... 1.0 amp.

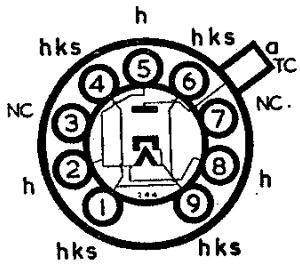
For further information and characteristics refer to type PY83.

Current Equipment Type



B9A Base

TYPE **EY86**
MINIATURE
HIGH VOLTAGE
RECTIFIER



The BRIMAR EY86 is a noval based indirectly heated half-wave rectifier for use in television receivers employing line fly-back E.H.T

Heater Voltage ... ... 6.3 volts Heater Current ... ... 0.09 amp.

RATINGS

Peak Inverse Voltage* ... 22 kV max. D.C. Anode Current ... 0.8 mA max.
Peak Anode Current† ... 40 mA max.

INTER-ELECTRODE CAPACITANCES

Anode to Heater, Cathode and Screen ... ... 1.7 pF approx.

* *Maximum duration* 18 *per cent of a line scanning cycle with a maximum of* 18 μ *second.*

† *Maximum duration* 10 *per cent of a line scanning cycle with a maximum of* 10 μ *second.*

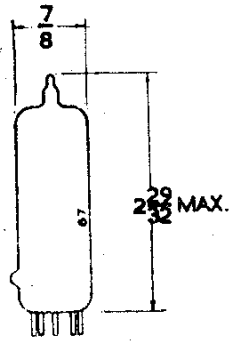
NOTE.—Precautions must be taken to prevent corona discharge from the connections to this valve by ensuring that no sharp points or bends occur in the wiring and adequate spacing must be left between the valve and surrounding components.

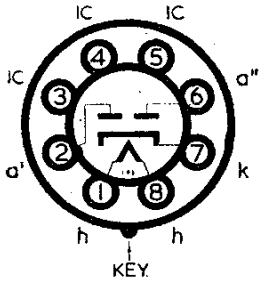
Pins 3 and 7 may be connected to points in the heater circuit only and must not be earthed. No low potential circuits should be connected to any base pins.

EZ40
EZ80

Replacement Type

TYPE **EZ40**
FULL WAVE
RECTIFIER

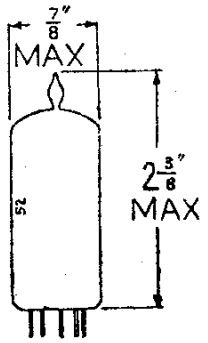


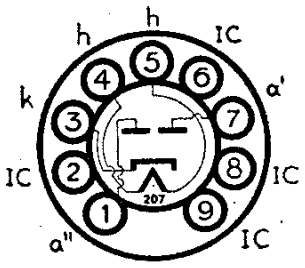


Heater Voltage ...	... 6.3 volts	Output Current ...	... 90 mA max.
Heater Current ...	... 0.6 amp.	Reservoir Capacitance	.... 50 μF max.
R.M.S. Input per Anode	... 350 volts max.	Limiting Resistance per Anode	300 Ω min.

Current Equipment Type

TYPE **EZ80**
MINIATURE
FULL-WAVE
RECTIFIER





Heater Voltage	6.3 volts	Heater Current	0.6 amp

RATINGS

Peak Inverse Voltage	980 volts max.
Peak Current (each Anode)	270 mA max.
Peak Surge Current (each Anode)	900 mA max.
Anode Supply Voltage	—see Rating Chart 1
D.C. Output Current	—see Rating Chart 1
Peak Heater Cathode Potential	500 volts max.

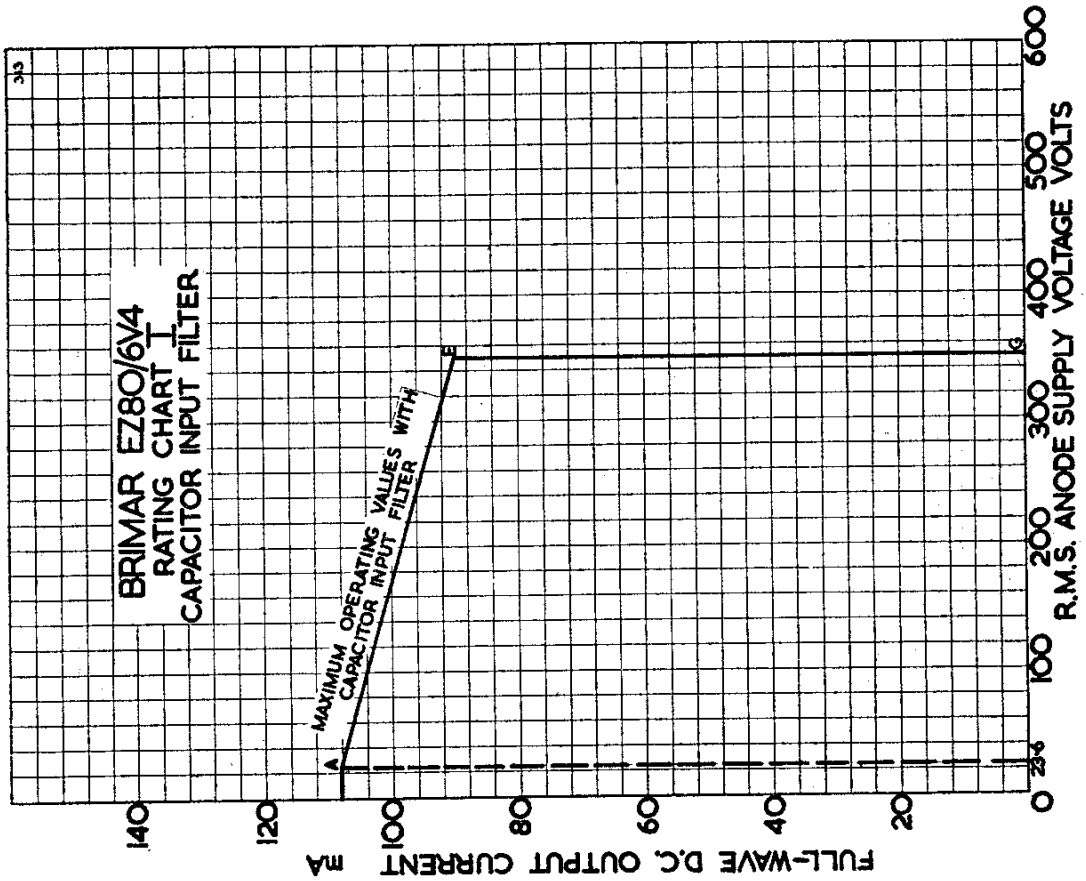
CHARACTERISTICS AS A FULL WAVE RECTIFIER

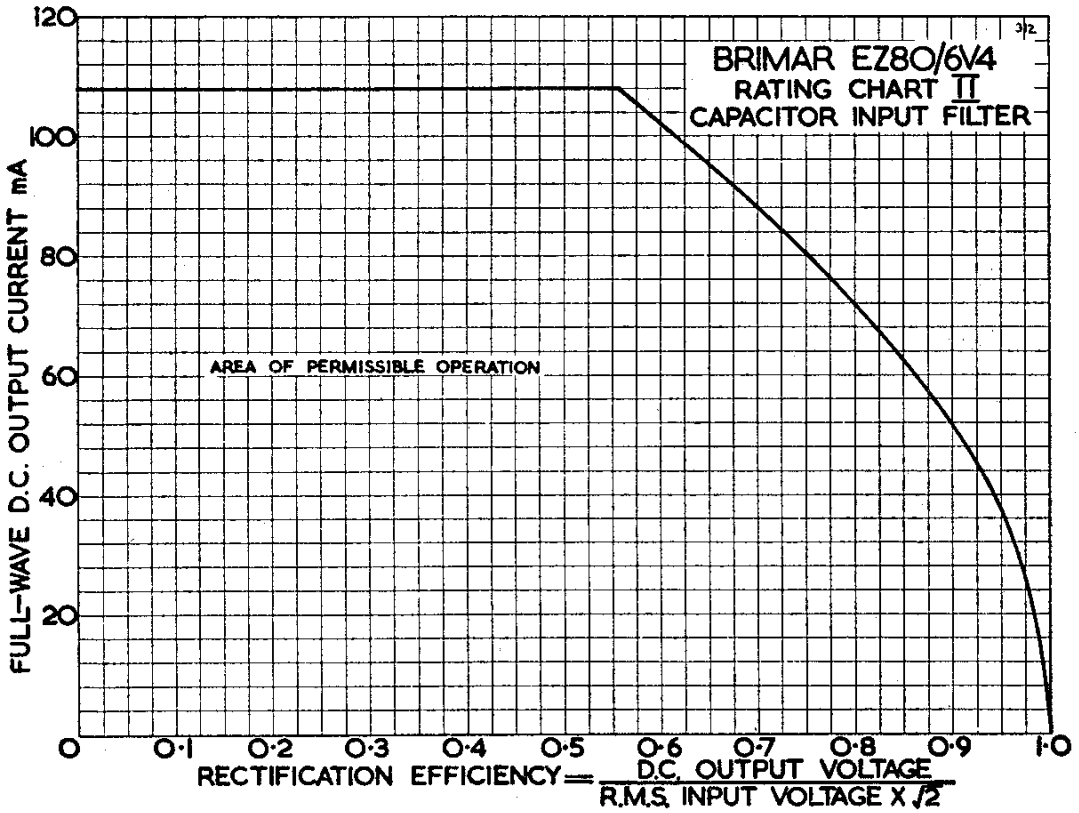
CAPACITOR INPUT:

R.M.S. Input per Anode	350 volts
Rectified Current	90 mA
D.C. Output Voltage	335 volts
Supply Impedance per Anode	425 Ω
Reservoir Capacitor	16 μF

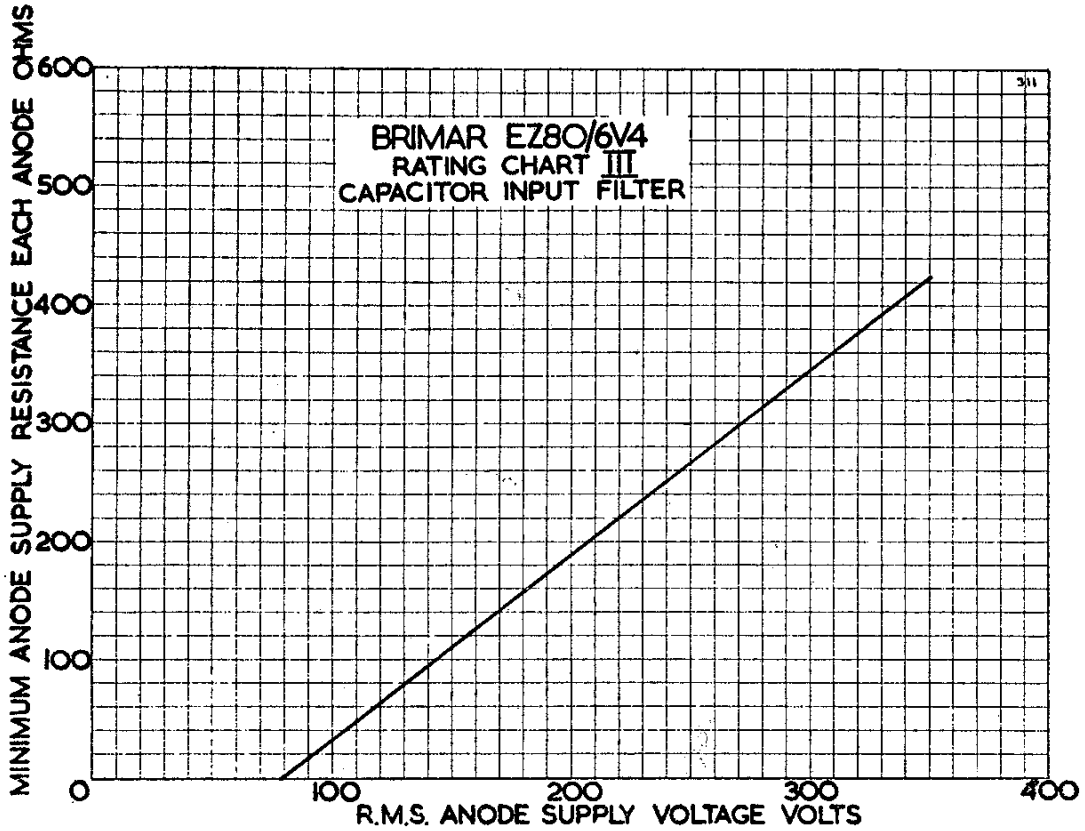
For notes on use of rating charts, refer to " Valve Ratings " section.

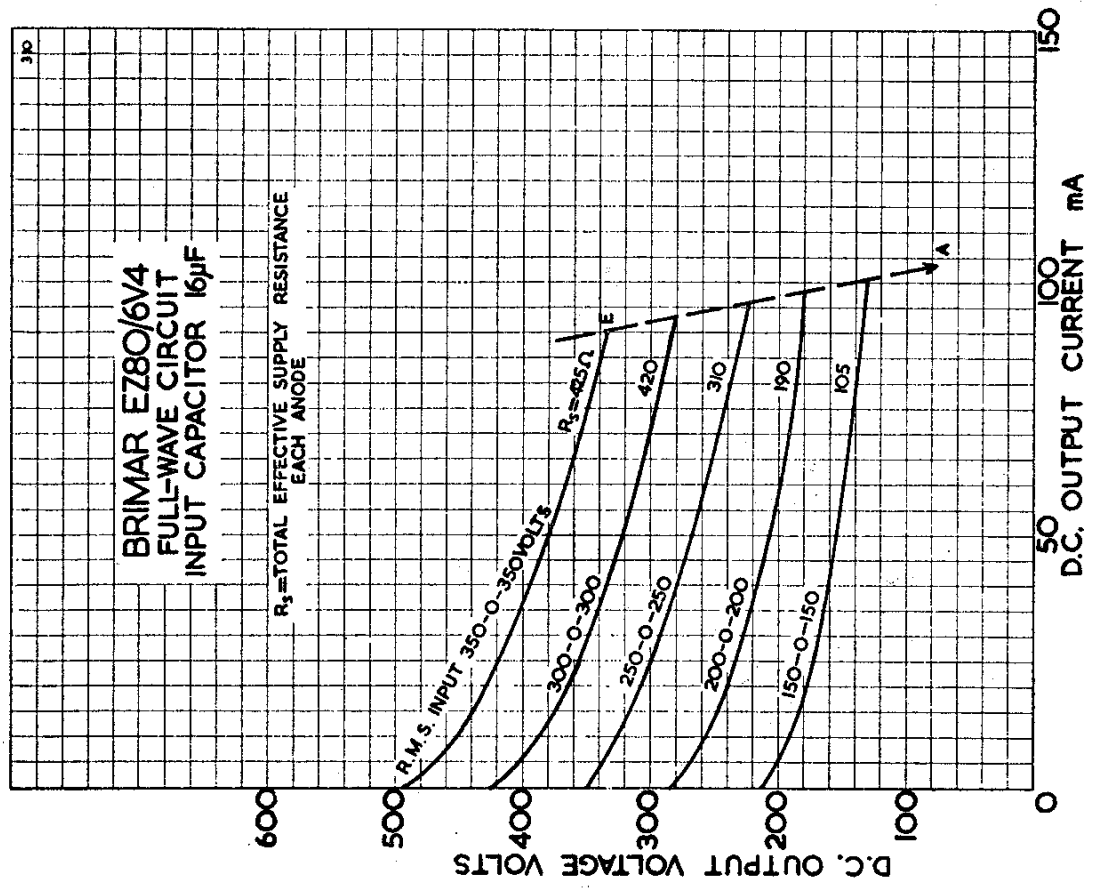
EZ80


BRIMAR EZ80/6V4
RATING CHART I
CAPACITOR INPUT FILTER
MAXIMUM OPERATING CAPACITOR INPUT VALUES WITH FILTER
A
B
FULL-WAVE D.C. OUTPUT CURRENT mA
140
120
100
80
60
40
20
0
R.M.S. ANODE SUPPLY VOLTAGE VOLTS
600
500
400
300
200
100
0
250


BRIMAR EZ80/6V4
RATING CHART II
CAPACITOR INPUT FILTER
AREA OF PERMISSIBLE OPERATION
FULL-WAVE D.C. OUTPUT CURRENT mA
120
100
80
60
40
20
0
0·1
0·2
0·3
0·4
0·5
0·6
0·7
0·8
0·9
1·0
RECTIFICATION EFFICIENCY = D.C. OUTPUT VOLTAGE / R.M.S. INPUT VOLTAGE X √2

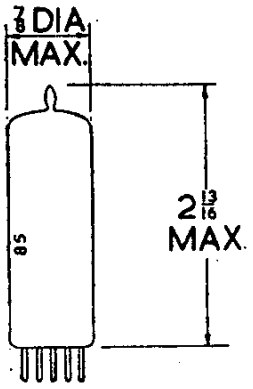
EZ80


BRIMAR EZ80/6V4
RATING CHART III
CAPACITOR INPUT FILTER
MINIMUM ANODE SUPPLY RESISTANCE EACH ANODE OHMS
0
100
200
300
400
500
600
100
200
300
400
R.M.S. ANODE SUPPLY VOLTAGE VOLTS

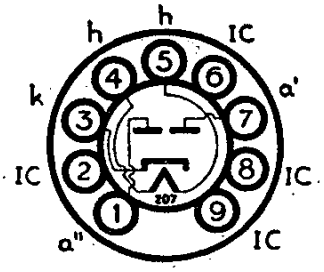

BRIMAR EZ80/6V4
FULL-WAVE CIRCUIT
INPUT CAPACITOR 16μF
Rs=TOTAL EFFECTIVE SUPPLY RESISTANCE EACH ANODE
R.M.S. INPUT 350-0-350 VOLTS
300-0-300
250-0-250
200-0-200
150-0-150
Rs=85Ω
420
310
190
105
E
A
D.C. OUTPUT VOLTAGE VOLTS
600
500
400
300
200
100
0
150
100
50
0
D.C. OUTPUT CURRENT mA

EZ81

Current Equipment Type



B9A Base



TYPE EZ81 MINIATURE FULL-WAVE RECTIFIER

Heater Voltage ... ... 6.3 volts Heater Current ... ... 1.0 amp.

RATINGS

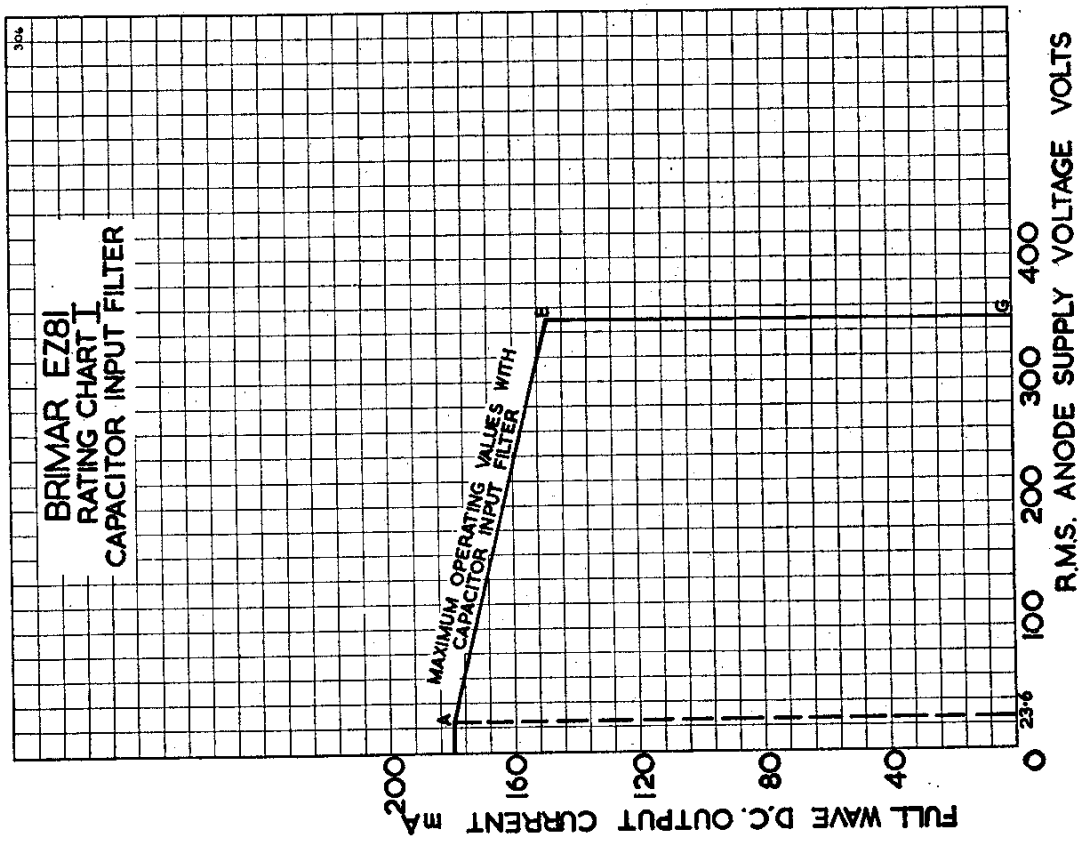
Peak Inverse Voltage	1,000 volts max.
Peak Current (each Anode)	450 mA max.
Peak Surge Current (each Anode)	1.5 amp. max.
Anode Supply Voltage	—see Rating Chart I
D.C. Output Current	—see Rating Chart I
Peak Heater Cathode Potential	500 volts max.

CHARACTERISTICS AS A FULL-WAVE RECTIFIER

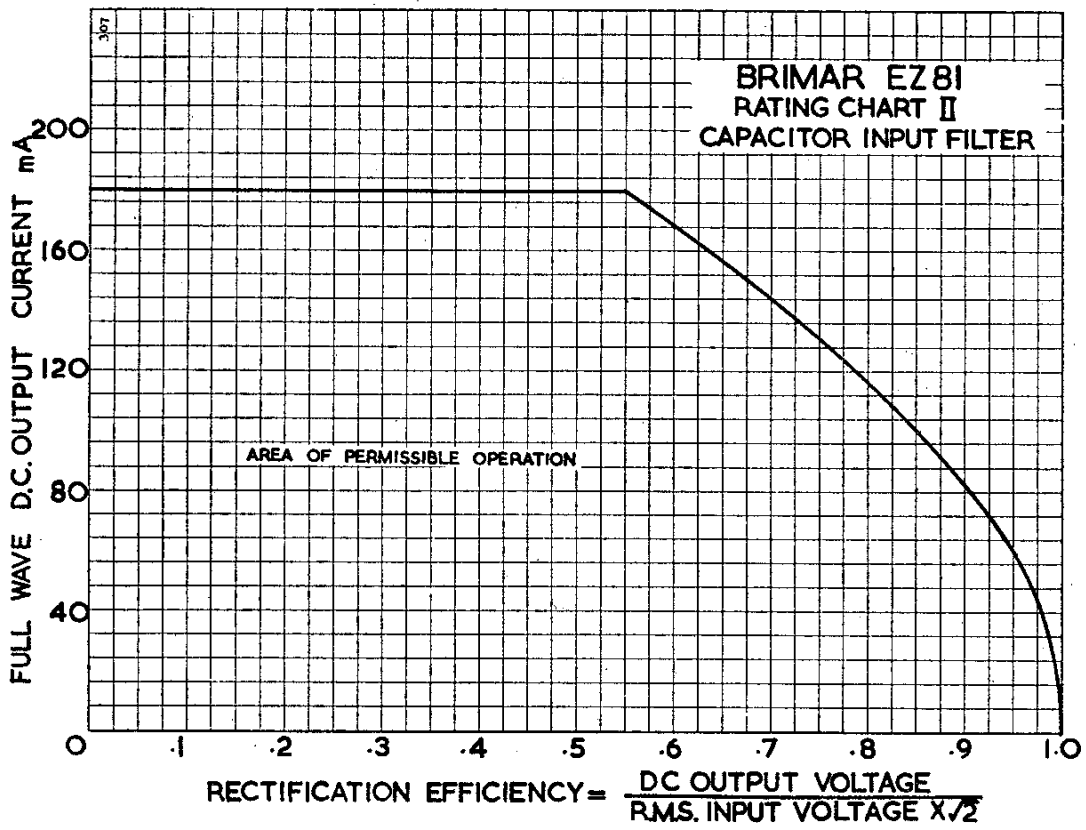
CAPACITOR INPUT :

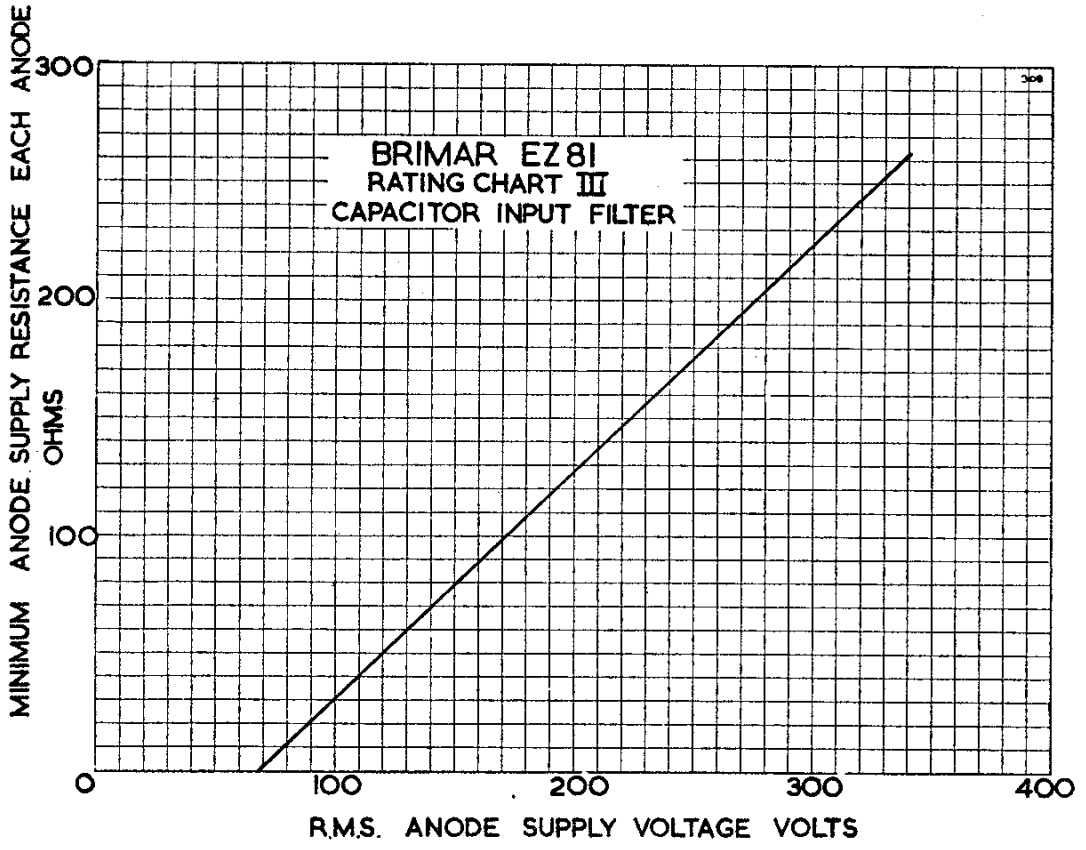
R.M.S. Input per Anode	350 volts
Rectified Current	150 mA
D.C. Output Voltage	330 volts
Supply Impedance per Anode	300 Ω
Reservoir Capacitor	16 μF

For notes on use of rating charts, refer to " Valve Ratings " section.

