BRIMAR

RECEIVING VALVE

6BR7

APPLICATION REPORT VAD/508.3

Standard Telephones and Cables Limited

FOOTSCRAY, KENT, ENGLAND

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1.0 INTRODUCTION: The Brimar 6BR7 is a single ended indirectly heated screened pentode of miniature construction intended for use where low AF noise, microphony and hum are required, as in early stages of high gain AF amplifiers. The heater is intended for operation in parallel with those of other valves in AC operated equipment.

Very effective internal screening is employed, but the input and output capacitances are low enough to allow the valve to be used in RF applications up to frequencies of at least 20 Mc/s.

In this report are characteristic curves and details of the performance of the valve as a resistance capacity coupled amplifier. The anticipated levels of hum, hiss and microphony are given and the precautions necessary to ensure the best performance are discussed.

2.0 DESCRIPTION: The valve is a miniature screened pentode with characteristics similar in most ways to those of the 6J7 valve. The structure is mounted in a T6½ bulb and is fitted with a B9A (Noval) base. The whole assembly is designed with a view to obtaining the utmost possible rigidity. The control grid is screened internally from the heater to eliminate hum due to electrostatic pick-up from that source. The heater is wound in the form of a double spiral to reduce, as far as possible, the magnetic field set up by the heater current.

3.0 CHARACTERISTICS:

3.1 Cathode:	Indirectly heated	
	Voltage	6·3 volts
	Current (nominal)	0·15 ampere
	Max. DC Heater-Cathode potential	100 volts
3.2 Dimensions:	Max. Overall Length	2-3/16 ins.
	Max. Diameter	7/8 in.
	Max. Seated Height	1-15/16 ins.
3.3 Base: Type B9A (Noval):	Pin 1 No Connection NC	
	Pin 2 Control Grid g_1	
	Pin 3 Cathode k	
	Pin 4 Heater h	
	Pin 5 Heater h	
	Pin 6 Internal Shield s	
	Pin 7 Anode a	
	Pin 8 Screen Grid g_2	
	Pin 9 Suppressor Grid g_3	

3.4 Ratings (Design Centre):

PENTODE CONNECTED:

Max. Anode Voltage	300 volts
Max. Screen Voltage	125 volts
Max. Anode Dissipation	0·75 watts
Max. Screen Dissipation	0·3 watts

TRIODE CONNECTED