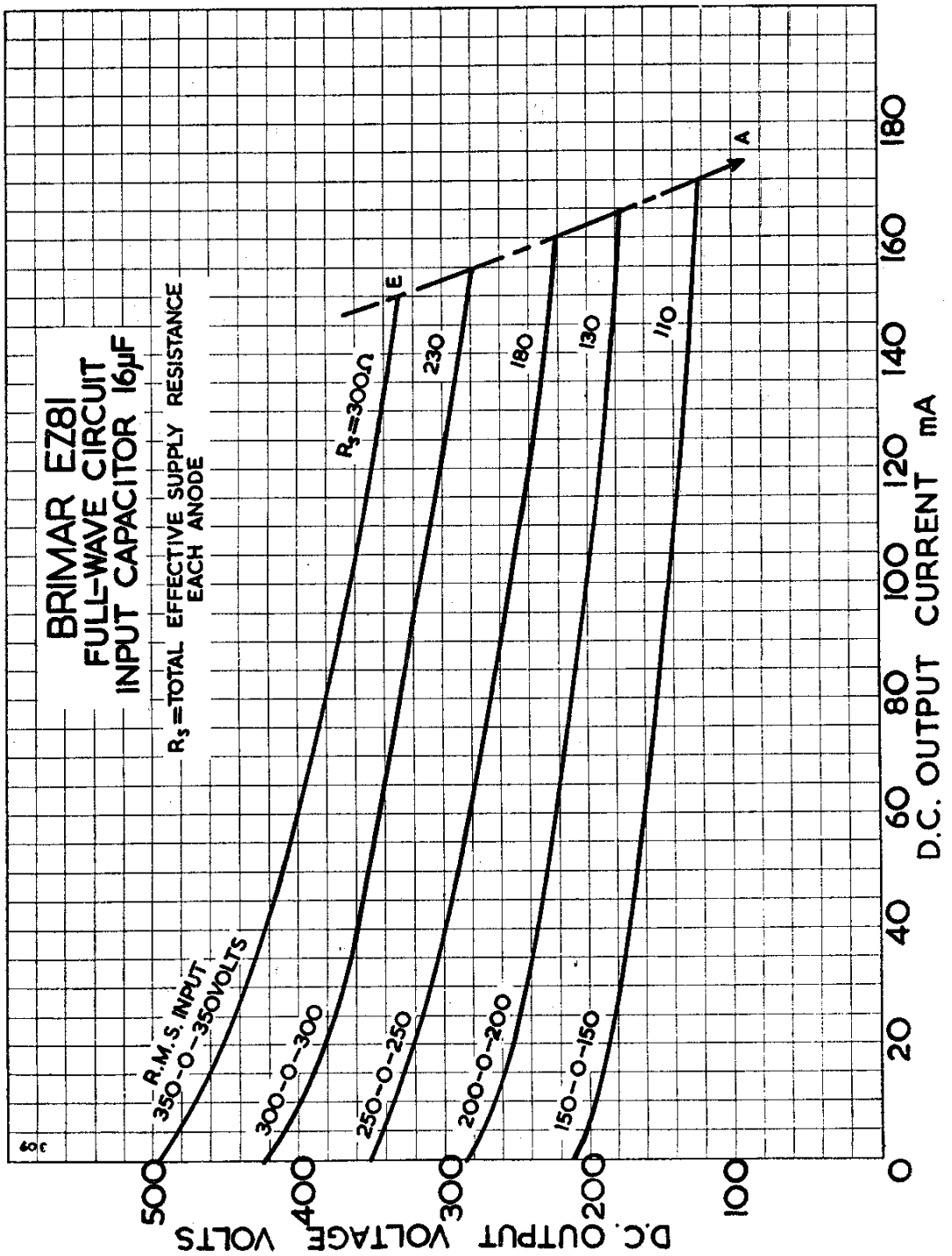


EZ81

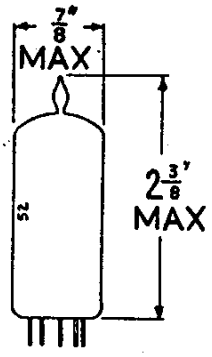

BRIMAR EZ81
RATING CHART II
CAPACITOR INPUT FILTER
FULL WAVE D.C. OUTPUT CURRENT mA
200
160
120
80
40
0
AREA OF PERMISSIBLE OPERATION
.1
.2
.3
.4
.5
.6
.7
.8
.9
1.0
RECTIFICATION EFFICIENCY = DC OUTPUT VOLTAGE / R.M.S. INPUT VOLTAGE X √2


BRIMAR EZ81
RATING CHART III
CAPACITOR INPUT FILTER
MINIMUM ANODE SUPPLY RESISTANCE EACH ANODE OHMS
300
200
100
0
100
200
300
400
R.M.S. ANODE SUPPLY VOLTAGE VOLTS

EZ81


BRIMAR EZ81
FULL-WAVE CIRCUIT
INPUT CAPACITOR 16μF
R_s=TOTAL EFFECTIVE SUPPLY RESISTANCE EACH ANODE
R.M.S. INPUT
350-0-350VOLTS
300-0-300
250-0-250
200-0-200
150-0-150
R_s=300Ω
230
180
130
110
E
A
D.C. OUTPUT VOLTAGE VOLTS
500
400
300
200
100
0
20
40
60
80
100
120
140
160
180
D.C. OUTPUT CURRENT mA

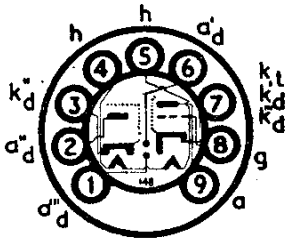
HABC80
HY90



B9A (Noval) Base

Current Equipment Type

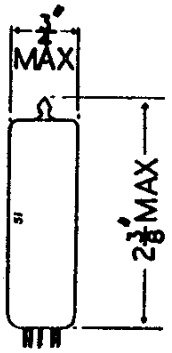
TYPE **HABC80**
MINIATURE
TRIPLE DIODE TRIODE



The type HABC80 is primarily intended for use as the demodulator/1st A.F. amplifier in A.M./F.M. receivers, one diode having a separate cathode. Diodes 2 and 3 should be used for discriminator circuits, Diode 1 for A.M. demodulator and A.G.C. circuits.

Heater Current	0.15 amp.
Heater Voltage	19 volts

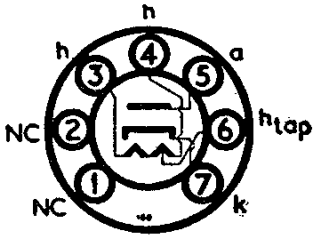
For further information and characteristics refer to type EABC80.



B7G Base

Current Equipment Type

TYPE **HY90**
MINIATURE
HALF WAVE RECTIFIER



Heater Current	0.15 amp.	Heater Voltage	35 volts

RATINGS

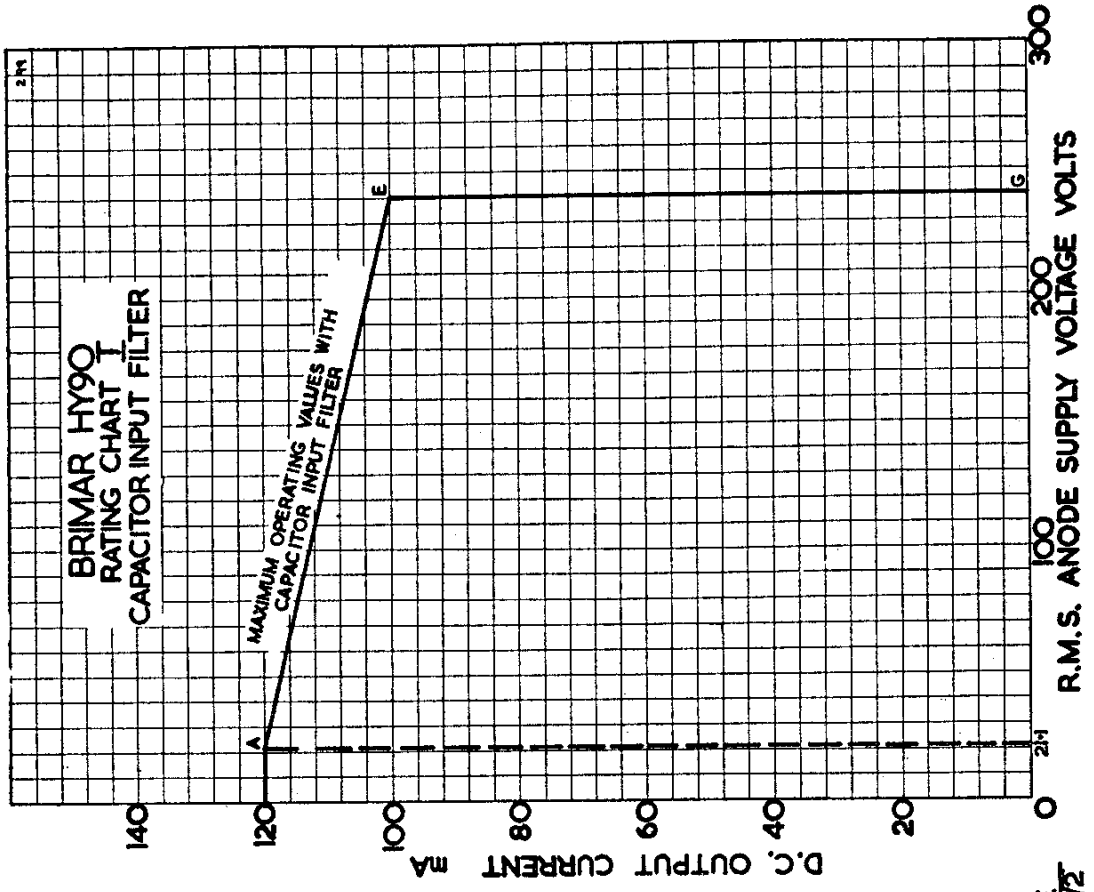
Peak Inverse Voltage	700 volts max.
Peak Current	600 mA max.
Peak Surge Current	2 amps. max.
Anode Supply Voltage	—see Rating Chart I
D.C. Output Current	—see Rating Chart I
Peak Heater Cathode Potential (D.C.)	350 volts max.

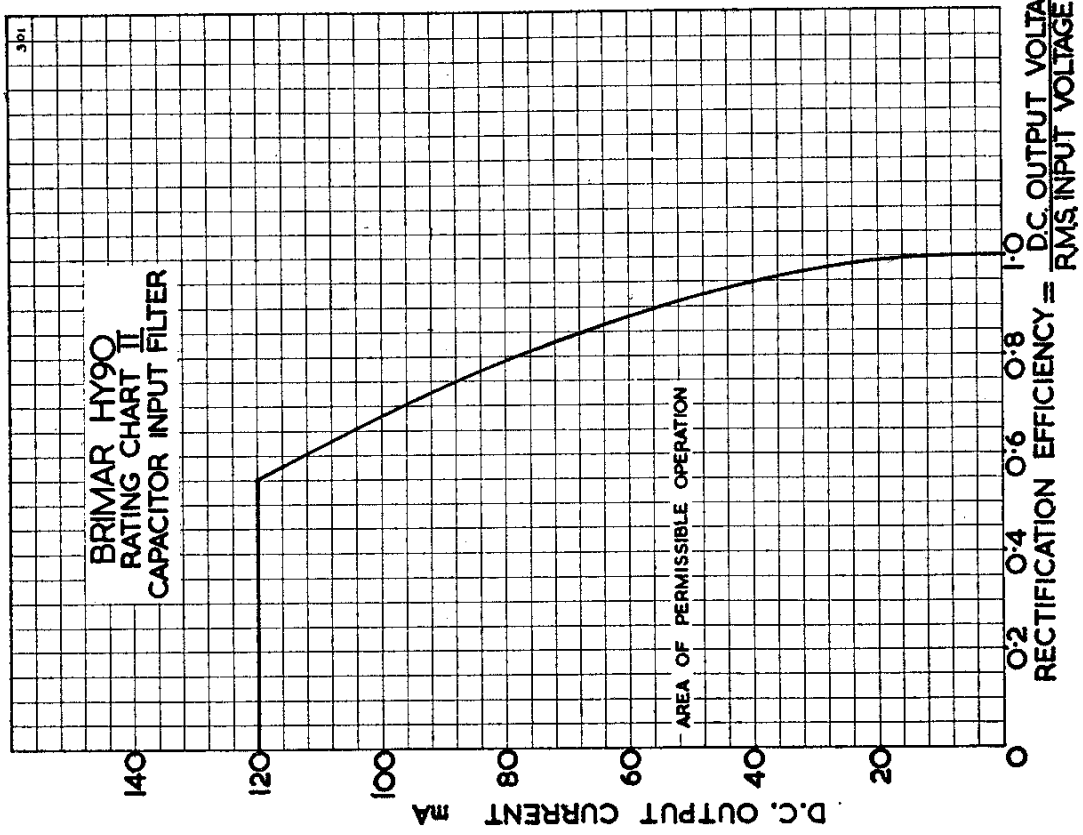
CHARACTERISTICS AS A HALF-WAVE RECTIFIER

CAPACITOR INPUT :	
R.M.S. Input Voltage	240 volts
Rectified Current	100 mA
D.C. Output Voltage	215 volts
Supply Impedance	143 Ω
Reservoir Capacitor	32 μF

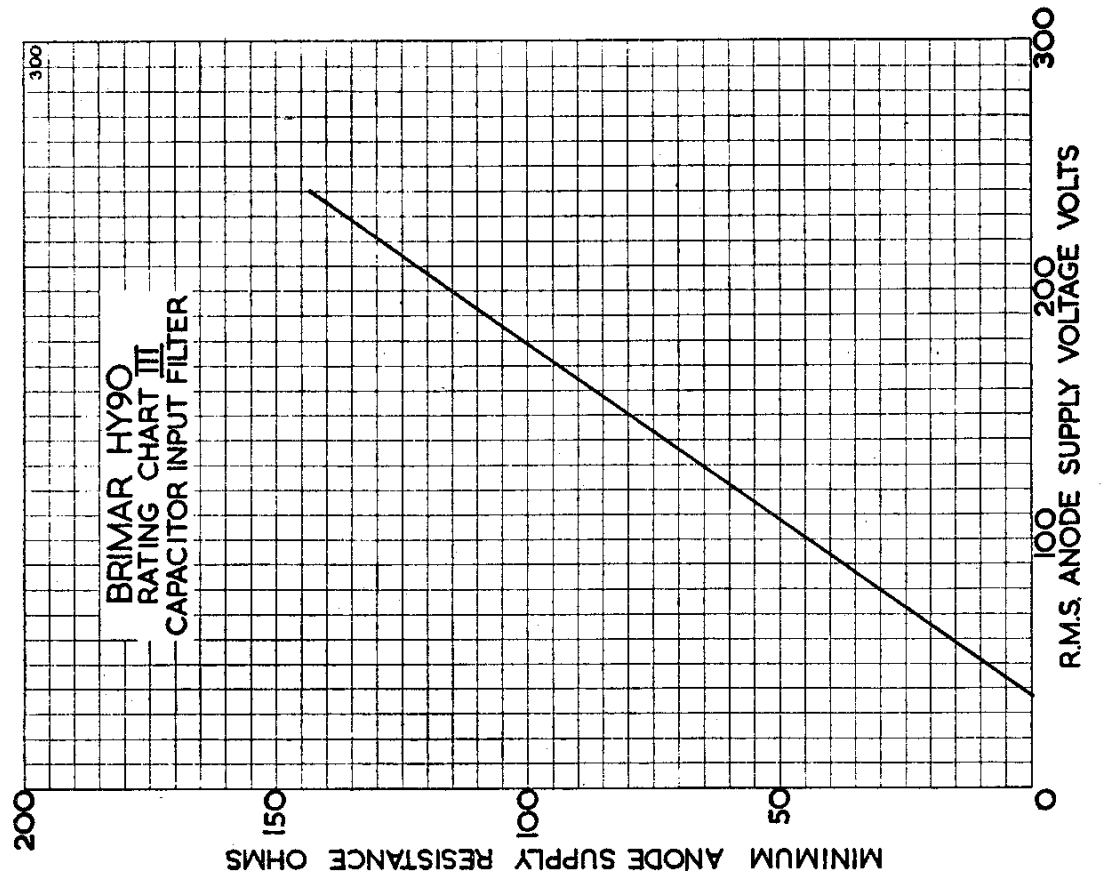
For notes on use of rating charts, refer to " Valve Ratings " section

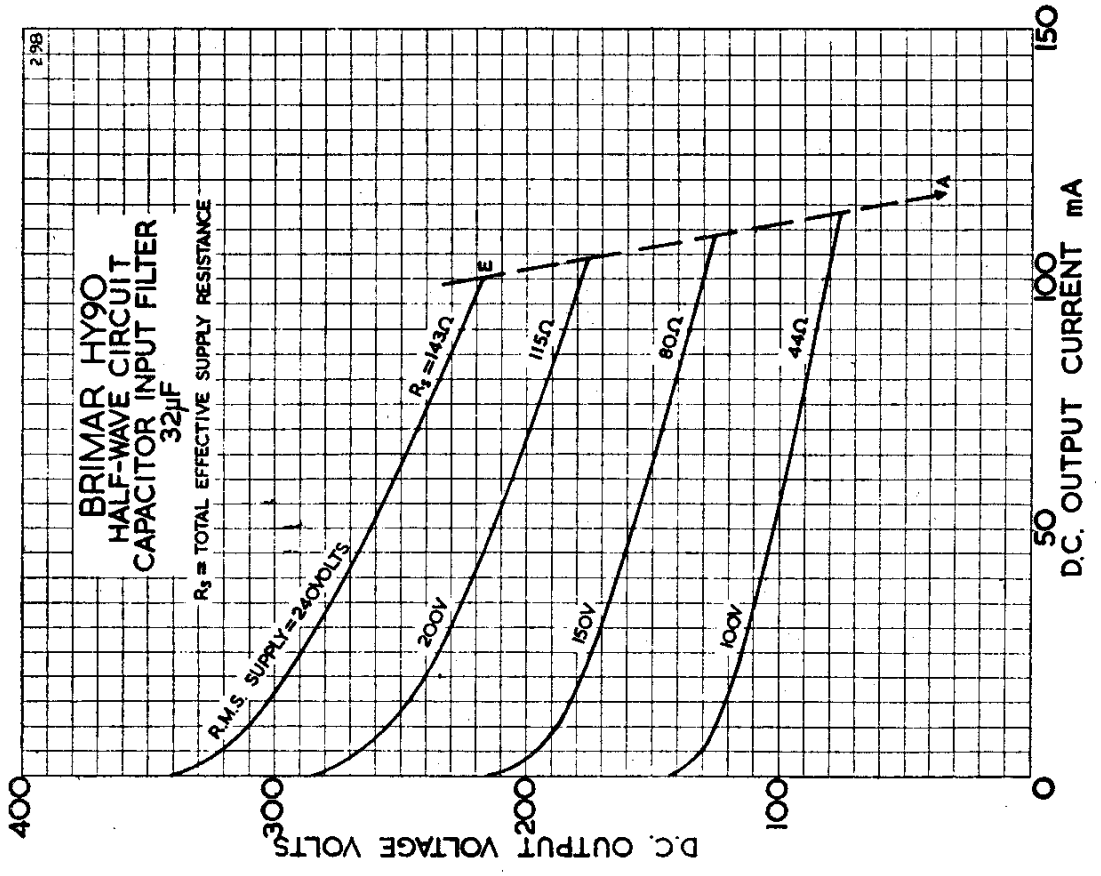
HY90


BRIMAR HY90
RATING CHART I
CAPACITOR INPUT FILTER
MAXIMUM OPERATING VALUES WITH CAPACITOR INPUT FILTER
A
E
G
D.C. OUTPUT CURRENT mA
140
120
100
80
60
40
20
0
100
200
300
R.M.S. ANODE SUPPLY VOLTAGE VOLTS


BRIMAR HY90
RATING CHART II
CAPACITOR INPUT FILTER
AREA OF PERMISSIBLE OPERATION
D.C. OUTPUT CURRENT mA
140
120
100
80
60
40
20
0
0·2
0·4
0·6
0·8
1·0
RECTIFICATION EFFICIENCY = D.C. OUTPUT VOLTAGE / R.M.S. INPUT VOLTAGE X √2

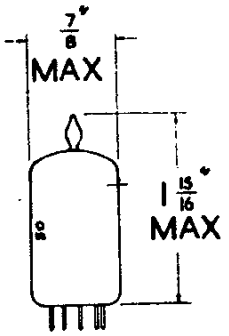
HY90


BRIMAR HY90
RATING CHART III
CAPACITOR INPUT FILTER
MINIMUM ANODE SUPPLY RESISTANCE OHMS
200
150
100
50
0
R.M.S. ANODE SUPPLY VOLTAGE VOLTS
300
200
100
0


BRIMAR HY90
HALF-WAVE CIRCUIT
CAPACITOR INPUT FILTER
32μF
Rs = TOTAL EFFECTIVE SUPPLY RESISTANCE
R.M.S. SUPPLY = 240 VOLTS
200V
150V
100V
Rs = 143Ω
115Ω
80Ω
44Ω
E
A
D.C. OUTPUT VOLTAGE VOLTS
400
300
200
100
0
D.C. OUTPUT CURRENT mA
150
100
50
0

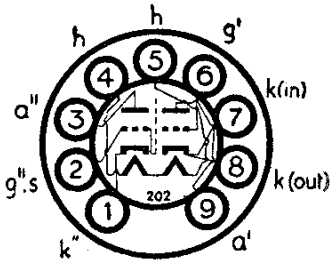
PCC84

Current Equipment Type



B9A Base

TYPE **PCC84**
MINIATURE
HIGH SLOPE
DOUBLE TRIODE



The BRIMAR PCC84 consists of two separate high slope triode units designed for use in VHF cascode amplifiers. Normally, triode 1 is operated as a grounded cathode stage directly coupled to triode 2 which is connected as a grounded grid stage. This gives a low noise input amplifier for use in television receivers for Band III. The shield connected to the grid of triode 2 keeps coupling between the two units to a minimum.

Heater Current	0.3 amp.
Heater Voltage	7.0 volts

RATINGS

Anode Voltage ($I_a = 0$)	550 volts max.
Anode Voltage	180 volts max.
Anode Dissipation (either triode separately)	2.0 watts max.
Total Anode Dissipation (both triodes operating)	2.5 watts max.
Negative Grid Voltage	—50 volts max.
Grid Resistance Triode 1	500 k ohms max.
Grid Resistance Triode 2 (with autobias)†	20 k ohms max.
Grid Resistance Triode 2 (with fixed bias)	500 k ohms max.
Cathode Current (each triode)	18 mA max.
Heater-Cathode 1 potential	90 volts max.
Heater-Cathode 2 potential (heater positive)	90 volts max.
Heater-Cathode 2 potential (heater negative) *	250 volts max.
Resistor between Heater and Cathode	20 k ohms max.

** Maximum D.C. component 180 volts.*
† In direct coupled cascode circuits.

OPERATING CHARACTERISTICS

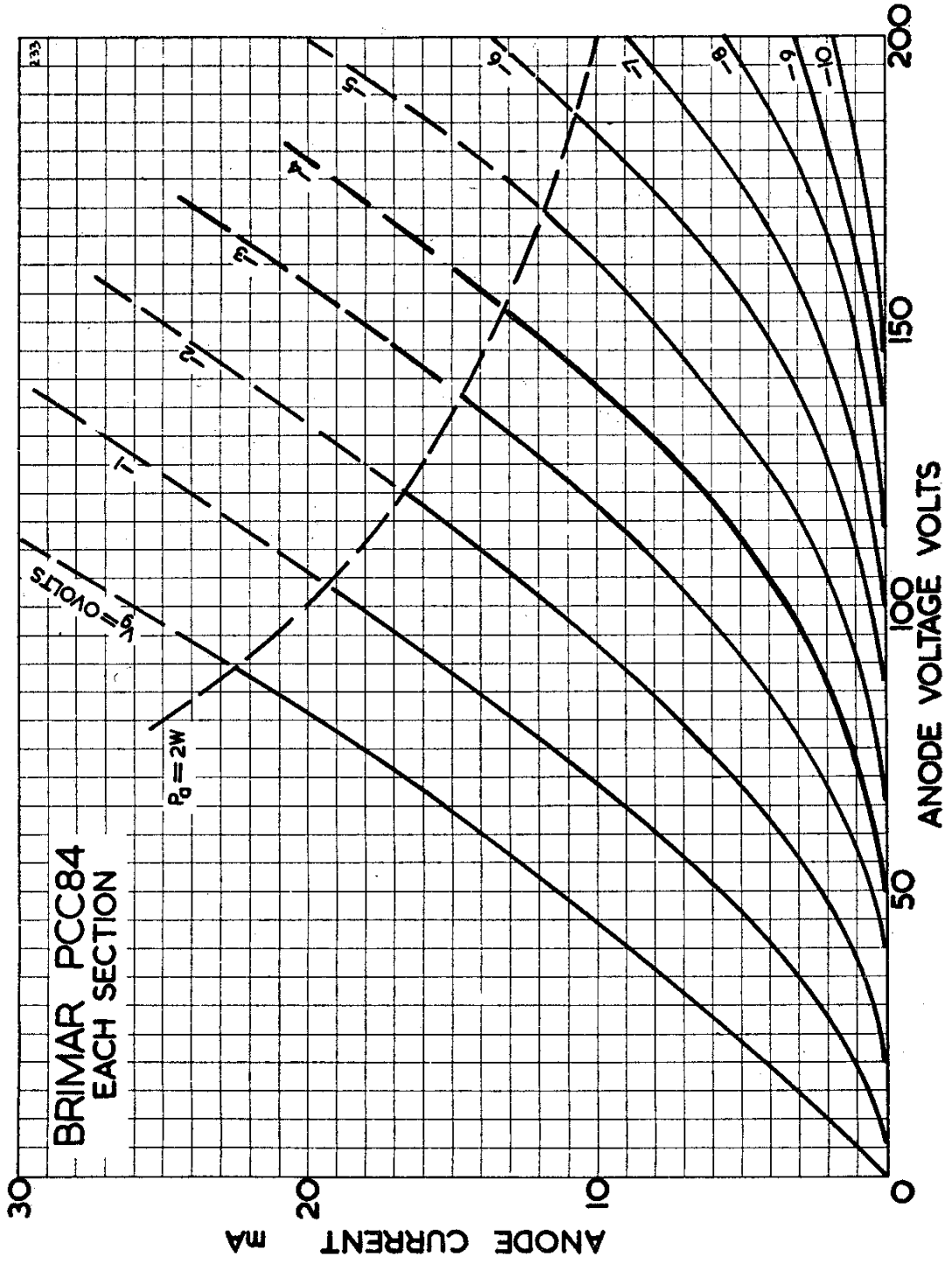
Anode Voltage	90 volts
Grid Voltage	—1.5 volts
Anode Current	12 mA
Mutual Conductance	6.0 mA/V
Amplification Factor	24
Anode Impedance	4,000 ohms
Input Impedance of Triode 1 at 200 Mc/s:	
Separate Cathodes	4,000 ohms
Strapped Cathodes	2,000 ohms

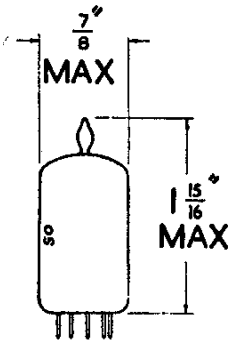
INTER-ELECTRODE CAPACITANCES *

$C_{a'-g'}$	1.1 pF	$C_{a''-k''}$	0.16 pF
$C_{in'}$	2.3 pF	$C_{k''-g''+h}$	4.9 pF
$C_{out'}$	0.5 pF	$C_{h-k''}$	2.8 pF
$C_{g'-h}$	0.25 pF max.	$C_{g'-a''}$	0.006 pF max.
$C_{a''-g''}$	2.3 pF	$C_{a'-a''}$	0.035 pF
$C_{a''-g''+h}$	2.5 pF	$C_{a'-k'+h+g''}$	1.2 pF

** Measured without external shield.*

PCC84

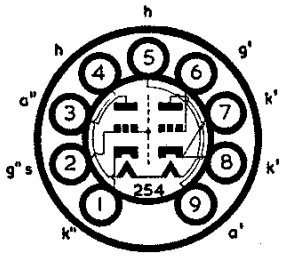

BRIMAR PCC84
EACH SECTION
$P_a = 2W$
V_g = 0 VOLTS
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
ANODE CURRENT mA
30
20
10
0
ANODE VOLTAGE VOLTS
200
150
100
50
0



Current Equipment Type

PCC89

TYPE **PCC89**
MINIATURE
HIGH SLOPE
DOUBLE TRIODE



The BRIMAR PCC89 is designed for use as a cascode R.F. amplifier at frequencies up to 220 Mc/s in television receivers with series connected heaters. Triode 1 operates as a grounded cathode stage directly coupled to Triode 2 which is connected as a grounded grid stage. An internal shield connected to the grid of Triode 2 reduces coupling between units to a minimum. The vari-mu characteristics enable gain control to be effected over a wide range, with low cross-modulation.

Heater Current	0.3	amp
Heater Voltage	7.2	volts

RATINGS (EACH SECTION)

Anode Voltage (Ia = O)	550	volts max
Anode Voltage	130	volts max
Anode Dissipation	1.8	watts max
Negative Grid Voltage	50	volts max
Grid Resistance (Triode 1)	1.0	MΩ max
Grid Resistance (Triode 2)	0.5	MΩ max
Cathode Current	22	mA max
Heater-Cathode 1 potential	50	volts r.m.s. max
Heater-Cathode 2 potential* (cathode positive)	180	volts max

* Maximum d.c. component 130 volts.

CHARACTERISTICS

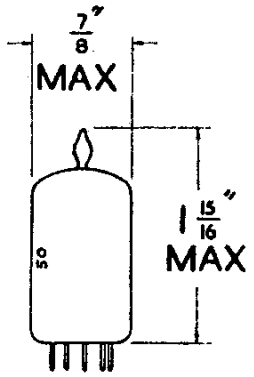
Anode Voltage	90	volts
Grid Voltage	−1.2	volts
Anode Current	15	mA
Mutual Conductance	12	mA/V
Grid Voltage for $g_m/100$	−8	volts
Amplification Factor	31	

INTER-ELECTRODE CAPACITANCES*

$C_{a'-g'}$	1.7	pF
$C_{in'}$	4.0	pF
$C_{out'}$	0.35	pF max
$C_{g'-h}$	0.3	pF max
$C_{a''-g''}$	3.9	pF
$C_{a''-g''+h}$	4.2	pF
$C_{a''-k''}$	0.2	pF max
$C_{k''-g''+h}$	6.8	pF
$C_{h-k''}$	3.1	pF
$C_{g'-a''}$	0.0027	pF
$C_{a'-a''}$	0.015	pF max

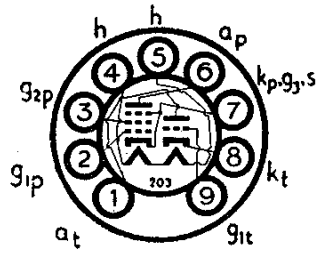
* Measured with external shield.

PCF80



Current Equipment Type

TYPE PCF80 MINIATURE TRIODE PENTODE FREQUENCY CHANGER



The BRIMAR PCF80 is a triode pentode with separate cathodes designed for use as a frequency changer in television equipment up to 220 Mc/s.

Heater Current	0.3 amp.
Heater Voltage	9.0 volts

RATINGS

	Triode	*Pentode*	
Anode Voltage (Ia = 0)	550	550	volts max.
Anode Voltage	250	250	volts max.
Anode Dissipation	1.5	1.7	watts max.
Screen Voltage (Ia = 0)	—	550	volts max.
Screen Voltage (Ik = 14 mA)	—	175	volts max.
Screen Voltage (Ik ≤ 10 mA)	—	200	volts max.
Screen Dissipation (Pa > 1.2 W)	—	0.5	watts max.
Screen Dissipation (Pa < 1.2 W)	—	0.75	watts wax.
Cathode Current	14	14	mA max.
Control Grid Resistance	500	—	k Ω max.
Control Grid Resistance (cathode bias)	—	1.0	M Ω max.
Control Grid Resistance (fixed bias)	—	500	k Ω max.
Heater-Cathode Potential (cathode negative)	100	100	volts max.
Heater-Cathode Potential (cathode positive)*	200	200	volts max.

* *Maximum d.c. component 120 volts.*

CHARACTERISTICS

	Triode	*Pentode*	
Anode Voltage	100	170	volts
Screen Voltage	—	170	volts
Control Grid Voltage	—2	—2	volts
Anode Current	14	10	mA
Screen Current	—	2.8	mA
Mutual Conductance	5	6.2	mA/V
Amplification Factor	20	—	
Inner Amplification Factor ($\mu g_1 - g_2$)	—	47	
Anode Impedance (approx.)	4	400	k Ω
Input Impedance at 50 Mc/s.	—	10	k Ω
Equivalent noise resistance	—	1.5	k Ω

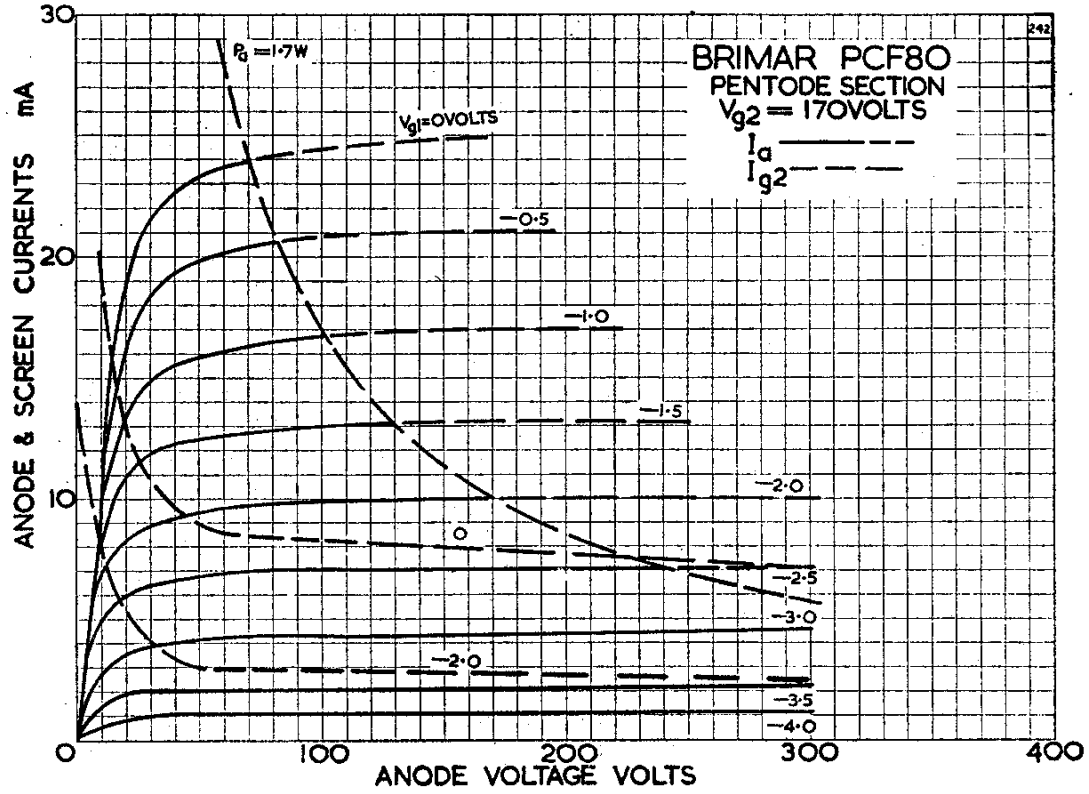
TYPICAL OPERATION AS A MIXER (Pentode Section)

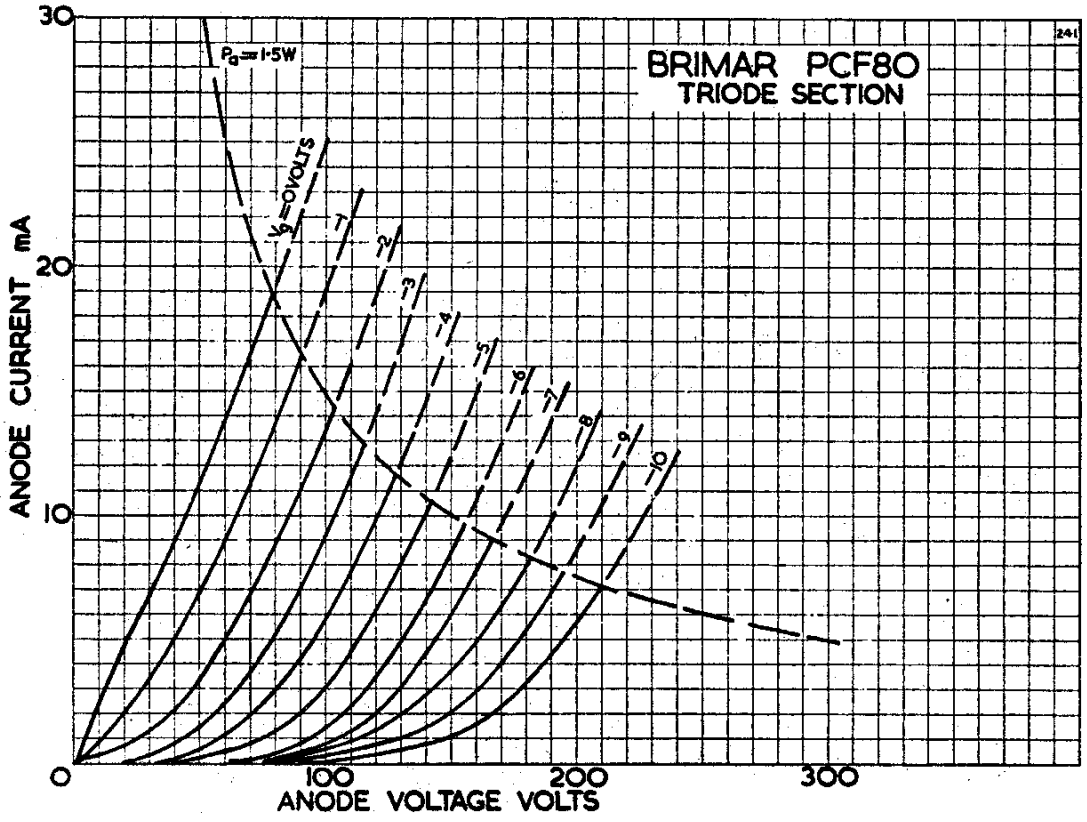
Anode Voltage	170	170	volts
Screen Voltage	170	170	volts
Grid Leak Resistor	100	100	k Ω
Cathode Bias Resistor	330	820	k Ω
Heterodyne Voltage	3.5	3.5	volts rms
Anode Current	6.5	5.2	mA
Screen Current	2.0	1.5	mA
Grid Current	20	0	μA
Conversion Conductance	2.2	2.1	mA/V
Input Impedance	800	870	k Ω

INTER-ELECTRODE CAPACITANCES (measured without external shield)

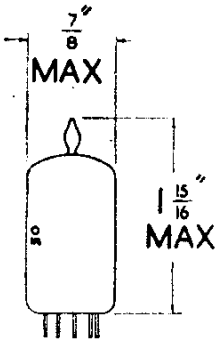
Pentode Grid 1 to Pentode Anode	0.025 pF
Pentode Input	5.2 pF
Pentode Output	3.4 pF
Triode Grid to Triode Anode	1.5 pF
Triode Grid to Triode Cathode and Heater	2.5 pF
Triode Anode to Triode Cathode and Heater	1.8 pF
Pentode Anode to Triode Anode	0.07 pF
Pentode Anode to Triode Grid	0.02 pF
Pentode Grid 1 to Triode Anode	0.16 pF

PCF80


BRIMAR PCF80
PENTODE SECTION
V_{g2} = 170VOLTS
I_a
I_{g2}
P_a = 1·7W
V_{g1}=0VOLTS
−0·5
−1·0
−1·5
−2·0
0
−2·5
−3·0
−2·0
−3·5
−4·0
ANODE & SCREEN CURRENTS mA
ANODE VOLTAGE VOLTS
0
10
20
30
100
200
300
400


BRIMAR PCF80
TRIODE SECTION
P_a = 1·5W
V_g =0VOLTS
1
2
3
4
5
6
7
8
9
0
ANODE CURRENT mA
ANODE VOLTAGE VOLTS
0
10
20
30
100
200
300

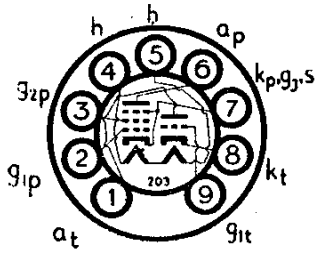
PCF82



B9A Base

Current Equipment Type

TYPE PCF82
MINIATURE
TRIODE PENTODE
FREQUENCY CHANGER



The BRIMAR PCF82 is a triode-pentode frequency changer featuring a high slope triode and a high input impedance pentode of high slope suitable for use in television receivers for Band III. The high input impedance at 200 Mc/s permits a sensibly constant conversion gain to be obtained over Bands I and III. The low value of C_{ag} for the pentode and $C_{ap,\ at}$ facilitate the reduction of oscillator radiation. The use of low oscillator grid current to obtain the required heterodyne voltage reduces the frequency drift of the oscillator to a minimum.

Heater Current	0.3 amp.
Heater Voltage	9.5 volts (nom.)

RATINGS

Heater—Cathode Potential (cathode positive)	220 volts max.
Heater—Cathode Potential (cathode negative)	90 volts max.

	Triode	*Pentode*
Anode Voltage (I_a = 0)	550	550 volts max.
Anode Voltage	300	300 volts max.
Screen (g_2) Voltage	—	300 volts max.
Anode Dissipation	2.7	2.8 watts max.
Screen Dissipation	—	0.5 watts max.
Positive D.C. Grid No. 1 Voltage	0	0 volts max.
Cathode Current	20	20 mA max.
Grid Resistance	1	1 megohm max.

CHARACTERISTICS

	Triode	*Pentode*
Anode Voltage	150	250 volts
Screen Voltage	—	110 volts
Cathode Bias Resistor	56	68 ohms
Anode Current	18	10 mA
Screen Current	—	3.5 mA
Mutual Conductance	8.5	5.2 mA/V
Anode Impedance (approx.)	5	400 k ohms
Amplification Factor	40	—
Grid No. 1 Voltage (for I_a = 10μA)	—12	—10 volts

TYPICAL OPERATION AS MIXER

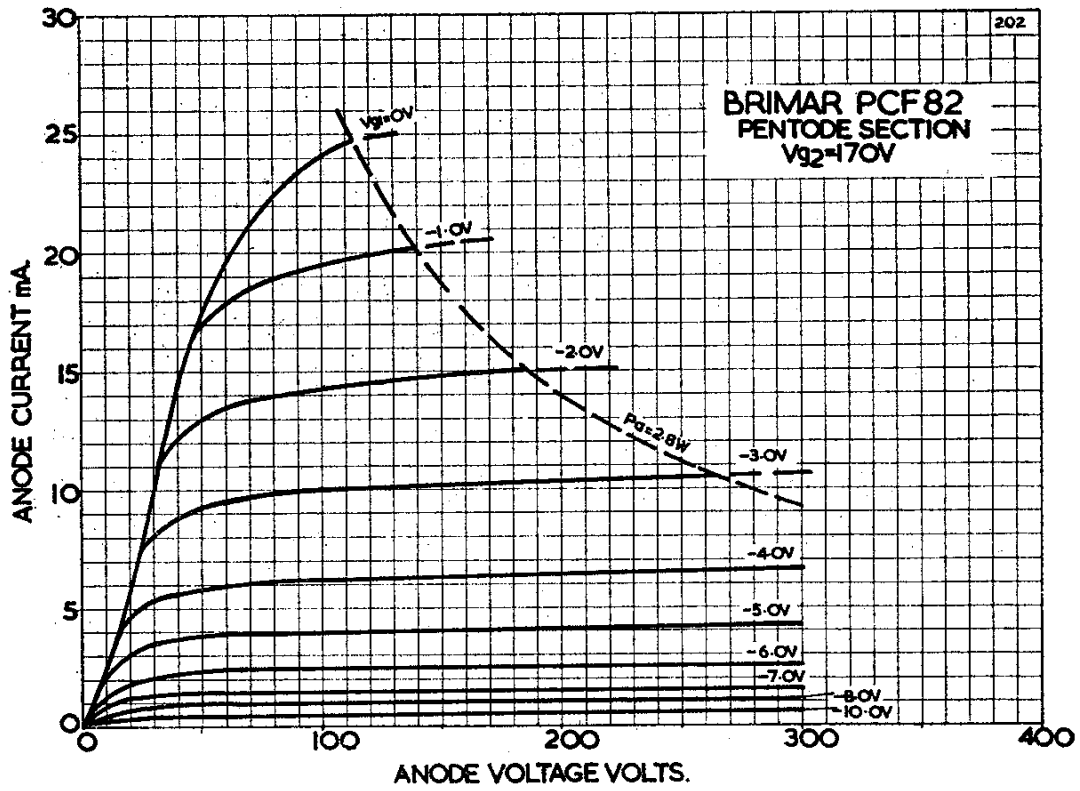
	Triode		*Pentode*
Anode Voltage	100	170	170 volts
Screen Voltage	—	110	170 volts
Cathode Bias Resistor	0	0	680 ohms
Grid Leak Resistor	27	270	100 k ohms
Anode Current	7.0	5.5	6.6 mA
Screen Current	—	2.0	2.5 mA
Heterodyne Voltage	—	3.0	5.0 volts peak
Conversion Conductance	—	1.6	1.65 mA/V

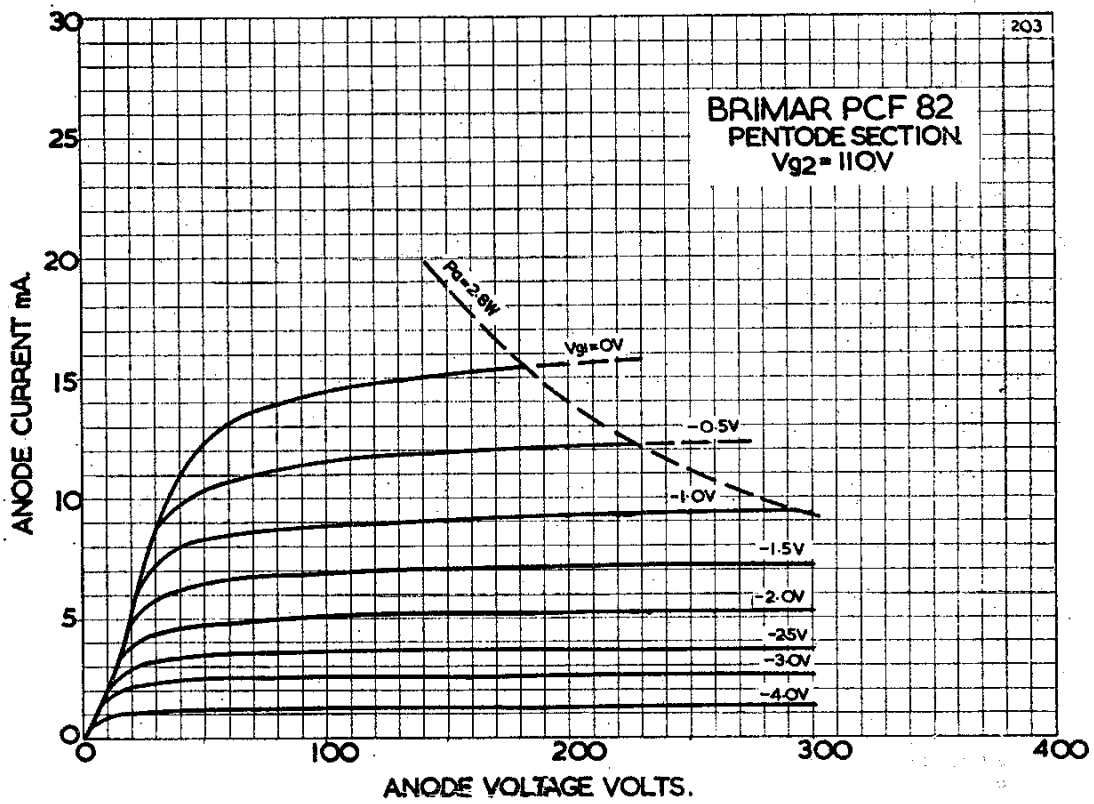
INTER-ELECTRODE CAPACITANCES *

Pentode Grid No. 1 to Pentode Anode	0.006 pF
Pentode Input	5.0 pF
Pentode Output	3.5 pF
Triode Grid to Triode Anode	1.8 pF
Triode Grid to Cathode	2.5 pF
Triode Anode to Cathode	1.0 pF
Cathode to Heater (either section) approx.	3.0 pF

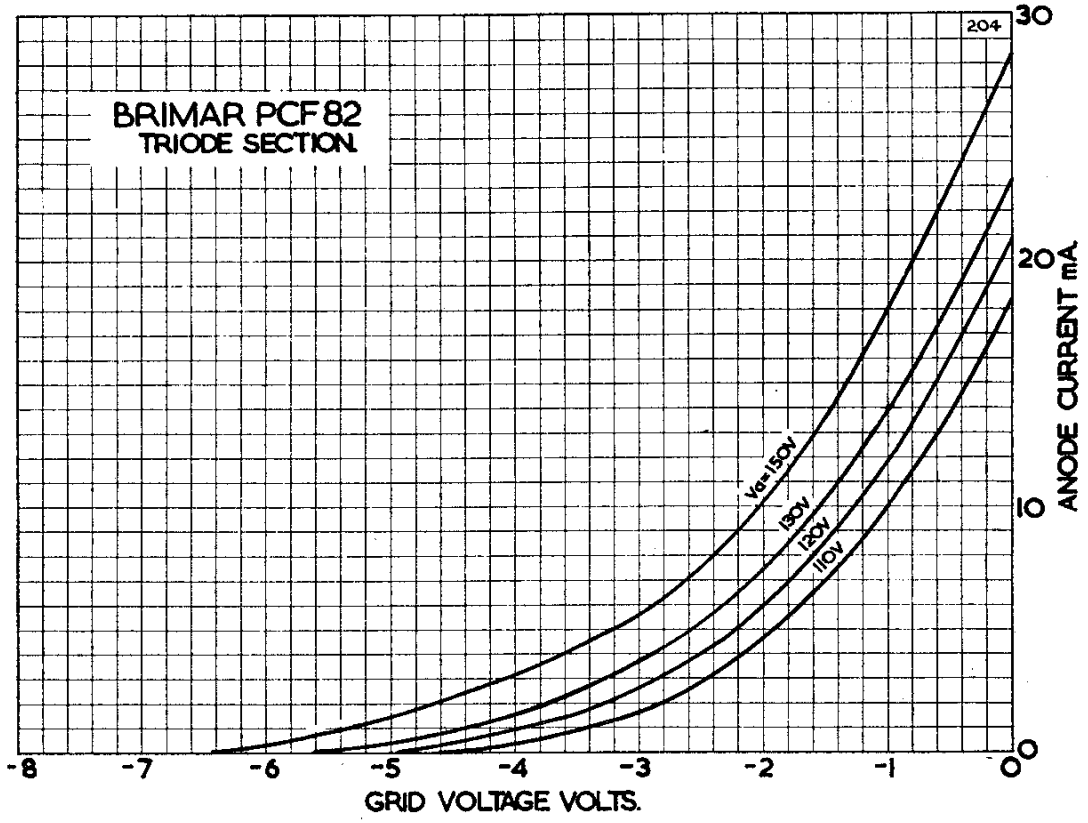
** Measured with external shield.*

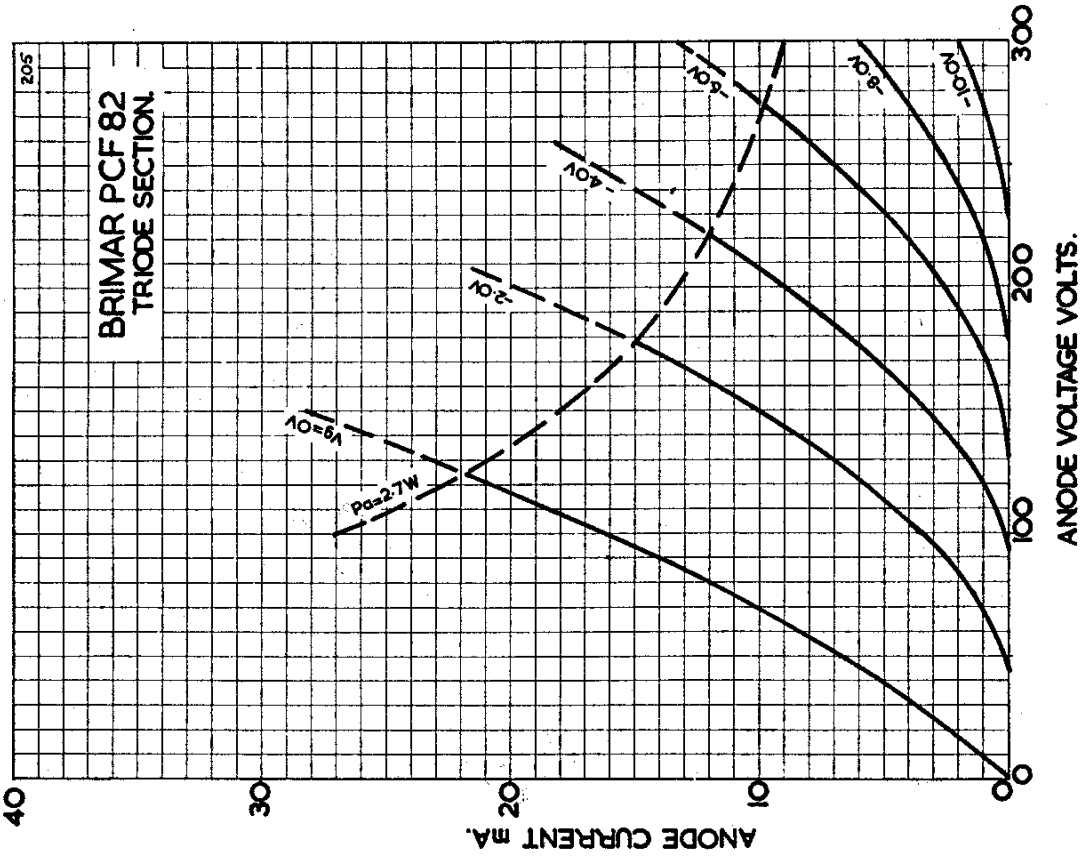
PCF82


202
BRIMAR PCF82
PENTODE SECTION
Vg2=170V
Vg1=0V
-1·0V
-2·0V
Pa=2·8W
-3·0V
-4·0V
-5·0V
-6·0V
-7·0V
-8·0V
-10·0V
ANODE CURRENT mA.
ANODE VOLTAGE VOLTS.
0
5
10
15
20
25
30
100
200
300
400

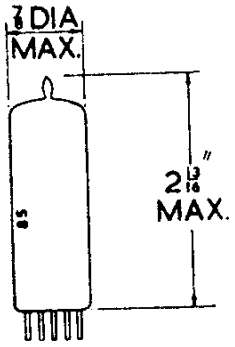

203
BRIMAR PCF 82
PENTODE SECTION
Vg2 = 110V
Pa=2·6W
Vg1=0V
-0·5V
-1·0V
-1·5V
-2·0V
-2·5V
-3·0V
-4·0V
ANODE CURRENT mA.
ANODE VOLTAGE VOLTS.
0
5
10
15
20
25
30
100
200
300
400

PCF82


204
BRIMAR PCF82
TRIODE SECTION
Va=150V
130V
120V
110V
-8
-7
-6
-5
-4
-3
-2
-1
0
0
10
20
30
ANODE CURRENT mA.
GRID VOLTAGE VOLTS.


205
BRIMAR PCF82
TRIODE SECTION
-6V
-8V
-10V
-4V
-2V
Vg=0V
Pa=2.7W
0
100
200
300
ANODE VOLTAGE VOLTS.
40
30
20
10
0
ANODE CURRENT mA.

PCL82

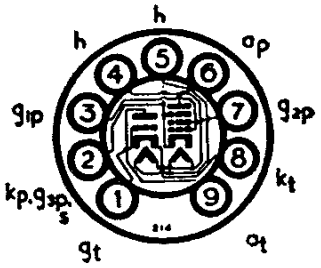


B9A Base

Current Equipment Type

TYPE PCL82

TRIODE PENTODE



The BRIMAR PCL82 is a noval triode pentode for use in frame time-base circuits and as a sound amplifier and output valve.

Heater Current ... ... 0.3 amp. Heater Voltage ... ... 16 volts

RATINGS

		Triode	*Pentode*	
Anode Voltage ($I_a = 0$)		550	550	volts max.
Anode Voltage		250	250	volts max.
Peak Anode Voltage† Positive		600	2,500	volts max.
Negative		—	500	volts max.
Anode Dissipation		1	7	watts max.
Screen Voltage ($Ig_2 = 0$)		—	550	volts max.
Screen Voltage		—	250	volts max.
Screen Dissipation		—	1.8	watts max.
Screen Dissipation (at full drive)		—	3.2	watts max.
Cathode Current		15	50	mA max.
Peak Cathode Current†		200	—	mA max.
Control Grid Resistance. Fixed Bias		1	1	M Ω max.
Cathode Bias		3	2	M Ω max.
Heater-Cathode Voltage		200	200	volts max.

† *Max. pulse duration 4 per cent. of a cycle with a maximum duration of 0.8 m. sec.*

CHARACTERISTICS

	Triode		*Pentode*		
Anode Voltage	100	100	170	200	volts
Screen Voltage	--	100	170	200	volts
Control Grid Voltage	0	—6	—11.5	—16	volts
Anode Current	3.5	26	41	35	mA
Screen Current	—	5	8	7	mA
Mutual Conductance	2.5	6.8	7.5	6.4	mA/V
Amplification Factor	70	—	—	—	
Inner Amplification Factor ($\mu g_2 - g_1$) ...	—	10	9.5	9.5	
Anode Impedance	—	15	16	20	k Ω

OPERATING CHARACTERISTICS

Pentode Section as an audio output stage.

Anode and Screen Voltage	170	200	volts
Grid Voltage	—11.5	—16	volts
Anode Current	41	35	mA
Screen Current	8	7	mA
Optimum Load	3.9	5.6	k Ω
Power Output	3.3	3.5	watts
Distortion	10	10	per cent.
Mutual Conductance ...	7.5	6.4	mA/V

Triode Section as an A.F. amplifier.

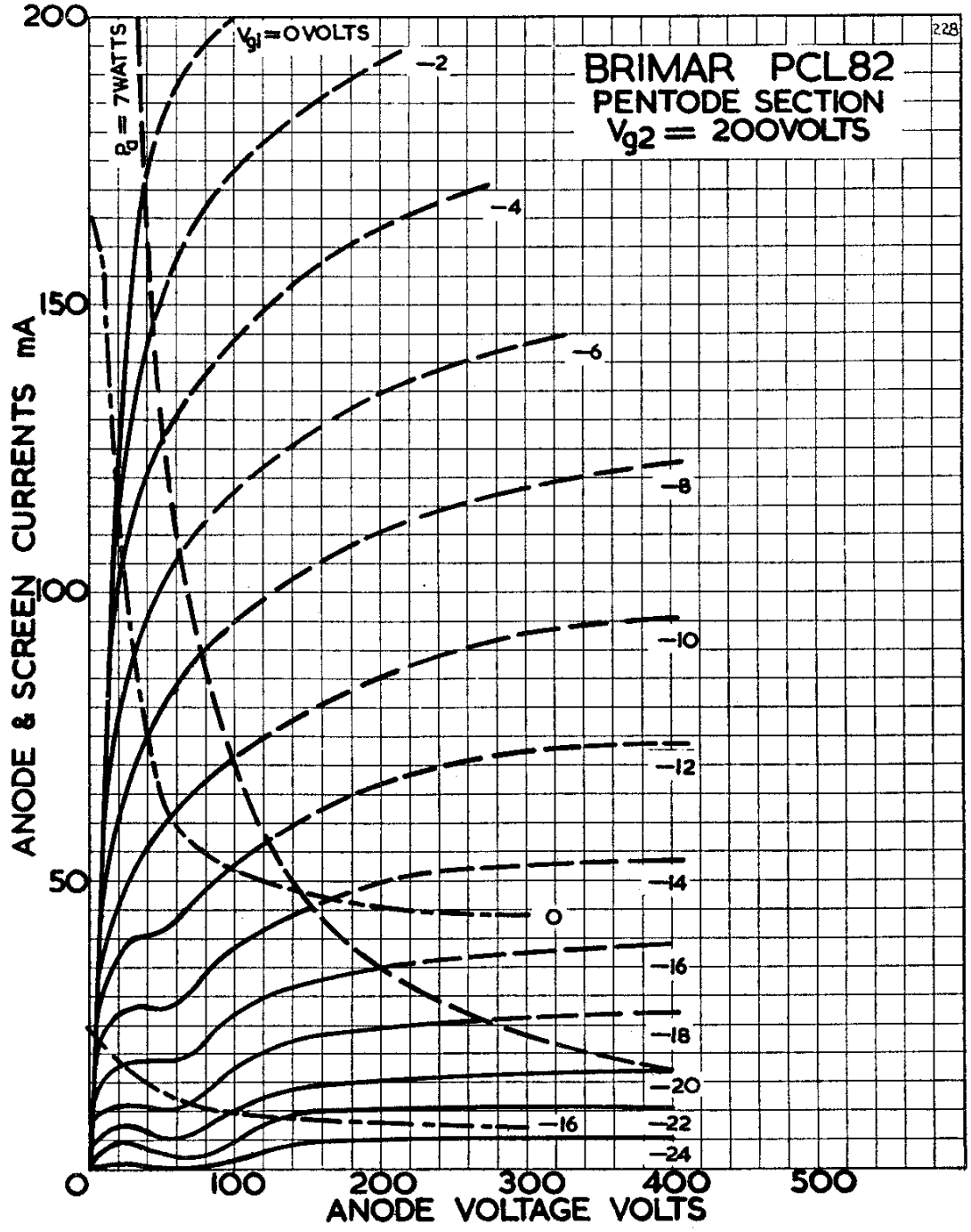
Anode Supply Voltage	170	200	volts
Cathode Bias Resistor	2.7	2.2	k Ω
Anode Resistor ...	220	220	k Ω
Maximum Output ...	25	26	V r.m.s.
Distortion	2.3	1.6	per cent.
Gain	51	52	
Following Grid Resistor	680	680	k Ω

INTER-ELECTRODE CAPACITANCES *

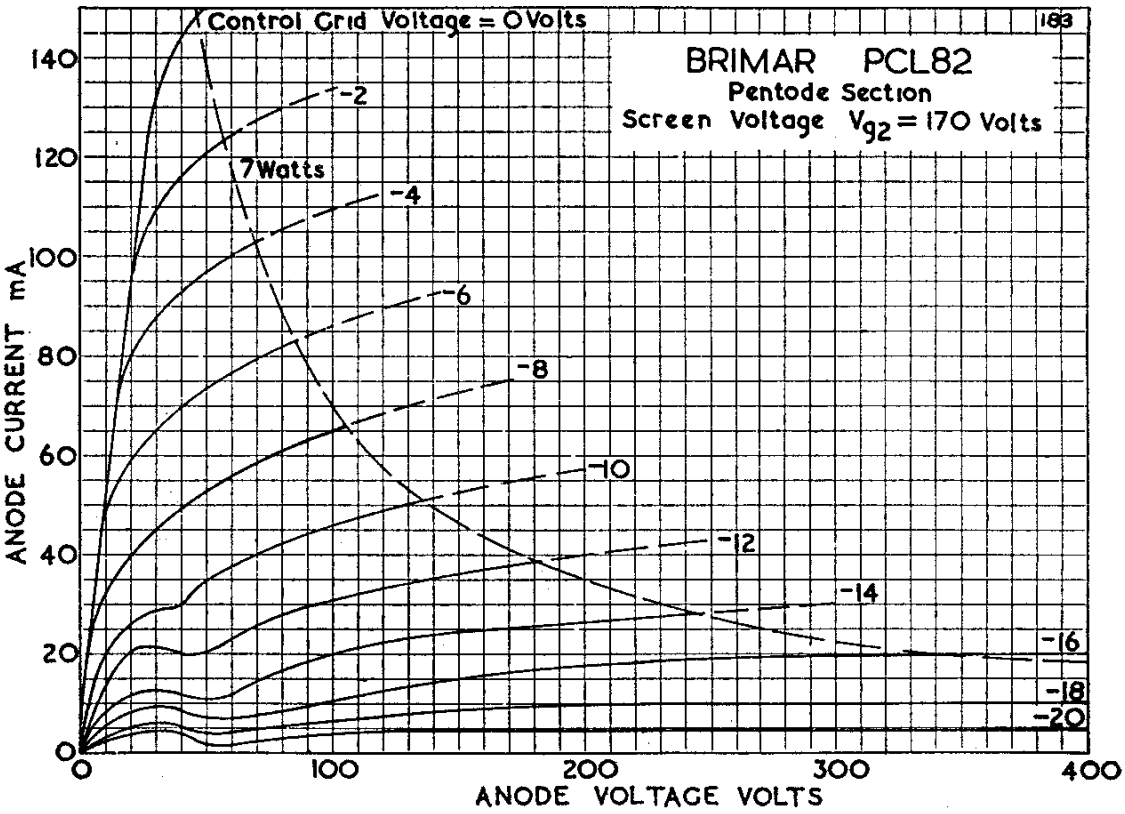
Triode Input	2.7	pF	Pentode Anode to Pentode Grid	0.3	pF
Triode Output	4.3	pF	Pentode Grid to Heater ...	0.3	pF
Triode Anode to Triode Grid	4.2	pF	Triode Anode to Pentode Grid	0.02	pF
Triode Grid to Heater ...	0.02	pF	Triode Grid to Pentode Anode	0.02	pF
Pentode Input	9.3	pF	Triode Grid to Pentode Grid ...	0.025	pF
Pentode Output	8	pF	Triode Anode to Pentode Anode	0.25	pF max.

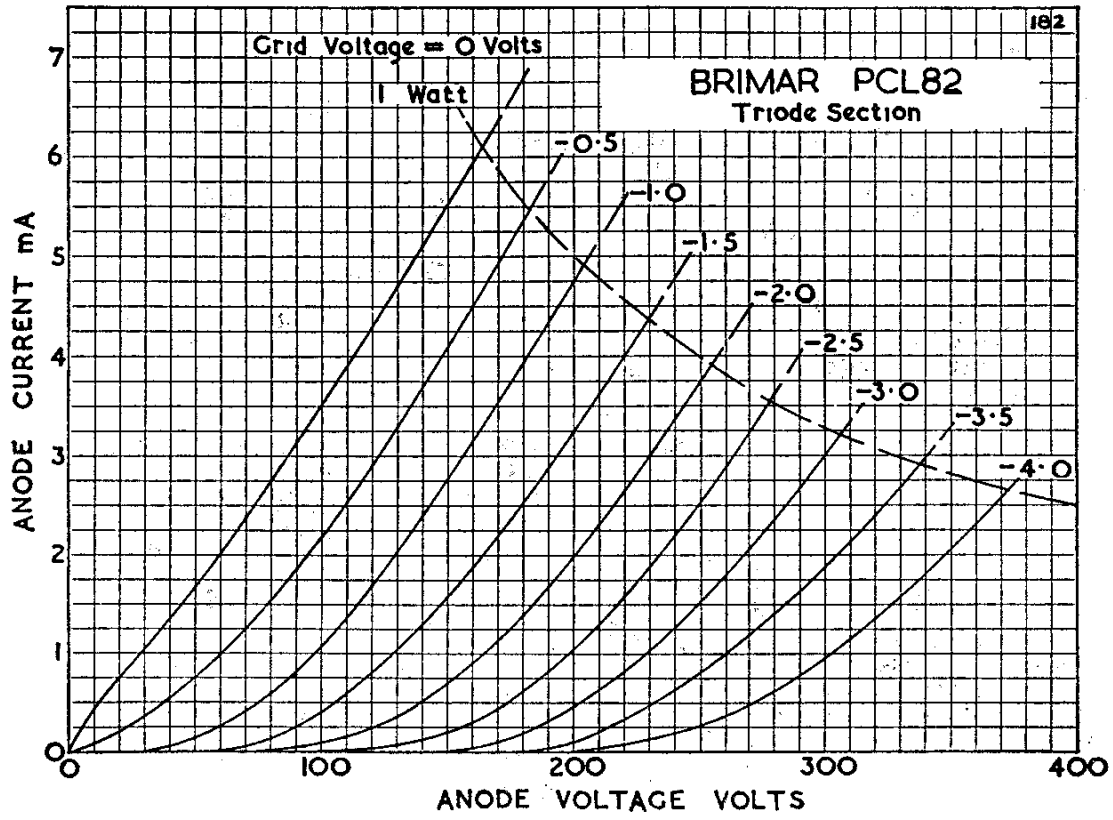
* *With no external shield.*

PCL82

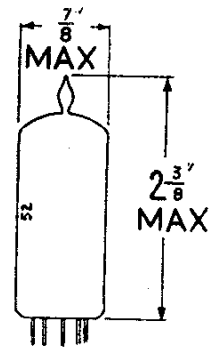

BRIMAR PCL82
PENTODE SECTION
Vg2 = 200VOLTS
228
Vg1 = 0 VOLTS
Pg = 7WATTS
-2
-4
-6
-8
-10
-12
-14
0
-16
-18
-20
-16
-22
-24
200
150
100
50
0
ANODE & SCREEN CURRENTS mA
0
100
200
300
400
500
ANODE VOLTAGE VOLTS

PCL82


183
Control Grid Voltage = 0 Volts
BRIMAR PCL82
Pentode Section
Screen Voltage V_{g2} = 170 Volts
7 Watts
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
ANODE CURRENT mA
0
20
40
60
80
100
120
140
0
100
200
300
400
ANODE VOLTAGE VOLTS


182
Grid Voltage = 0 Volts
BRIMAR PCL82
Triode Section
1 Watt
-0·5
-1·0
-1·5
-2·0
-2·5
-3·0
-3·5
-4·0
ANODE CURRENT mA
0
1
2
3
4
5
6
7
0
100
200
300
400
ANODE VOLTAGE VOLTS

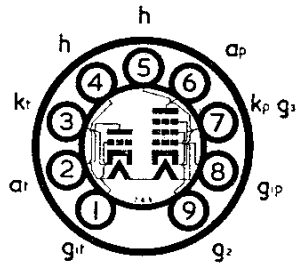
PCL84



B9A (Noval) Base

Current Equipment Type

TYPE **PCL84**
MINIATURE
TRIODE
PENTODE



The BRIMAR PCL84 is a triode pentode with separate cathodes for use in television receivers using series connected heaters. The pentode section is designed for video output service, while the triode may be used as a cathode follower or for a variety of purposes, in sync, a.g.c. and noise suppression circuits.

Heater Current	0.3 amp.
Heater Voltage	15 volts

RATINGS

	Triode	*Pentode*	
Anode Voltage (Ia = 0)	550	550	volts max.
Anode Voltage	250	250	volts max.
Peak Anode Voltage* (Ia < 0.1 mA)	600	—	volts max.
Anode Dissipation	1	4	watts max.
Screen Voltage (Ia = 0)	—	550	volts max.
Screen Voltage	—	250	volts max.
Screen Dissipation	—	1.7	watts max.
Cathode Current	12	40	mA max.
Control Grid Resistor (fixed bias)	1	1	M Ω max.
Control Grid Resistor (cathode bias)	3	2	M Ω max.
Heater-Cathode Voltage (cathode negative)	150	200	volts max.
Heater-Cathode Voltage (cathode positive)†	350	200	volts max.

* *Maximum pulse duration 18 per cent. of a cycle with a maximum of 18μ sec.*

† *Maximum d.c. component = 200 volts.*

CHARACTERISTICS

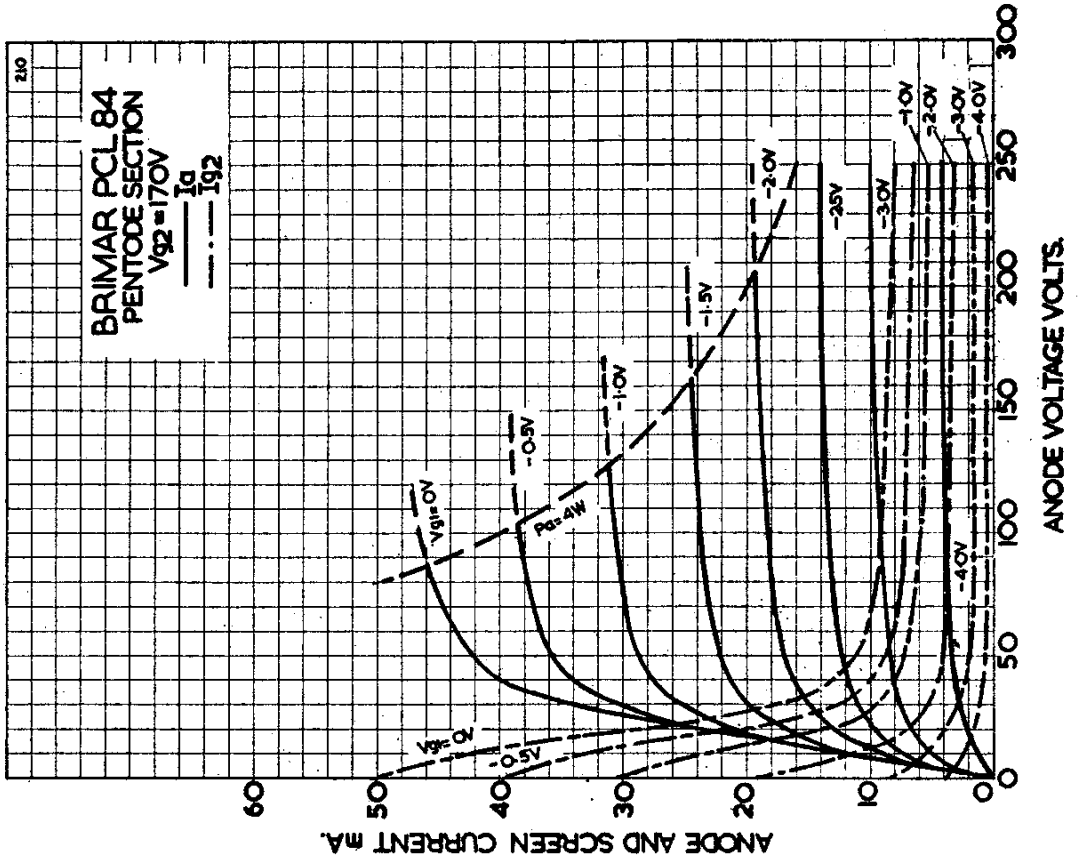
	Triode	*Pentode*			
Anode Voltage	200	170	200	220	volts
Screen Voltage	—	170	200	220	volts
Control Grid Voltage	—1.7	—2.1	—2.9	—3.4	volts
Anode Current	3	18	18	18	mA
Screen Current	—	3	3	3	mA
Mutual Conductance	4	11	10.4	10	mA/V
Amplification Factor	65	—	—	—	
Inner Amplification Factor ($\mu g_1 - g_2$)	—	36	36	36	
Anode Impedance (approx.)	16.2	100	130	150	k Ω
Control Grid Voltage for Ig = 0.3 μA	—1.3	—1.3	—1.3	—1.3	volts

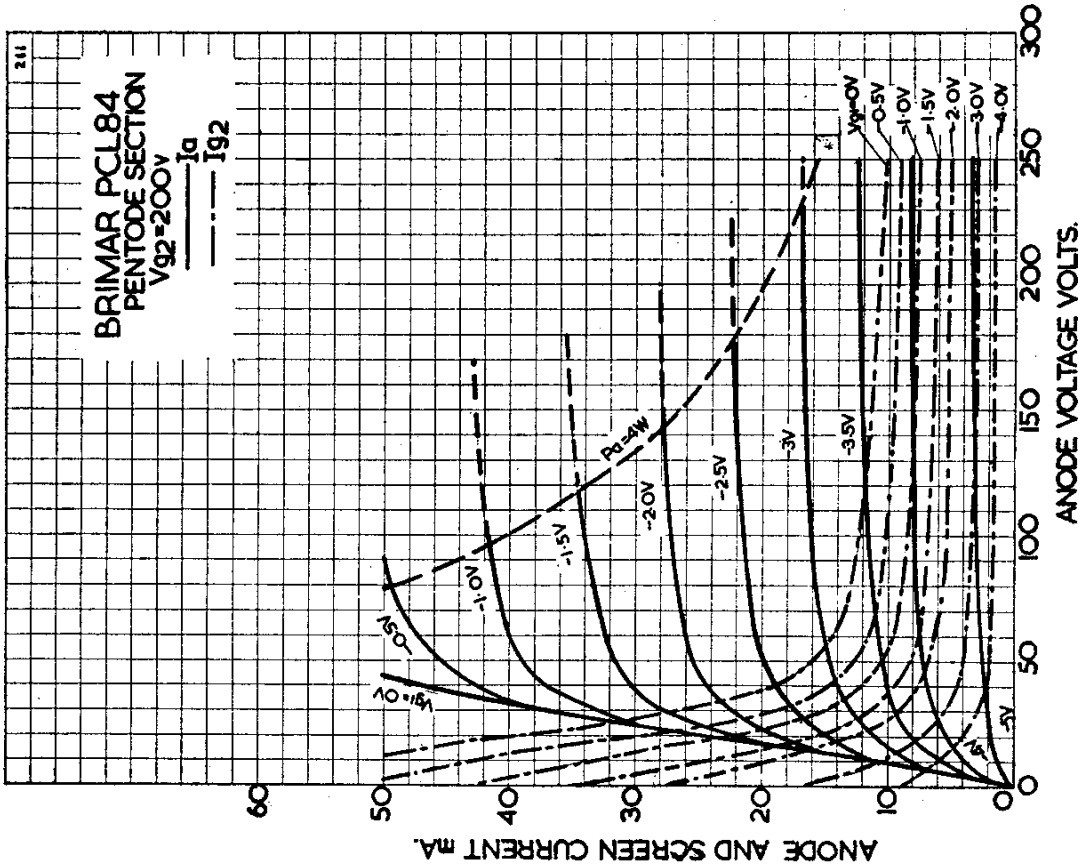
INTER-ELECTRODE CAPACITANCES*

Triode Grid to Triode Cathode	4 pF
Triode Anode to Triode Cathode	2.3 pF
Triode Anode to Triode Grid	2.7 pF
Triode Grid to Heater	< 0.1 pF
Pentode Input	9 pF
Pentode Output	4.5 pF
Pentode Anode to Pentode Grid 1	< 0.1 pF
Pentode Grid 1 to Heater	< 0.1 pF
Triode Anode to Pentode Grid 1	< 0.01 pF
Triode Grid to Pentode Grid 1	< 0.01 pF

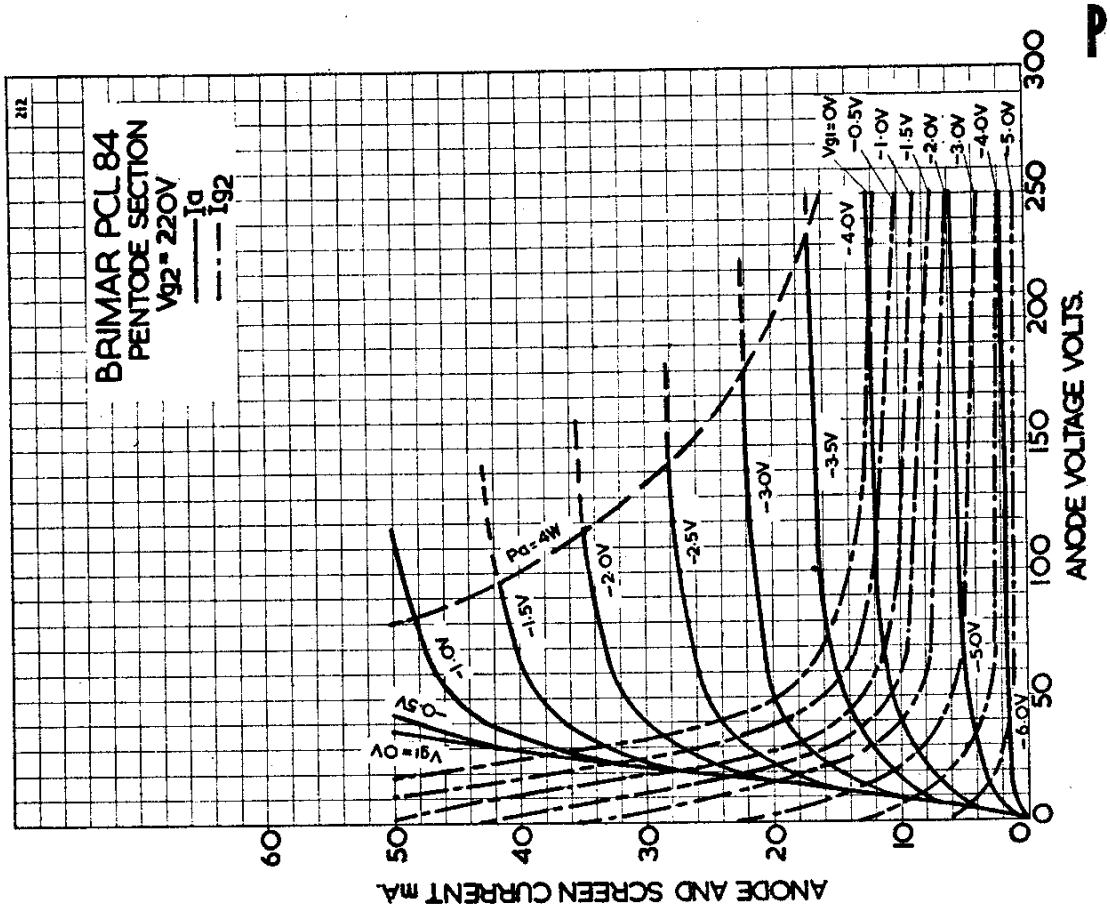
* *With no external shield*

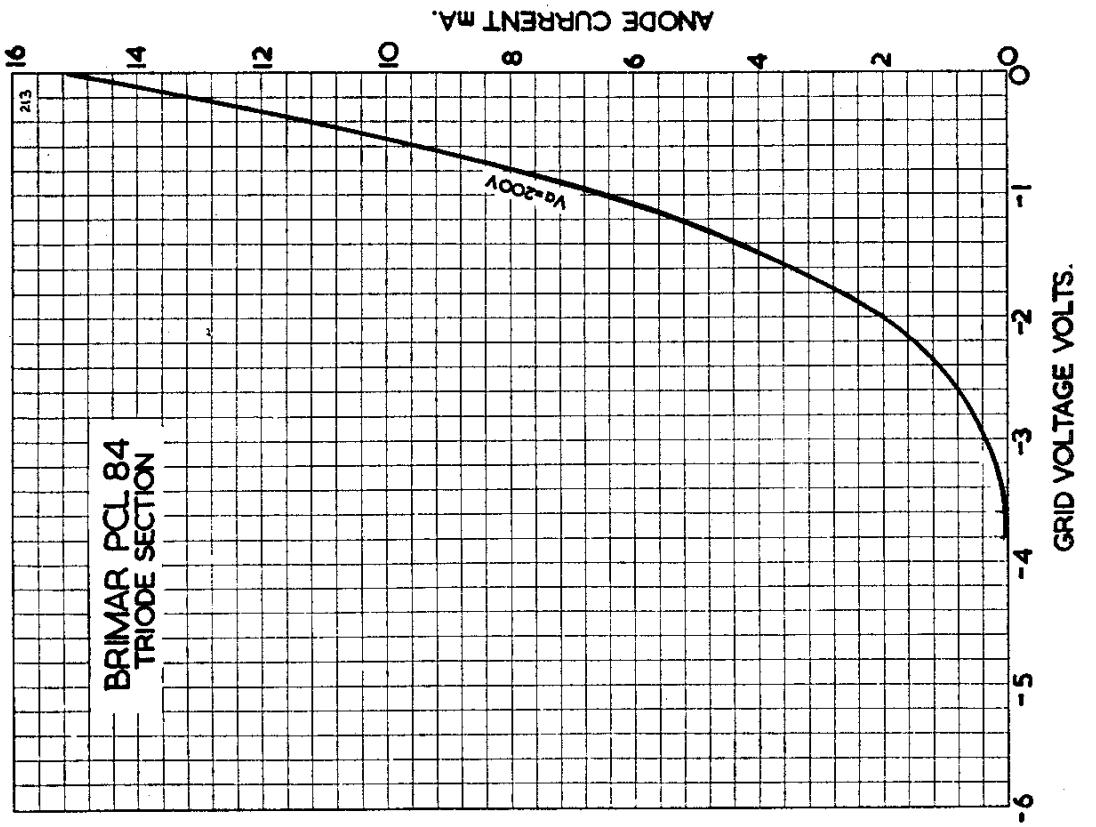
PCL84


BRIMAR PCL 84
PENTODE SECTION
Vg2=170V
Ia
Ig2
Vg1=0V
-0.5V
-1.0V
-1.5V
-2.0V
-2.5V
-3.0V
-4.0V
Pa=4W
ANODE AND SCREEN CURRENT mA.
ANODE VOLTAGE VOLTS.

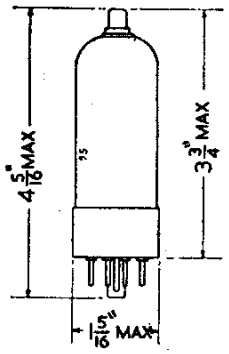

BRIMAR PCL84
PENTODE SECTION
Vg2=200V
Ia
Ig2
Vg1=0V
-0.5V
-1.0V
-1.5V
-2.0V
-3V
-3.5V
-4.0V
Pa=4W
ANODE AND SCREEN CURRENT mA.
ANODE VOLTAGE VOLTS.

PCL84


BRIMAR PCL 84
PENTODE SECTION
Vg2 = 220V
Ia
Ig2
Vg1=0V
-0.5V
-1.0V
-1.5V
-2.0V
-3.0V
-4.0V
-5.0V
-6.0V
Pa=4W
ANODE VOLTAGE VOLTS.
ANODE AND SCREEN CURRENT mA.

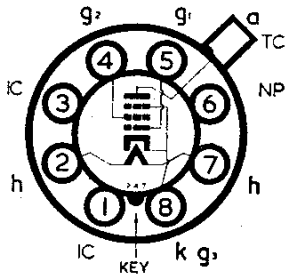

BRIMAR PCL 84
TRIODE SECTION
Va=200V
GRID VOLTAGE VOLTS.
ANODE CURRENT mA.

PL36



Current Equipment Type

TYPE **PL36**
(OCTAL BASE)
LINE TIME BASE
OUTPUT VALVE



The BRIMAR PL36 is designed for line time base output service in television receivers using series connected heaters. It is particularly suitable for use with 110° tubes at the relatively low levels of H.T. voltage available in A.C./D.C. receivers. Special features include a high peak positive anode voltage rating and high anode current at low anode voltages.

Heater Current	0.3 amp.
Heater Voltage	25 volts

RATINGS

Anode Supply Voltage (Ia = 0)	550 volts max.
Anode Voltage	250 volts max.
*Peak Positive Anode Voltage	7 kV max.
*Peak Negative Anode Voltage	1.5 kV max.
Anode Dissipation	10 watts max.
Screen Supply Voltage ($Ig_2 = 0$)	550 volts max.
Screen Voltage	250 volts max.
†Screen Dissipation	5.0 watts max.
Total Anode + Screen Dissipation	13 watts max.
Peak Negative Control Grid Voltage	1.0 kV max.
Direct Cathode Current	200 mA max.
Heater-Cathode Potential (Cathode Positive)	250 volts max.
Heater-Cathode Potential (Cathode Negative)	200 volts max.
Control Grid Resistance	500 k ohms max.

** Max. duration 18 per cent. of one cycle with a max. duration of 18μ sec.*

† Max. average screen dissipation is 7 watts during the period between the commencement of screen current flow and the instant when the anode current attains one-half of its normal operating value.

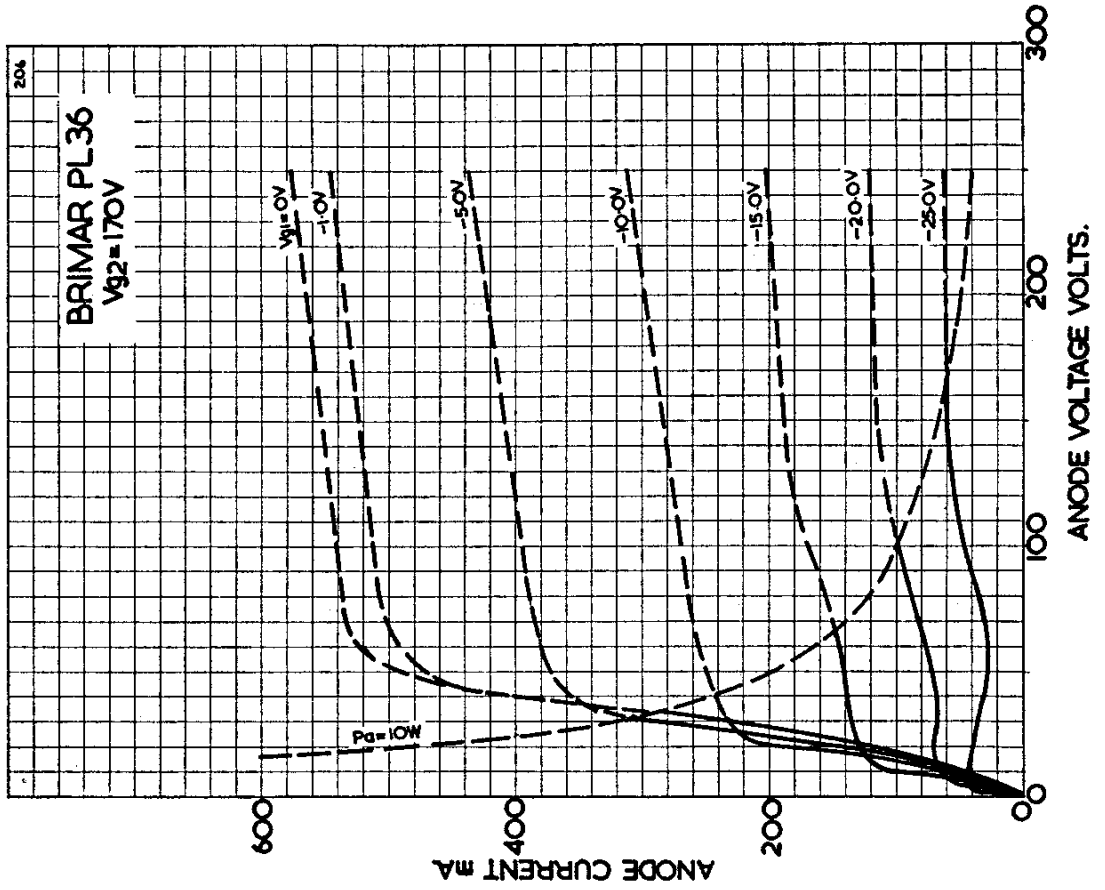
CHARACTERISTICS

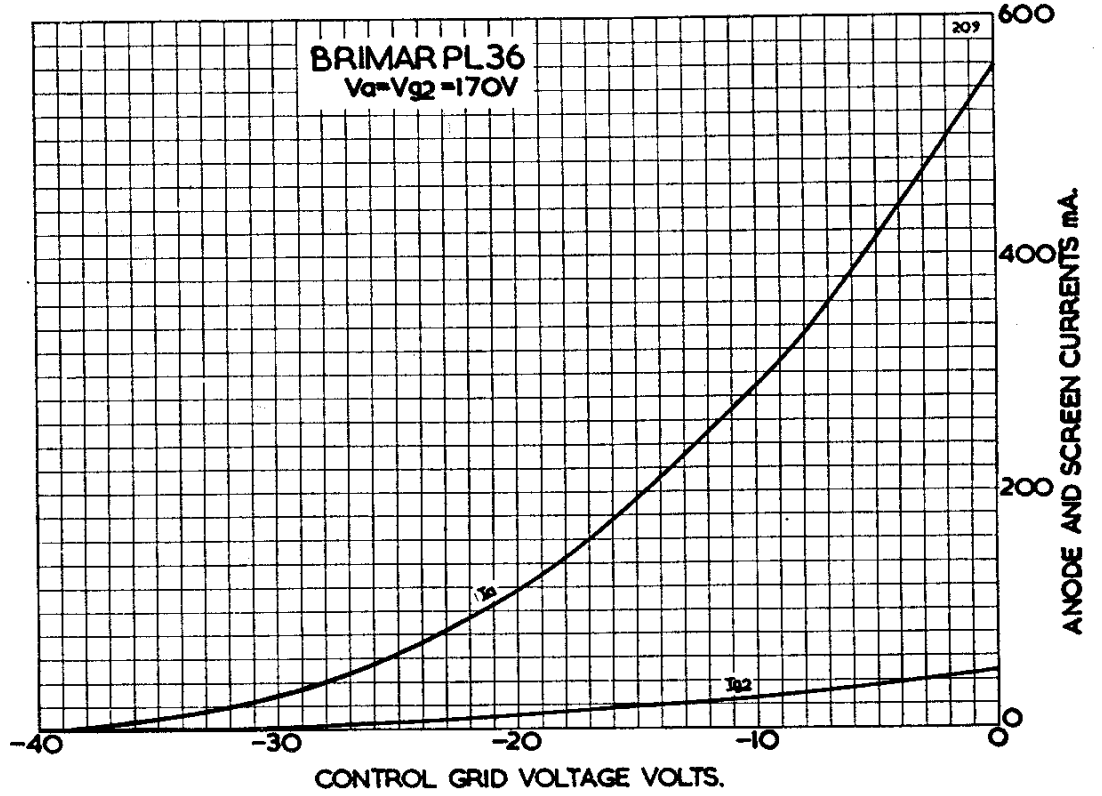
Anode Voltage	100 volts
Screen Voltage	100 volts
Control Grid Voltage	—8.2 volts
Anode Current	100 mA
Screen Current	7 mA
Mutual Conductance	14 mA/V
Anode Impedance	5 k ohms
Inner Amplification Factor ($\mu g_1 - g_2$)	5.6

INTER-ELECTRODE CAPACITANCES

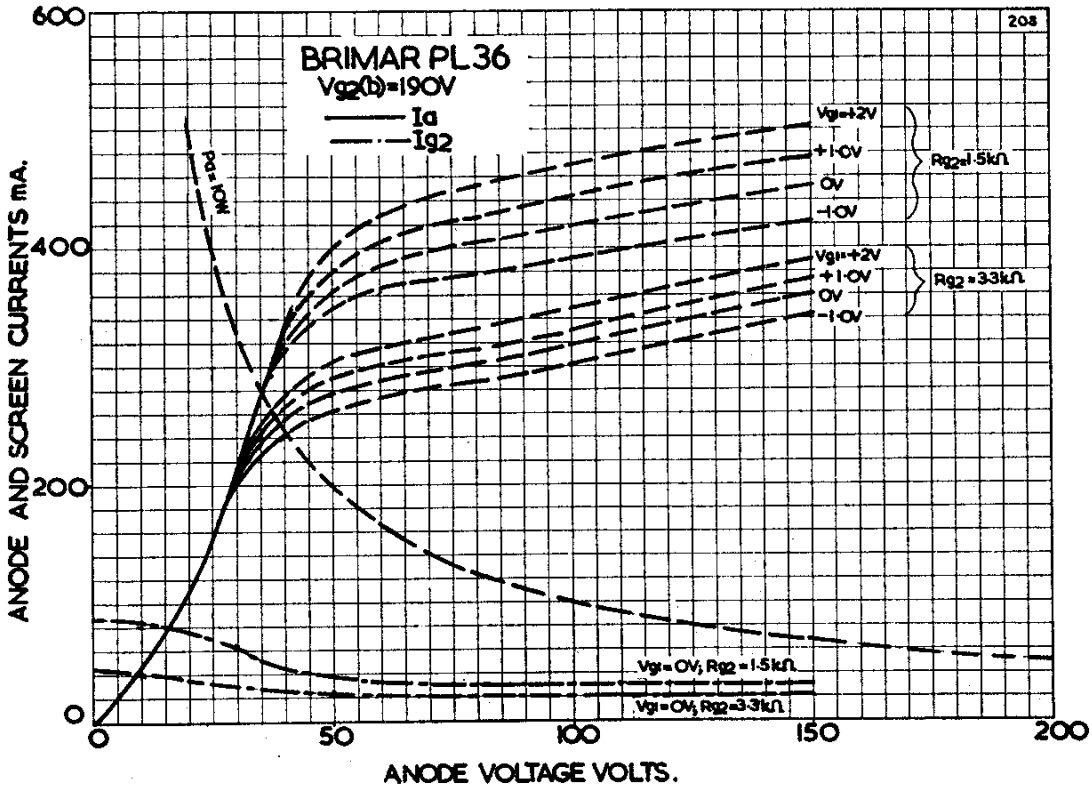
Input	18.0 pF
Output	8.0 pF
Anode — Control Grid	1.1 pF

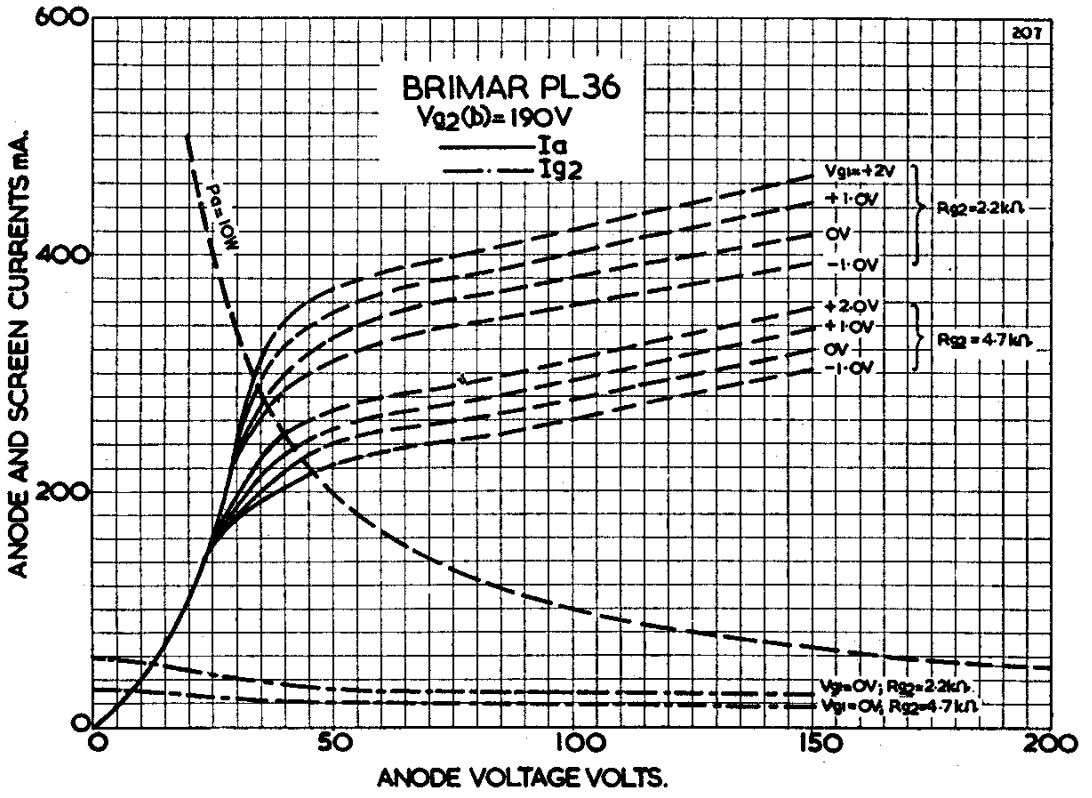
PL36


BRIMAR PL36
Vg2=170V
Vg1=0V
-1·0V
-5·0V
-10·0V
-15·0V
-20·0V
-25·0V
Pa=10W
600
400
200
0
ANODE CURRENT mA
300
200
100
0
ANODE VOLTAGE VOLTS.

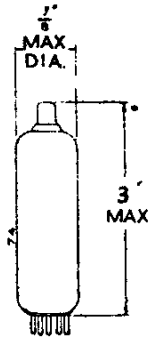

BRIMAR PL36
Va=Vg2=170V
209
600
400
200
0
ANODE AND SCREEN CURRENTS mA.
Ia
Ig2
-40
-30
-20
-10
0
CONTROL GRID VOLTAGE VOLTS.

PL36


208
BRIMAR PL36
Vg2(b)=190V
Ia
Ig2
Pa=10W
Vg1=+2V
+1·0V
0V
-1·0V
Rg2=1·5kΩ
Vg1=+2V
+1·0V
0V
-1·0V
Rg2=3·3kΩ
Vg1=0V; Rg2=1·5kΩ
Vg1=0V; Rg2=3·3kΩ
ANODE AND SCREEN CURRENTS mA.
600
400
200
0
0
50
100
150
200
ANODE VOLTAGE VOLTS.


207
BRIMAR PL36
Vg2(b)=190V
Ia
Ig2
Pa=10W
Vg1=+2V
+1·0V
0V
-1·0V
Rg2=2·2kΩ
+2·0V
+1·0V
0V
-1·0V
Rg2=4·7kΩ
Vg1=0V; Rg2=2·2kΩ
Vg1=0V; Rg2=4·7kΩ
ANODE AND SCREEN CURRENTS mA.
600
400
200
0
0
50
100
150
200
ANODE VOLTAGE VOLTS.

PL81

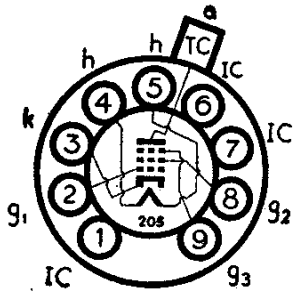


B9A Base

Current Equipment Type

TYPE **PL81**

MINIATURE LINE TIME BASE OUTPUT VALVE



The BRIMAR PL81 is designed for operation as the line time base output valve in A.C./D.C. television receivers. Used in conjunction with a booster diode it is suitable for the scanning of wide angle cathode ray tubes from low H.T. rail voltages.

RATINGS

Heater Current	0.3 amp.
Heater Voltage	21.5 volts (nom.)
Anode Voltage (I_a=0 mA)	550 volts max.
Anode Voltage	250 volts max.
Peak Positive Anode Pulse Voltage *	7,000 volts max.
Screen Supply Voltage	550 volts max.
Screen Voltage	250 volts max.
Anode Dissipation	8.0 watts max.
Screen Dissipation †	4.5 watts max.
Anode + Screen Dissipation	10.0 watts max.
Cathode Current	180 mA max.
Grid Resistor **	500 k ohms max.
Heater-Cathode Potential	200 volts max.

** Maximum pulse duration 15% of one cycle, with maximum of 18 μsecs.*

† The screen dissipation may rise to a maximum of 6 watts during the period between the commencement of screen current flow and the instant when the anode current attains one half of its normal value.

*** In line output service this may be increased to 3.3 MΩ max.*

CHARACTERISTICS

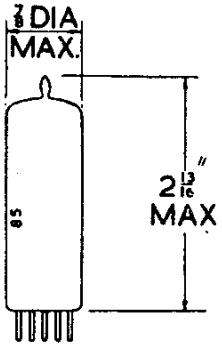
Anode Voltage	170	200 volts
Suppressor (g_3) Voltage	0	0 volts
Screen (g_2) Voltage	170	200 volts
Anode Current	45	40 mA
Screen Current	3.0	2.8 mA
Control Grid Voltage	—22	—28 volts
Mutual Conductance	6.2	6.0 mA/V
Anode Impedance	10,000	11,000 ohms
Inner Amplification Factor	5.5	5.5

INTER-ELECTRODE CAPACITANCES *

Input	14.7 pF
Output	6.0 pF
Anode to Grid 1	0.8 pF max.
Grid 1 to Heater	0.2 pF max.
Anode to Cathode	0.1 pF max.

** Measured with no external shield.*

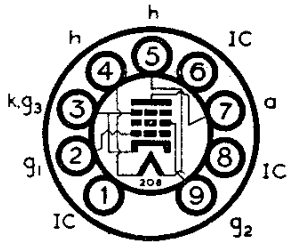
PL84



B9A (Noval) Base

Current Equipment Type

TYPE **PL84**
MINIATURE
FRAME TIME BASE
OUTPUT PENTODE



The BRIMAR PL84 is designed for frame time base output service in television receivers using series connected heaters. It is particularly suitable for use with 110° tubes at the relatively low levels of H.T. voltage available in A.C./D.C. receivers.

Heater Current...	0.3 amp.
Heater Voltage	15 volts

RATINGS

Anode Supply Voltage (Ia = 0)	550 volts max.
Anode Voltage	250 volts max.
Peak Positive Anode Voltage	2.0 kV max.
Peak Negative Anode Voltage	500 volts max.
Anode Dissipation	12 watts max.
Screen Supply Voltage ($Ig_2 = 0$)	550 volts max.
Screen Voltage	200 volts max.
Screen Dissipation	1.75 watts max.
Direct Cathode Current	100 mA max.
Grid Circuit Resistance (cathode bias)	1.0 M Ω max.
Heater-Cathode Voltage	200 volts max.

CHARACTERISTICS

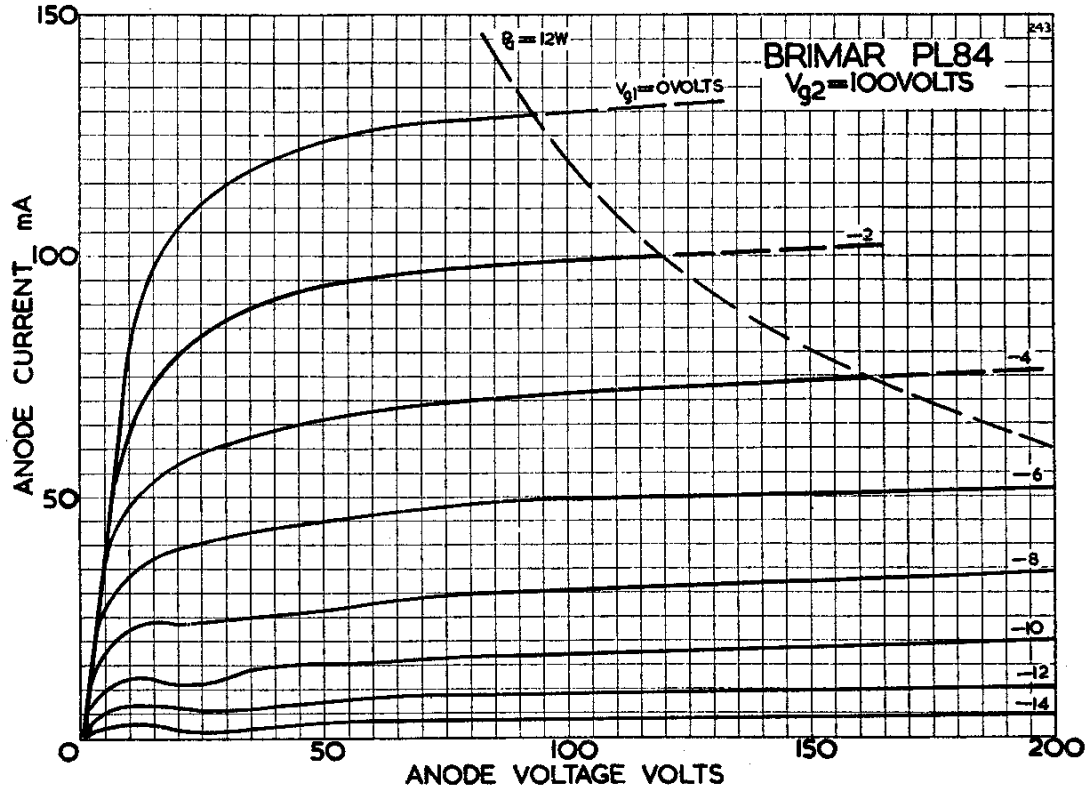
Anode Voltage	100	170	volts
Screen Voltage	100	170	volts
Anode Current	43	70	mA
Screen Current	3	5	mA
Control Grid Voltage	— 6.7	— 12.5	volts
Mutual Conductance	9	10	mA/V
Anode Impedance	23	23	k Ω
Inner Amplification Factor ($\mu g_1 - g_2$)	8	8	

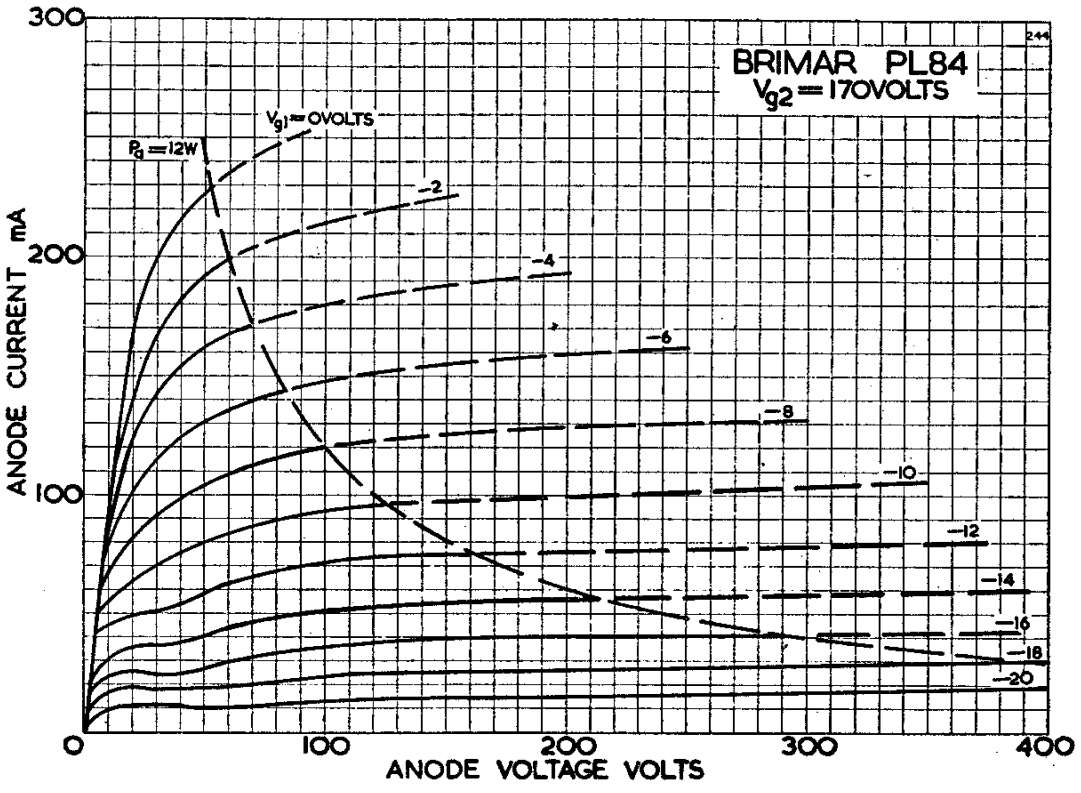
INTER-ELECTRODE CAPACITANCES*

Input	11.8 pF
Output	6.0 pF
Control Grid to Anode	0.6 pF max.

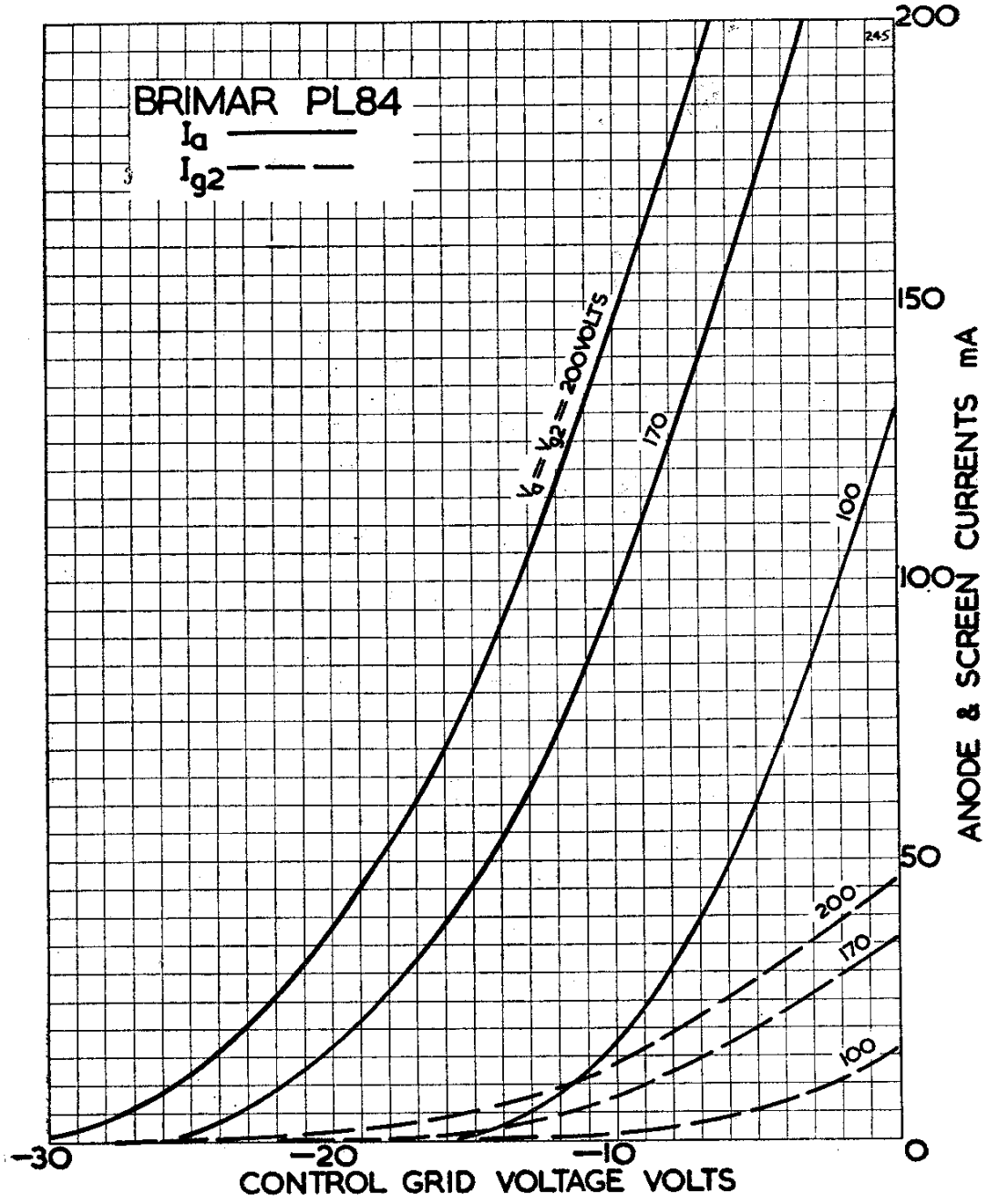
** With no external shield*

PL84

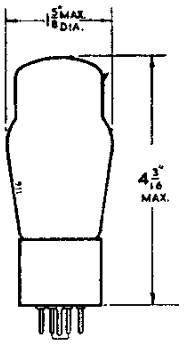

BRIMAR PL84
V_{g2}=100VOLTS
243
P_a=12W
V_{g1}=0VOLTS
-2
-4
-6
-8
-10
-12
-14
ANODE CURRENT mA
150
100
50
0
50
100
150
200
ANODE VOLTAGE VOLTS


BRIMAR PL84
V_{g2}=170VOLTS
244
V_{g1}=0VOLTS
P_a=12W
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
ANODE CURRENT mA
300
200
100
0
100
200
300
400
ANODE VOLTAGE VOLTS

PL84

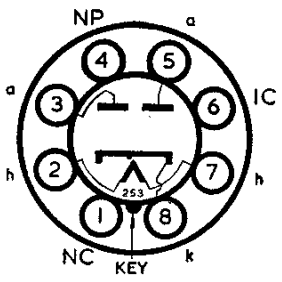

BRIMAR PL84
I_a
I_{g2}
$V_b = V_{g2} = 200$ VOLTS
170
100
200
170
100
200
150
100
50
0
−30
−20
−10
ANODE & SCREEN CURRENTS mA
CONTROL GRID VOLTAGE VOLTS

PY32



Current Equipment Type

TYPE **PY32**
(OCTAL BASE)
HALF-WAVE
RECTIFIER



The BRIMAR PY32 is an indirectly-heated half-wave rectifier for use in television receivers employing series connected 0.3A heaters.

Heater Current	0.3 Amp
Heater Voltage	29 volts

RATINGS

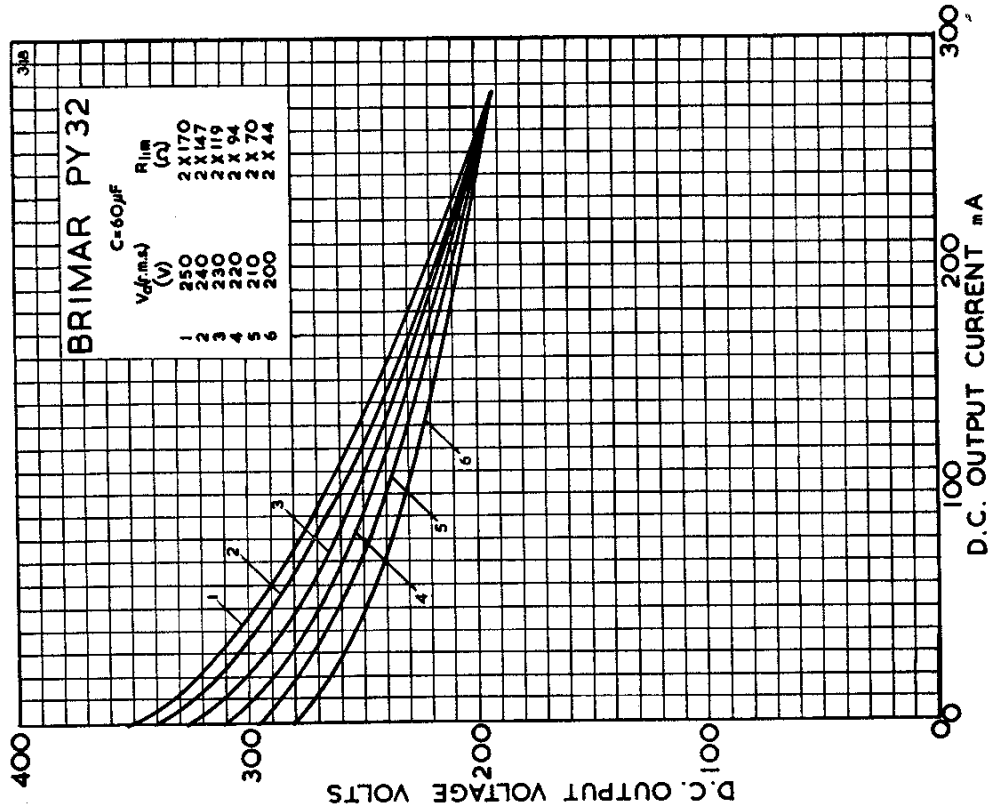
Peak Inverse Voltage	700	volts max
Anode Voltage	250	volts r.m.s. max
Output Current	300	mA max
Peak Anode Current	2.0	amp max
Reservoir Capacitor	100	μF max
Limiting Resistance per anode	56	Ω min
Peak Heater to Cathode Voltage*	550	volts max

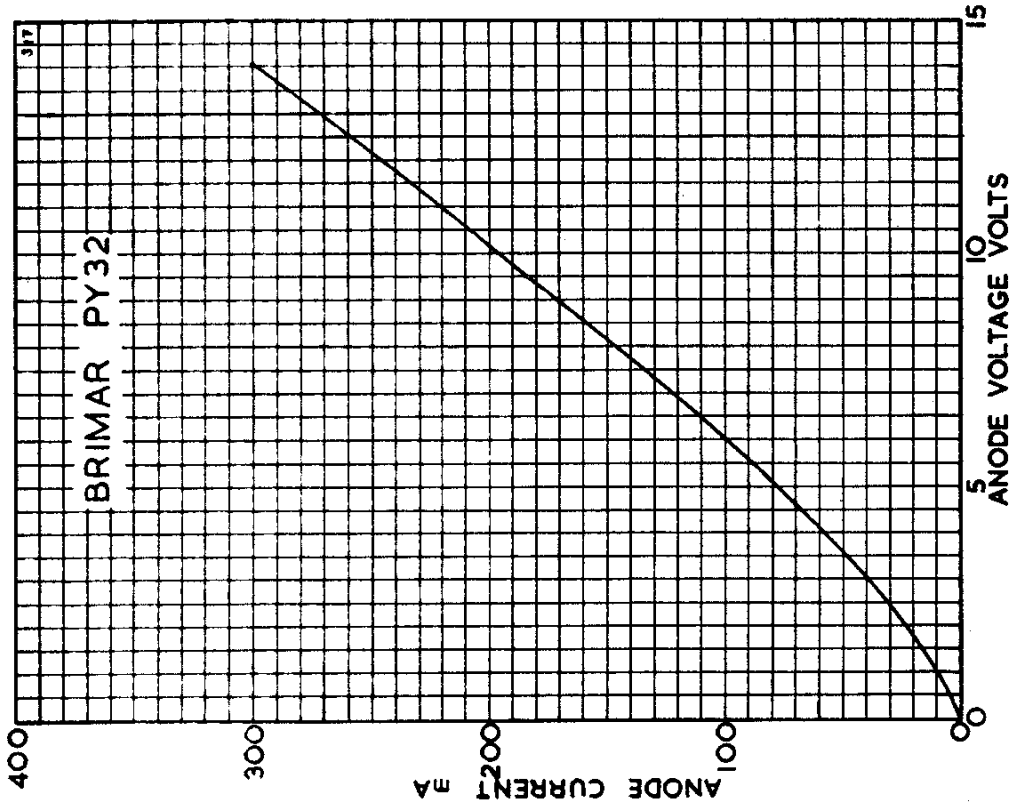
* 220 volts a.c. (r.m.s.) max + 250 volts d.c. max. Heater negative with respect to cathode.

OPERATING CHARACTERISTICS

Anode Supply Voltage	200–250	volts r.m.s.
Output Voltage	192	volts
Output Current	275	mA
Limiting Resistance per anode*		see curve
Reservoir Capacitor	60	μF

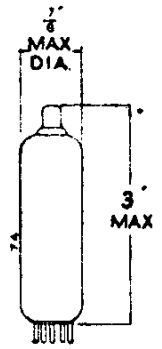
PY32


BRIMAR PY32
C=60μF
Vef(r.m.s.) (V)
Rlim (Ω)
1 250 2X170
2 240 2X147
3 230 2X119
4 220 2X94
5 210 2X70
6 200 2X44
D.C. OUTPUT VOLTAGE VOLTS
D.C. OUTPUT CURRENT mA
400
300
200
100
0
300
200
100
0


BRIMAR PY32
ANODE CURRENT mA
ANODE VOLTAGE VOLTS
400
300
200
100
0
15
10
5
0

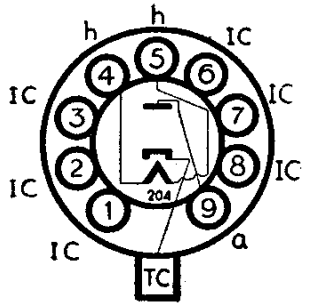
PY81

Replacement Type



B9A Base

TYPE **PY81**
MINIATURE
BOOSTER DIODE



The BRIMAR PY81 is an indirectly heated booster diode designed for operation in A.C./D.C. television receivers. The high working peak heater to cathode potential renders the use of a separate, highly insulated heater winding unnecessary.

Heater Current	0.3 amp.
Heater Voltage	17.0 volts

RATINGS

Peak Anode Current †	450 mA max.
Mean Anode Current	150 mA max.
Heater-Cathode potential (with respect to cathode) :	
Heater Negative during forward stroke *	800 volts max.
Heater Negative during flyback †	4,500 volts max.
Heater-Anode potential during flyback (heater positive) † ...	3,000 volts max.
Peak Inverse Voltage †	4,500 volts max.

† Maximum pulse duration 15% of one cycle with a maximum of 15 μsecs.

** This voltage may be made up of a maximum voltage of 220 volts R.M.S. at the mains supply frequency and a D.C. component of not more than 600 volts.*

INTER-ELECTRODE CAPACITANCES *

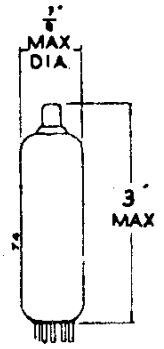
Anode to Cathode	6.4 pF
Heater to Cathode	3.6 pF

** Measured with no external shield.*

Note.—The heating time of this valve is approximately twice that of other valves normally used in the series heater chain of television receivers and precautions may be necessary to ensure that the screen dissipation of the line output valve is not exceeded during the warm-up period.

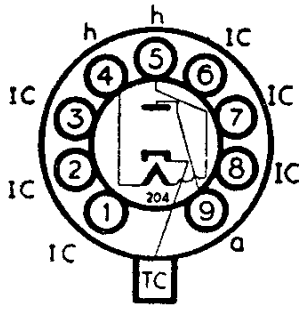
PY83

Current Equipment Type



B9A (Noval) Base

TYPE **PY83**
MINIATURE
BOOSTER DIODE



The BRIMAR PY83 is an indirectly heated booster diode designed for operation in A.C./D.C. television receivers. The high working peak heater to cathode potential renders the use of a separate, highly insulated heater winding unnecessary.

Heater Current	0.3 amp.
Heater Voltage	20.0 volts nom.

RATINGS

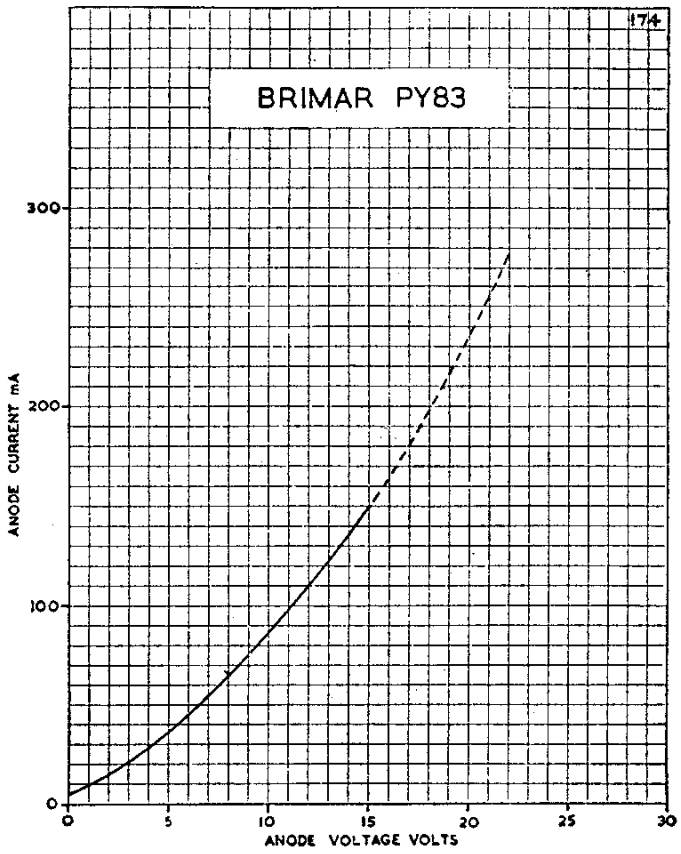
Peak Anode Current	500 mA max.
Mean Anode Current	175 mA max.
Heater-Cathode potential during flyback (heater negative with respect to cathode) †	5,000 volts max.
Peak Inverse Voltage †	5,000 volts max.

† *Maximum pulse duration 15% of one cycle with a maximum of 15 μsecs.*

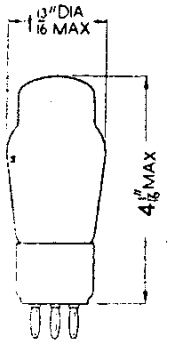
INTER-ELECTRODE CAPACITANCES *

Anode to Cathode	6.2 pF
Heater to Cathode	2.1 pF

* *Measured with no external shield.*

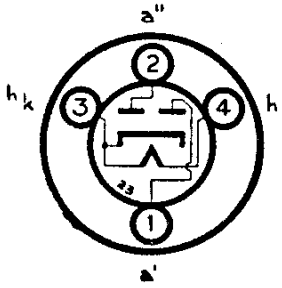


R2
R3
R10



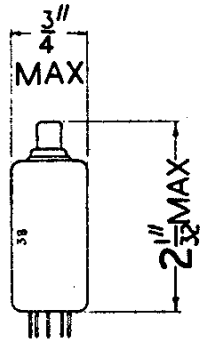
Replacement Types

TYPES **R2, R3** (ENGLISH BASE) FULL-WAVE RECTIFIERS



CHARACTERISTICS

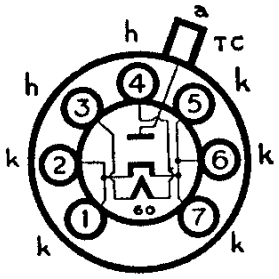
	Type R2	Type R3	
Heater Voltage	4.0	4.0	volts
Heater Current	2.5	2.5	amp.
R.M.S. Input per Anode	350	500	volts
Rectified Current	120	120	mA



B7G Base

Replacement Type

TYPE **R10** MINIATURE HIGH VOLTAGE RECTIFIER



RATINGS

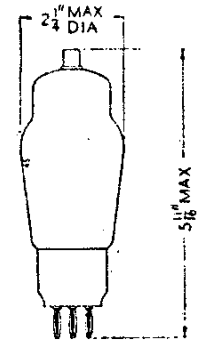
Heater Voltage	4.0 volts
Heater Current	0.5 amp.
Peak Inverse Voltage (No Load)	15.5 kV max.
Peak Inverse Voltage (Full Load)	12.5 kV max.
Peak Anode Current	40 mA max.
Supply Frequency	100 kc/s max.
Absolute Max. Heater Cathode Potential	10 volts

CHARACTERISTICS AS HALF-WAVE RECTIFIER

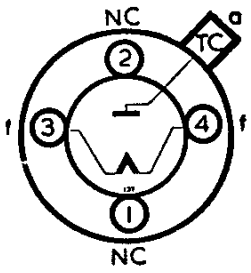
R.M.S. Input (DELAYED SWITCHING)	5.5 kV max.
R.M.S. Input (SIMULTANEOUS SWITCHING)	3.5 kV max.
Series Anode Impedance	62,000 ohms min.
Rectified Current	5.0 mA max.

R11
R12

Obsolescent Type



TYPE R11
(ENGLISH BASE)
HIGH VOLTAGE
RECTIFIER

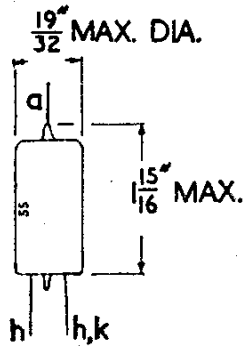


RATINGS

Heater Voltage	4.0 volts
Heater Current	1.1 amp.
Peak Inverse Voltage (No Load)	14 kV max.
Peak Inverse Voltage (Full Load)	12.5 kV max.
Peak Anode Current	350 mA max.
Supply Frequency	60 cps. max.

CHARACTERISTICS AS HALF-WAVE RECTIFIER

R.M.S. Input	5.0 kV max.
Series Anode Impedance	4,000 ohms min.
Rectified Current	50 mA max.
Reservoir Condenser	1.0 μF max.



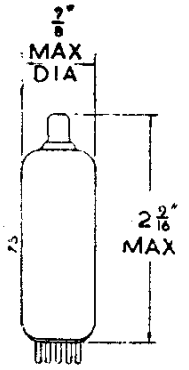
Replacement Type

TYPE R12
(WIRE ENDED)
E. H. T.
RECTIFIER

RATINGS

Heater Voltage	6.3 volts ± 10 per cent.		
Heater Current	0.09 amp.		
	Sinusoidal * Input	Pulse Input	
Peak Inverse Voltage	17	17	kV max.
Rectified Current	0.5	0.1	mA max.
Series Anode Impedance	0.1	0.1	meg. min.
Reservoir Condenser	5/f *	0.1	µF max.

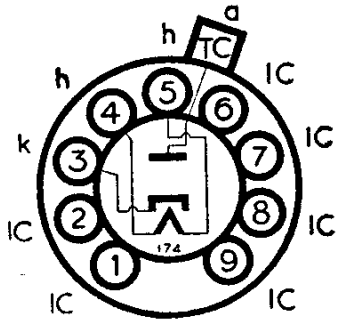
*Maximum operating frequency 500 Kc/s.
f measured in cycles per second.*



B9A (Noval) Base

Obsolescent Type

TYPE R17 MINIATURE HALF-WAVE RECTIFIER



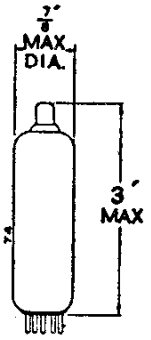
RATINGS

Heater Voltage	6.3 volts
Heater Current	0.8 amp.
Peak Anode Current	750 mA max.
Peak Inverse Voltage	1,450 volts max.
Peak Heater to Cathode Voltage	700 volts max.

TYPICAL OPERATION AS A HALF-WAVE RECTIFIER

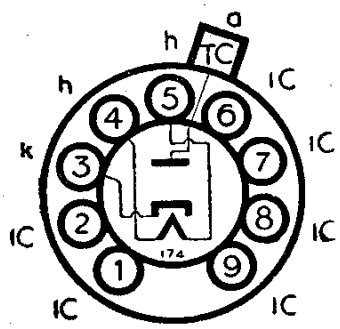
R.M.S. Input Voltage	350	500 volts
Supply Impedance	50	50 ohms min.
Reservoir Condenser	32	32 μF max.
Direct Output Current	125	75 mA max.

Replacement Type



B9A (Noval) Base.

TYPE R18 MINIATURE HALF-WAVE RECTIFIER



RATINGS

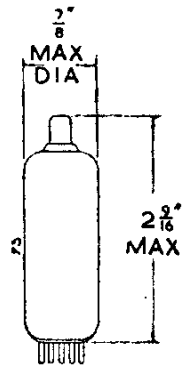
Heater Voltage	6.3 volts
Heater Current	1.1 amps.
Peak Anode Current	900 mA max.
Peak Inverse Voltage	1,800 volts max.
Peak Heater to Cathode Voltage	900 volts max.
D.C. Output Current	150 mA max.

TYPICAL OPERATION AS A HALF-WAVE RECTIFIER

R.M.S. Input Voltage	500	625 volts
Supply Impedance	200	160 ohms min.
Reservoir Condenser	8	8 μF max.
Direct Output Current	150	125 mA max.

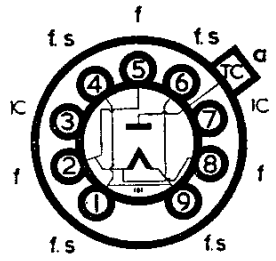
R19

Current Equipment Type



B9A (Noval) Base

TYPE R19
MINIATURE
HIGH VOLTAGE
RECTIFIER



The BRIMAR R19 is a noval based E.H.T. rectifier for use in Television Receivers. It may be used as a replacement for the American 1X2A, although its ratings are higher than those of the latter type.

RATINGS

Filament Voltage	1.25 volts
Filament Current	0.2 amp.
Peak Inverse Voltage	25 kV max.
Peak Anode Current*	12 mA max.
Peak Anode Current†	45 mA max.
D.C. Anode Current	2 mA max.

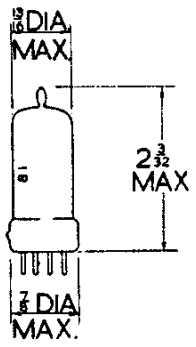
INTER-ELECTRODE CAPACITANCES

Anode to Filament	1.0 pF approx.

** Sinusoidal operation.*
† Maximum pulse duration 15% of one cycle, with a maximum of 15 μ secs.

Note.—Precautions must be taken to prevent corona discharge from the connections to this valve by ensuring that no sharp points or bends occur in the wiring and adequate spacing must be left between the valve and surrounding components.

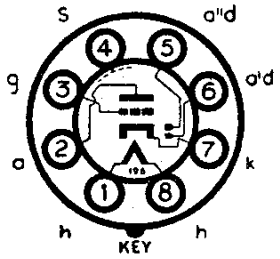
UBC41
UCH42



B8A Base

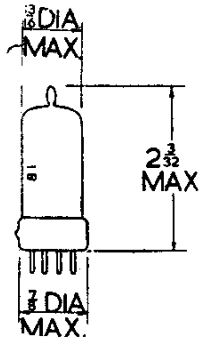
Replacement Type

TYPE **UBC41**
DOUBLE DIODE TRIODE



CHARACTERISTICS

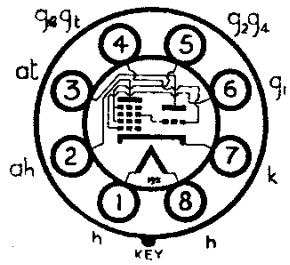
Heater Voltage	14.0 volts
Heater Current	0.1 amp.
Anode Voltage	170 volts
Grid Voltage	—1.6 volts
Anode Current	1.5 mA
Amplification Factor	70
Mutual Conductance	1.65 mA/V
Anode Impedance	42 kΩ



B8A Base

Replacement Type

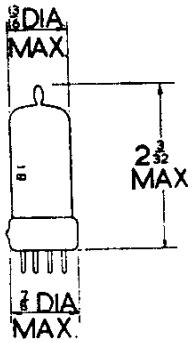
TYPE **UCH42**
TRIODE HEXODE FREQUENCY CHANGER



CHARACTERISTICS

Heater Voltage	14.0 volts
Heater Current	0.1 amp.
Hexode Anode Voltage	200 volts
Hexode Screen Voltage	85 volts
Hexode Grid Voltage	—2 volts
Hexode Anode Current	3 mA
Hexode Screen Current	3 mA
Triode Anode Supply Voltage	200 volts
Triode Anode Resistor	22 kΩ
Triode Grid Resistor	47 kΩ
Triode Grid Current	200 μA
Conversion Conductance	750 μA/V

UF41
UL41
UY41

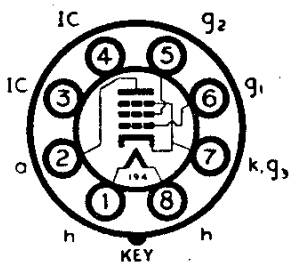


B8A Base

Replacement Type

TYPE **UF41**

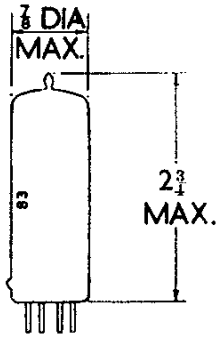
VARI-MU R.F. PENTODE



CHARACTERISTICS

Heater Voltage	...	12.6 volts	Anode Current	...	7.2 mA
Heater Current	...	0.1 amp.	Screen Current	...	2.1 mA
Anode Voltage	...	200 volts	Anode Impedance	...	1 MΩ
Screen Resistor	...	40 kΩ	Mutual Conductance		2.3 mA/V
Grid Voltage ...	...	—3 volts	Grid Voltage for $\frac{g_m}{100}$		— 34 volts

---

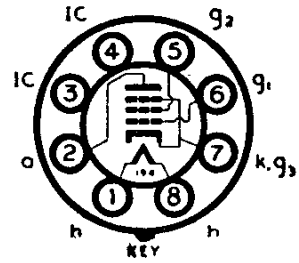


B8A Base

Replacement Type

TYPE **UL41**

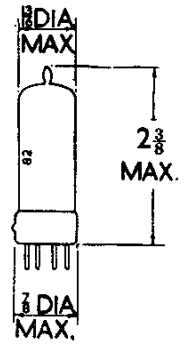
POWER PENTODE



CHARACTERISTICS

Heater Voltage	...	45 volts	Anode Current	...	45 mA
Heater Current	...	0.1 amp.	Screen Current	...	8.5 mA
Anode Voltage	...	200 volts	Mutual Conductance		8.2 mA/V
Screen Voltage	...	200 volts	Anode Load Impedance		4,300 Ω
Grid Voltage ...	...	—14.2 volts	Power Output (D_{tot}=10%)	...	4.2 watts

---

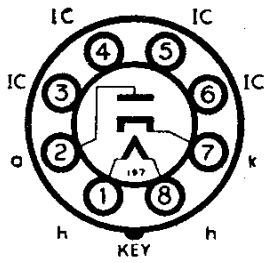


B8A Base

Replacement Type

TYPE **UY41**

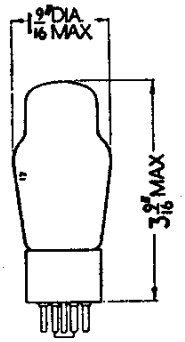
HALF-WAVE RECTIFIER



CHARACTERISTICS

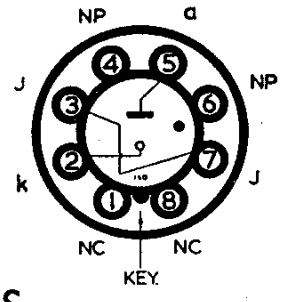
Heater Voltage	...	31.0 volts	Output Current	...	100mA max.
Heater Current	...	0.1 amp.	Reservoir Capacitance		50 μF max.
Anode Voltage R.M.S.		250 volts max.	Limiting Resistance		210 Ω min.

VR75/30
VR105/30
VR150/30



Current Equipment Types

TYPE **VR75/30**
TYPE **VR105/30**
TYPE **VR150/30**
(OCTAL BASE)
VOLTAGE REGULATORS



CHARACTERISTICS

TYPE VR75/30

Minimum Starting Voltage	100 volts
Nominal Operating Voltage	75 volts
Minimum Operating Current	5 mA
Maximum Operating Current	40 mA
Maximum Peak Current	100 mA
Regulation (minimum to maximum currents)	6.5 volts

TYPE VR105/30

Minimum Starting Voltage	135 volts
Nominal Operating Voltage	105 volts
Minimum Operating Current	5 mA
Maximum Operating Current	40 mA
Maximum Peak Current	100 mA
Regulation (minimum to maximum currents)	4 volts

TYPE VR150/30

Minimum Starting Voltage	180 volts
Nominal Operating Voltage	150 volts
Minimum Operating Current	5 mA
Maximum Operating Current	40 mA
Maximum Peak Current	100 mA
Regulation (minimum to maximum currents)	5.5 volts

The series resistor fitted between regulator valve and supply voltage must be such that under no-load conditions the current rating of the valve is not exceeded.

Note : Type VR75/30 is exactly equivalent to type OA3
Type VR105/30 is exactly equivalent to type OC3
Type VR150/30 is exactly equivalent to type OD3

Type VR75/30 *is a commercial equivalent to the* CV3798
Type VR105/30 *is a commercial equivalent to the* CV686
Type VR150/30 *is a commercial equivalent to the* CV216

BRIMAR T VALVES

The BRIMAR "T" Range of special quality valves has been specifically designed to provide long life and reliability and to operate efficiently under adverse conditions of vibration and shock.

The use of "T" valves in Communications and Industrial Equipment ensures that greater reliability and life expectancy are built into such equipment, and safeguards against costly delays and shutdowns due to failure or the need for frequent overhaul. The risk of initial and short life failures, or of losses due to glass failure and heater breakdown, is extremely low, and the robust structure is effective in reducing microphony and noise.

Certain types employ special cathode structures, which permit the operation of these valves for long periods under cut-off conditions with negligible interface growth.

These properties are achieved by the use of advanced and novel designs and methods of assembly of the component parts of the electrode structure, coupled with the use of improved materials and manufacturing methods. Strict control and careful attention to detail is employed at all stages of manufacturing and testing.

Stringent and comprehensive tests applied to these types include glass and base strain, vibration noise and fatigue, resonance search, shock, heater cycling, stability and life tests.

To take full advantage of the inherent reliability and long life expectancy of Brimar "T" valves, careful consideration should be paid to operating conditions in the design of equipment. Close control of heater voltage is advised, and it is recommended that variations should not exceed $\pm 5\%$ of the nominal value. Brimar "T" valves will give outstanding performance under all conditions within their ratings, but in general the life expectancy of any valve is improved by conservative use well within its limiting ratings. Life expectancy is closely related to bulb temperature and careful attention to cooling is advised. The use of close-fitting screening cans of high thermal conductivity in intimate thermal contact with a large area of the bulb, in conjunction with an adequate "heat sink" can materially reduce the operating bulb temperature and very considerably improve the life of the valve.

BRIMAR "T" VALVES

Flying Lead Types

The life expectancy and reliability of Brimar "T" valves, when used correctly within their published ratings, is such as to justify wiring them into circuits in the same manner as other components. Most of the available types have alternative versions fitted with flying leads, and these versions are distinguished by the prefix F/ before the type number. Chassis mounting moulded bases, with blackened close-fitting metal cans suitable for use with flying lead valves, can be provided, and examples of these assemblies are shown in the accompanying illustration. More detailed information concerning them can be obtained from the Valve Sales Department, Standard Telephones and Cables Ltd., Footscray, Sidcup, Kent. Telephone: FOOtscray 3333.

BRIMAR "T" VALVES—

Pinned Types

Brimar "T" Valve Type	C.V. No. †	Commercial Type with Similar Character-istics	Base	Application	** BRIEF CHARACTERISTICS									
					Heater		Anode Voltage Normal	Screen Voltage Normal	Grid Voltage Normal	Amplifi-cation Factor	Mutual Conductance mA/V	Optimum Load Ohms	Auto Bias Resistor Ohms	Power Output Watts
					Volts	Amps.								
5726	CV4007	—	B7G	Double Diode	6.3	0.3	Max. A.C. Voltage per Anode 117 R.M.S. Max. D.C. Output 9 mA.							
5749	CV4009	6BA6	B7G	Vari-Mu R.F. Pentode	6.3	0.3	250	100	−1/−21	—	4.4	—	68	—
5750	CV4012	6BE6	B7G	Heptode F.C.	6.3	0.3	250	100	−1.5/−30	—	0.475 (gc)	—	—	—
5965	—	—	B9A	Double Triode	6.3	0.45	300	—	—	47	6.5	—	—	—
6057	CV4004	12AX7	B9A	Double Triode	6.3 (12.6)	0.3 (0.15)	250	—	−2.0	100	1.6	—	1650	—
6058	CV4025	6AL5	B7G	Double Diode	6.3	0.3	Max. A.C. Voltage per Anode 150 R.M.S. Max. D.C. Output 9 mA.							
6059	CV4006	6BR7	B9A	Low Noise A.F. Pentode	6.3	0.15	250	100	−3	—	1.25	—	1200	—
6060	CV4024	12AT7	B9A	Double Triode	6.3 (12.6)	0.3 (0.15)	250	—	−2	55	5.5	—	200	—
6061	CV4043	6BW6	B9A	Output Beam Tetrode	6.3	0.45	250	250	−12.5	—	4.1	5000	250	4.5
6062	CV4039	5763	B9A	V.H.F. Amplifier	6.0	0.75	250	250	−7.25	—	7.0	—	—	—
6063	CV4005	6X4	B7G	A.C. Rectifier	6.3	0.6	Max. A.C. Voltage per Anode 325 R.M.S. Max. D.C. Output 70 mA.							
6064	CV4014	6AM6	B7G	R.F. Pentode	6.3	0.3	250	250	−2.0	—	7.5	—	160	—
6065	CV4015	9D6	B7G	Vari-Mu R.F. Pentode	6.3	0.2	250	200	−2.5/−28	—	2.5	—	250	—
6067	CV4003	12AU7	B9A	Double Triode	6.3 (12.6)	0.3 (0.15)	250	—	−8.5	17	2.2	—	800	—
6132	CV4055	6CH6	B9A	Video Output Pentode	6.3	0.75	250	250	−4.5	—	11.0	—	—	—
6158	CV4068	13D3	B9A	Double Triode	6.3 (12.6)	0.6 (0.3)	250	—	−4.6	32	2.3	—	—	—

6688	—	—	B9A	Wide Band Amplifier	6.3	0.3	190	160	+9*	—	16.5	—	630	—
6870	—	—	B9A	R.F. and Video Pentode	6.3 (12.6)	0.6 (0.3)	250	250	—	—	8.5	—	120	—
7032	—	—	B7G	Gating Heptode	6.3	0.3	150	75	0 (g_1) 0 (g_3)	—	1.4 0.65	—	—	—
7227	—	—	B9A	Low Voltage Output Pentode	27.5	0.175	27.5	27.5	−2.5	—	5.5	—	—	0.07

* * For greater detail refer to commercial type with similar characteristics, or to data under the appropriate "T" code.

* Positive grid bias used in conjunction with 630 ohm cathode bias resistor.

† BRIMAR "T" valves are commercial equivalents to these CV numbers.

BRIMAR "T" VALVES—

Flying Lead Types

"T" Code	F/5726	F/5750	F/6057	F/6060	F/6061	F/6063	F/6064	F/6067	F/6132	F/6158
C.V. No.†	CV4049	CV4037	CV4035	CV4033	CV4045	CV4001	CV4002	CV4034	CV4056	CV4069

BRIMARIZE SECTION

The following notes are published as a guide to some of the more important points to be observed in selecting a valve to replace one which is obsolete or unobtainable. The information contained in the section on Valve Ratings should be studied in conjunction with the following recommendations, and the table of " Preferred Types " may be found useful, although in some cases " Replacement " or " Obsolescent " types may exist which are more suitable as substitutes for unobtainable valves.

Brimarizing Procedure

1. Check the function of the valve and determine the characteristics which are most critical in the application. Choose a valve having these characteristics as near as possible to those of the original valve. The substituted valve should in general be of the same class and have the same order of anode dissipation.

2. Check the heater rating. For parallel operation from a transformer the voltage should be the same, and for series connected heaters the current must be identical. In some cases of series-parallel connection, both voltage and current may be important.

3. Check the base connections. Valves with identical characteristics are often available with different bases, or in different physical forms. It may be more convenient to change the socket rather than undertake extensive circuit modifications.

4. Check the operating conditions. Where these are substantially different the necessary circuit modifications must be made.

5. Ensure that the ratings of the substituted valve are not exceeded.

6. Check that the equipment power supply is not overloaded if any increase in current drain has resulted from the substitution.

7. Check that ratings of existing components are adequate to meet the new conditions.

8. Check the performance of the equipment, and see that any changes are not greater than would be expected, making allowances for any differences in valve characteristics.

9. Miniature high slope valves of modern design capable of operating at high frequencies are liable to parasitic oscillation, particularly if long leads are employed, and the fitting of stoppers in grid, anode and screen circuits may be necessary.

NOTES ON BRIMARIZING

1. **Heaters.** For parallel operation from a transformer it is usually sufficient that the heater voltage of the substituted valve should be the same as that of the original. If the current rating is substantially greater, overloading of the transformer may occur, and the voltage may fall due to transformer regulation and losses in the leads and socket.

Valves in a series heater chain must have the same current ratings. Small

differences in the voltage drop may not be significant, and larger changes can usually be accommodated by changing the series resistance. Battery valves operated with filaments in series are often shunted by resistors to by-pass anode and screen currents flowing in the filament circuit. These resistors may need adjustment where a different type of valve has been substituted, to equalise the voltage drops across individual filaments.

In some equipments series-parallel connection of heaters is used, in which case both the voltage and current ratings are important.

2. **Sockets.** Where socket changes are necessary, due attention must be paid to layout. This is particularly important in circuits operating at low signal levels, high gain or high frequencies. The layout should be disturbed as little as possible and wiring should be kept short. Input and output circuits should be well separated and heater leads kept clear of the grid circuit. Any screens on the socket should be earthed.

3. **Operating Conditions.** Reference should be made to the published data to determine whether any circuit changes will be necessary with the substituted valve. In particular, bias and screen resistors may need to be changed. Care must be taken to ensure that none of the ratings is exceeded. Where different values of voltage and current result from the substitution, the voltage rating of coupling and decoupling capacitors, and the wattage ratings of resistors should be checked to ensure that they are not exceeded. Care must be taken not to overload the equipment power supply.

4. **R.F. Stages.** In the case of R.F. Pentodes, a substitute should be chosen with input and output capacities and mutual conductance as near as possible to those of the original. At higher frequencies anode to grid capacity and input damping may be important. In sensitive receivers the equivalent noise resistance and input damping will affect the noise factor. Triodes used in R.F. stages in grounded-grid or cascode configurations are normally types specially developed for these applications, and valves should not in general be substituted unless they are specified as suitable for this service. Circuits of this kind often incorporate neutralising, and adjustments to values of neutralising components may be necessary.

At higher frequencies, performance may be critically dependent on layout.

5. **Frequency Changers.** Many different types of frequency changer are in use. If possible, valves of similar structure and having comparable values of conversion conductance and similar capacities should be used. Differences in nomenclature due to the presence or absence of a suppressor grid may not be significant, provided that the characteristics are similar. Thus triode heptodes and triode hexodes may be interchangeable. Conversely, valves of apparently the same type are not necessarily similar, as in the case of heptodes. Some heptodes are provided with an oscillator anode, and these are not interchangeable with heptodes having no oscillator anode, without considerable circuit modifications.

Triode pentodes used with cathode injection may be conveniently replaced by pentagrids or triode hexodes of more modern design. Heptodes with separate oscillators may usually be replaced by triode-hexodes, in which case the triode section is rendered inoperative by connecting together the anode and the cathode.

Care must be taken to ensure that the correct level of oscillation is obtained.

This is usually assessed by measuring the grid current in the earthy end of the grid leak, and curves of conversion conductance or conversion gain plotted against grid current are normally included in published data. The oscillator level is not very critical and appreciable variation may occur over the band, but if deviations from the optimum are too great, serious loss of gain will result.

6. **I.F. Stages.** Substitute valves should be chosen to have similar values of mutual conductance and input and output capacity. Anode to grid capacity is important, particularly at high gain and at higher frequencies. Substitution of a valve having too great a value of anode to grid capacity may result in an asymmetrical response, or in instability. Neutralising by feedback from the screen is sometimes employed, in which case the values of anode and screen decoupling capacitors are critically related to the valve inter-electrode capacities, and may need modification to achieve stability.

In wide band circuits, tuning and bandwidth are often critically dependent on the valve input and output capacities. The effective value of input capacity under operating conditions will in general be different from the " cold " capacity of the valve, and will vary with the mean grid potential. Hence a comparison of the " cold " capacities of valves is not necessarily an indication that the capacities under dynamic conditions will be identical. Compensation by feedback in the cathode circuit is sometimes employed to reduce variation of capacity in gain-controlled stages, and modifications may be necessary if a different valve type is substituted.

7. **Detector and Discriminator Circuits.** Diodes are often found in combination with another valve in the same envelope, and substitution may involve the use of two valves to replace a multiple type.

8. **A.F. Amplifiers.** Where a triode is used as a normal R.C. voltage amplifier, a substitute should be chosen having as nearly as possible the same value of amplification factor. If the valve impedance is small compared with the anode load, its value will not be critical. In the case of pentodes the gain is difficult to estimate where the valve is used at low anode current with a large resistive anode load, unless information relating to this type of service is published. This is not always the case since R.F. pentodes are sometimes used as voltage amplifiers at A.F., and the performance of a substitute may have to be established by measurement. Screen operating conditions will have a considerable influence on performance, and optimum conditions may again have to be determined experimentally unless data are published.

Valves used in input stages at low signal levels are specially designed for this application, and only a valve suitable for this class of service should be substituted. Low level stages are particularly susceptible to hum pick-up, and careful consideration must be given to layout and screening if changes have to be made.

Instability may occur in high gain circuits due to layout changes, and valves having similar characteristics but different basing may not be suitable as substitutes. This is particularly applicable to multiple valves connected in cascade.

9. **A.F. Output Stages.** A substitute valve should be chosen so as to have, as far as possible, the same power output as the original valve at a given distortion level with the supply voltage available. The quoted performance will be obtained only if the valve works into the correct value of anode load

as specified in the published data. If some reduction of power is acceptable, adequate performance may be obtainable into a load somewhat different from the optimum. Output valves usually run near their rated anode and screen dissipations, and these electrode dissipations vary considerably with the signal level in certain types of circuit. Care must be taken to ensure that the average dissipation is not exceeded under normal operating conditions. The grid circuit resistance for output valves is usually limited to a relatively low value. If the value has to be reduced when a valve is replaced by a different type, the gain of the previous stage may be reduced and the low frequency response may also be affected, unless the appropriate circuit modifications are made. The signal voltages required to drive output valves may differ appreciably, and if a less sensitive output valve is substituted care must be taken that none of the previous stages, including the last I.F. stage, is overloaded at maximum output. If cathode bias has to be increased the voltage rating of the by-pass capacitor should be checked.

Pentodes with apparently similar characteristics will not necessarily give comparable performances when operated in "ultralinear" circuits.

10. **Video Stages.** A substitute valve should be chosen so as to have as nearly as possible the same capacities and mutual conductance as the original, since frequency response and gain are largely determined by these characteristics. Video amplifiers work into relatively low values of anode load and a substitute must be capable of providing the necessary current swing. The D.C. operating conditions should be properly adjusted, and this is particularly important where direct coupling from the anode is employed. If a frequency compensating network in the cathode circuit is employed, any change in the cathode bias resistor will affect the frequency compensation. Where the latter is provided by a capacitor partially by-passing the cathode resistor, the value of the capacitor should be adjusted to restore the time-constant of the cathode circuit to its original value.

11. **Line Output Stages.** Line output valves operate normally below the "knee" and the position of the "knee" of the zero bias I_aV_a characteristic is important. In some circuits the screen resistor is not by-passed and this will result in modified I_aV_a characteristics. The available "knee" current on the modified characteristics may be increased by reducing the screen resistor, provided that the screen dissipation is not exceeded. Care is needed to ensure that the peak positive anode voltage rating is not exceeded, and sufficient negative voltage on the control grid to cut the valve off during fly-back is essential. Where a booster diode is to be replaced, the peak anode, and peak heater-cathode voltage ratings must be adequate. Changes in the I_aV_a characteristic of the diode may affect the pentode current waveform, and if the peak current is increased, operation below the "knee" may not be maintained with resultant distortion of the scan.

12. **Frame Output Stages.** Frame output valves are required to give large peak currents at relatively low anode voltages at the end of the scanning period, and a substitute valve must be adequate in this respect. A large amount of negative feedback is often employed, so that some change of mutual conductance may be tolerable, although reduction of gain will probably result in degradation of the linearity.

13. **Rectifiers.** Care is needed to ensure that the ratings of the substituted type are adequate. Peak anode current should be checked, and the anode series

resistance increased, if necessary, to limit the peak current to its permitted value. Heating time may be important and if the substituted rectifier warms up more quickly than the original valve excessive surge voltages may occur. The cause of the failure of the original valve should be ascertained where possible. Failure may have resulted from overload due to component breakdown, or alternatively damage to the reservoir capacitor may have been caused by breakdown of the rectifier. The reservoir and smoothing capacitors and the H.T. circuit should therefore be checked. Substitution of a new rectifier may result in an increase of H.T. voltage, and it may be advisable to replace the reservoir and smoothing capacitors, particularly if they have seen considerable service.

TELETUBES

1. It is in general preferable, where a cathode ray tube of a different type is substituted, that the physical dimensions should be similar to those of the original tube. Change to a type having a different deflection angle will usually involve a major circuit re-design, and different physical dimensions will involve considerable modification to the mountings.

2. Check the heater ratings. The same considerations apply as in the case of valve heaters. Check the heater cathode rating, remembering that the total voltage includes both D.C. and A.C. components. The latter may be quite large where the heater is part of a series chain.

3. Check the E.H.T. requirements and ratings. Both minimum and maximum E.H.T. voltages are normally specified. Best results will be obtained when the recommended voltage is used, and operation at substantially lower voltages will cause reduced brightness and increased spot size.

4. Compare the focus requirements. The strength of the magnetic field required may vary from tube to tube, and the position of the focus magnet may need to be adjusted. Many modern tubes employ electrostatic focus, and a tube of this type can usually be substituted for a tube with magnetic focus provided other characteristics are similar. The focus anode voltage is not critical, and it is common practice to connect this anode either to earth, to the H.T. line, or to the boost rail, selecting the voltage which gives optimum focus.

5. Check the ratings and normal requirements of other electrodes, and make any necessary adjustments.

6. Check the base. Change to a different type of base or change of base connections is usually a fairly simple matter.

7. Check whether an ion trap is required, and if so whether any existing ion trap magnet is suitable.

8. If a change to a tube having a larger deflection angle is contemplated, it will usually be necessary to change the deflection coils in addition to making modifications to the time base circuits. Failure to do this may result in corner shading. Change to a tube with a flatter face may also require a change of deflector coils, to avoid poor focus at the edges, and geometrical distortion.

9. Where the E.H.T. voltage has increased, check whether there is likely to be any danger from X-rays. This danger will not usually exist at voltages below 16 kV. Where there is likely to be danger, ensure that suitable shielding is employed.

DIRECT REPLACEMENTS

TYPE	BRIMAR Equivalent	TYPE	BRIMAR Equivalent	TYPE	BRIMAR Equivalent
OA3	VR75/30	6DA6	EF89	25E5	PL36
OC3	VR105/30	6F12	6AM6	30C1	PCF80
OD3	VR150/30	6F15	EF41	30L1	PCC84
1AB6	DK96	6G5	6U5G	31A3	UY41
1AH5	DAF96	6LD3	EBC41	40PPA	7D3
1AJ4	DF96	6LD12	EABC80	40SUA	ID5
1C1	IR5	6M1	6U5G	42MP/Pen	7A3
1C2	IAC6	6N8	EBF80	42/OT	7A3
1C3	DK96	6S2	EY86	45A5	UL41
1F1	DF96	6T8	EABC80	62DDT	EBC41
1F2	IL4	6U8	ECF82	62TH	ECH42
1F3	IT4	6V4	EZ80	62VP	EF41
1FD1	DAF96	6W2	R12	66KV	EZ40
1FD9	IS5	6X2	R12	67PT	EL41
1P1	DL96	7AN7	PCC84	121VP	UF41
1P10	3S4	7C6	7B6	141DDT	UBC41
1P11	3V4	7D9	6AM5	141TH	UCH42
1W4-350	R2	7D10	6CH6	311SU	UY41
1W4-500	R3	8D3	6AM6	431U	R2
1X2B	R19	8D5	6BR7	441U	R3
2T/270K	R10	8D6	6BW7	442BU	R2
3C4	DL96	8D7	6BS7	451PT	UL41
6AB8	ECL80	9A8	PCF80	460BU	R3
6AK8	EABC80	9U8	PCF82	4274A	5Z3
6AQ8	ECC85	10LD3	UBC41	A11B	R2
6BL8	ECF80	12AC5	UF41	A11C	R3
6BQ5	EL84	13DHA	IID3	A11D	R2
6BT4	EZ40	13SGA	8D2	A70B	7A2 (7 pin)
6BX6	EF80	13VPA	9D2	A70C	7A3 (7 pin)
6C10	ECH42	14K7	UCH42	AC2/Pen	7A3
6CK5	EL41	14L7	UBC41	AC/Pen	7A2
6CJ5	EF41	16A8	PCL82	APP4A	7A2 (7 pin)
6CQ6	9D6	1723	PY81	APP4B	7A3
6CV7	EBC41	20A3	2D21	APV4	R3
6CU7	ECH42	20D3	I2AH8	B65	6SN7GT
6D2	6AL5	21A6	PL81	B152	I2AT7

BRIMAR VALVES

TYPE	BRIMAR Equivalent	TYPE	BRIMAR Equivalent	TYPE	BRIMAR Equivalent
B309	12AT7	DL95	3Q4	HBC90	12AT6
B319	PCC84	DW3	R2	HBC91	12AV6
B329	12AU7	DW4	R3	HD14	1H5
B339	12AX7	DW4-350	R3	HF93	12BA6
B719	ECC85	DW4-500	R3	HK90	12BE6
C10B	1D5	EB34	6H6GT	HL13C	4D1
C30B	4D1	EB91	6AL5	HL92	50C5
C50B	8D2	EBC33	6Q7G	HL1320	4D1
C50N	9D2	EBC90	6AT6	HL/DD/1320	11D3
C70D	7D6	EC90	6C4	HN309	PCL82
D63	6H6G	ECC32	6SN7GT	HR1	R10
D77	6AL5	ECC35	6SL7GT	HR2	R10
D152	6AL5	ECC81	12AT7	KD21	VR75/30
DA	4D1	ECC82	12AU7	KD24	VR105/30
DAC32	1H5	ECC83	12AX7	KD25	VR150/30
DAF91	1S5	ECC91	6J6	KT30	7D5
DD6	6AL5	ECH35	6K8G	KT32	25L6GT
DF91	1T4	EF22	7B7	KT41	7A3
DF92	1L4	EF39	6K7GT	KT42	7A2 (7 pin)
DH63	6Q7G	EF91	6AM6	KT61	6AG6G
DH76	12Q7GT	EF92	9D6	KT63	6F6G
DH77	6AT6	EF93	6BA6	KT66	6L6G
DH81	7B6	EF94	6AU6	KT71	50L6GT
DH142	UBC41	EF95	6AK5	KTW63	6K7G, 6U7G
DH147	6Q7G	EK90	6BE6	KTW74M	12K7GT
DH149	7C6	EL33	6AG6G	KTZ63	6J7G
DH150	EBC41	EL35	6L6G	L63	6J5G
DH719	EABC80	EL90	6AQ5	L77	6C4
DK32	1A7	EL91	6AM5	LN152	ECL80
DK91	1R5	EL821	6CH6	LZ319	PCF80
DK92	1AC6	EM35	6U5G	MKT4	7A2
DL33	3Q5	EN91	2D21	MP/Pen	7A2
DL35	1C5	EY51	R12	MPT4	7A2 (7 pin)
DL63	6R7G	EY84	R18	MU12	R2, R3
DL74M	12Q7GT	EZ35	6X5GT	MU14	R3
DL82	7B6	EZ90	6X4	N14	1C5
DL91	1S4	GZ30	5Z4G	N16	3Q5
DL92	3S4	GZ31	5U4G	N17	3S4
DL94	3V4	HAD	11D3	N18	3Q4

TYPE	BRIMAR Equivalent	TYPE	BRIMAR Equivalent	TYPE	BRIMAR Equivalent
N19	3V4	S11D	R2	VP13C	9D2
N30	7D5	SP6	6AM6	VP1322	9D2
N40	7A2 (7 pin)	SP13C	8D2	W17	IT4
N41	7A3	SP1320	8D2	W63	6K7G, 6U7G
N77	6AM5	SPTA	8D2	W76	12K7GT
N142	UL41	SU61	RI2	W77	9D6
N144	6AM5	TDD13C	11D3	W81	7H7
N147	6AG6G	U12	R2	W142	UF41
N148	7C5	U14	R3	W147	6K7G
N150	EL41	U31	25Z4	W148	7H7
N152	PL81	U37	IT2	W149	7B7
N339	PL81	U43	RI2	W150	EF41
N359	EBF80	U50	5Y3GT	W727	6BA6
N709	EL84		5Z4G	WD709	EBF80
N727	6AQ5	U52	5U4G	WE350A	807
OM4	6Q7G	U70	6X5G	X14	IA7
OM6	6K7G	U74	35Z4GT	X17	IR5
OM10	6K8G	U76	35Z4GT	X18	IAC6
Pen A4	7A3	U78	6X4	X63	6A8G
Pen 4VA	7A2 (7 pin)	U82	7Z4, 7Y4	X65	6K8G
Pen 4VB	7A3	U142	UY41	X71M	12K8GT
Pen 13C	7D8	U147	6X5G	X76M	12K8GT
Pen 36C	7D6	U149	7Y4	X77	6BE6
Pen 383	7D6	U150	EZ40	X81M	7S7
Pen 1340	7D8	U151	RI2	X142	UCH42
Pen 3520	7D6	U153	PY81	X147	6K8G
PT4	7A3	U709	EZ81	X148	7S7
PTA	7D8	U4020	1D5	X150	ECH42
QS150/40	VR150/30	UR1C	1D5	X727	6BE6
QVO5-25	807	UU2	R2	Y61	6U5G
QVO3-12	5763	UU3	R2	Y63	6U5G
R4	R2	UU4	R3, R2	Z63	6J7G
R4A	R3	UU5	R3	Z77	6AM6
R12A	RI2	UU9	EZ40	Z152	EF80
R16	IT2	UU60/250	R2	Z719	EF80
R42	R2	UU120/350	R2	ZD17	IS5
R43	R3	UU120/500	R3	ZD152	EBF80
R52	5Z4G	V1928	RI0		
RZ	1D5	VP6	9D6		

BRIMAR COMMERCIAL EQUIVALENTS TO C.V. NUMBERS

TYPE	C.V. No.	TYPE	C.V. No.	TYPE	C.V. No.
OA2	1832	6AG6G	1438	6K7GT	1943
OB2	1833	6AK5	850	6K8G	1944
OZ4	692	6AL5	140	6K8GT	1946
IA5G/GT	756	6AM4	5073	6L6G	1947
IA7G	1800	6AM5	136	6L6GA	2817
IA7GT	1802	6AM6	133	6N7GT	1958
IC5G	1803	6AQ5	1862	6Q7G	587
IC5GT	1805	6AT6	452	6Q7GT	589
ID5	764	6AU6	2524	6R7G	1962
IH5G	1818	6AV6	2526	6SC7GT	1970
IH5GT	1820	6B4G	851	6SL7GT	1985
IL4	1758	6B8G	1893	6SN7GT	1988
IR5	782	6BA6	454	6U5/6G5	504
IS4	783	6BE6	453	6U5G	2747
IS5	784	6BH6	3908	6U7G	706
IT4	785	6BJ6	3909	6V6G	509
IU5	3912	6BR7	2135	6V6GT	511
2A3	1831	6BS7	5086	6X4	493
2D21	797	6BW6	2136	6X5G	572
3Q4	818	6C4	133	6X5GT	574
3Q5GT	819	6C5G	581	7A2	1174
3S4	820	6C6	585	7A3	1181
3V4	1633	6CH6	2127	7B6	882
4D1	1109	6D6	1900	7B7	522
5R4GY	717	6F6G	1911	7C5	885
5U4G	575	6H6G	1929	7C6	887
5V4G	729	6H6GT	1931	7D5	1425
5Y3GT	1856	6J5G	1932	7D6	1672
5Z3	1861	6J5GT	1934	7D8	889
5Z4G	1863	6J6	858	7H7	895
6A7	1870	6J7G	1935	7R7	900
6A8G	578	6J7GT	1937	7Y4	901
6A8GT	580	6K6G	1938	7Z4	1790
6AF4A	5074	6K7G	1941	8D2	1108

BRIMAR COMMERCIAL EQUIVALENTS TO C.V. NUMBERS

TYPE	C.V. No.
9D2	1106
9D6	131
11D3	1419
12AT7	455
12AU6	1961
12AU7	491
12AX7	492
12BA6	1928
12BH7	5042
12C8GT	3827
12J7GT	535
12K7GT	918
12K8GT	3927
13D1	423
13D3	2212
14S7	3936
25L6GT	553
35L6GT	562
35Z4GT	2500
42	609
43	2514
50C5	1959
50L6GT	571
75	614
77	616
78	2544
80	617
83	618
807	124
5763	2129
6146	3523

TYPE	C.V. No.
6870	5121
ECF82	5063
ECH42	2888
EF41	3886
EF80	1736
EL41	3889
EL84	2975
EZ40	3891
EZ80	1535
PL81	5077
R3	1039
R10	261
R11	1111
R12	426
R17	2218
R18	2235
UL41	1977
VR75/30	3798
VR105/30	686
VR150/30	216

"T" TYPES

5726	4007
F/5726	4049
5749	4009
5750	4012
F/5750	4037
6057	4004
F/6057	4035
6058	4025
6059	4006

TYPE	C.V No.
6060	4024
F/6060	4033
6061	4043
F/6061	4045
6062	4039
6063	4005
F/6063	4001
6064	4014
F/6064	4002
6067	4003
F/6067	4034
6132	4055
F/6132	4056
6158	4068
F/6158	4069
6516	4063

S.T.C. TYPES

G400/1K	2194
G400/2G	4047
G1/371K	2224
G10/241E	2223
G150/2D	413
G240/2D	2174
5B/254M	428
5B/255M	391
5B/257M	2220
5B/258M	2347
3D21A	2659
VLS631	S.H. 342

C.V. NUMBERS TO BRIMAR EQUIVALENTS

C.V. No.	BRIMAR TYPE
124	807
131	9D6
133	6C4
136	6AM5
138	6AM6
140	6AL5
216	VR150/30
261	R10
423	13D1
426	R12
452	6AT6
453	6BE6
454	6BA6
455	12AT7
491	12AU7
492	12AX7
493	6X4
504	6U5/6G5
509	6V6G
511	6V6GT
522	7B7
535	12J7GT
562	35L6GT
571	50L6GT
572	6X5G
574	6X5GT
575	5U4G
578	6A8G
580	6A8GT
581	6C5G
585	6C6
587	6Q7G
589	6Q7GT
614	75
616	77
617	80
618	83
686	VR105/30
692	OZ4
706	6U7G
717	5R4GY
729	5V4G
755	1A5G
756	1A5GT
764	1D5
782	1R5
783	1S4
784	1S5
785	1T4
797	2D21
818	3Q4
819	3Q5GT
820	3S4
850	6AK5
851	6B4G
858	6J6
882	7B6
885	7C5
887	7C6
889	7D8
895	7H7
900	7R7
901	7Y4
1181	7A3
1438	6AG6G
1535	EZ80
1633	3V4
1672	7D6
1736	EF80
1870	6A7
1893	6B8G
1900	6D6
1911	6F6G
1928	12BA6
1929	6H6G
1931	6H6GT
1932	6J5G
1934	6J5GT
1935	6J7G
1937	6J7GT
1938	6K6G
1941	6K7G
1943	6K7GT
1944	6K8G
1946	6K8GT
1947	6L6G
1958	6N7GT
1959	50C5
1961	12AU6
1962	6R7G
1970	6SC7GT
1977	UL41
1985	6SL7GT
1988	6SN7GT
2127	6CH6
2129	5763
2135	6BR7
2136	6BW6
2212	13D3
2218	R17
2235	R18
2500	35Z4GT
2514	43
2524	6AU6
2526	6AV6
2544	78
2747	6U5G
2817	6L6GA
2888	ECH42
2975	EL84
3523	6146
3798	VR75/30
3827	12C8GT
3886	EF41
3889	EL41
3891	EZ40
3908	6BH6
3909	6BJ6
3912	1U5
3927	12K8GT
3936	14S7
4001	F/6063
4002	F/6064
4003	6067
4004	6057
4005	6063
4006	6059
4007	5726
4009	5749
4012	5750
4014	6064
4024	6060
4025	6058
4033	F/6060
4034	F/6067
4035	F/6057
4037	F/5750
4039	6062
4043	6061
4045	F/6061
4049	F/5726
4055	6132
4056	F/6132
4068	6158
4069	F/6158
5042	12BH7
5063	ECF82
5073	6AM4
5074	6AF4A
5077	PL81
5086	6BS7
5121	6870

S.T.C. TYPES

C.V. No.	S.T.C. TYPE
391	5B/255M
413	G150/2D
428	5B/254M
2174	G240/2D
2194	G400/1K
2347	5B/258M
2659	3D21A
2220	5B/257M
2223	G10/241E
2224	G1/371K
4047	G400/2G

S.H. No.	S.T.C. TYPE
342	VLS631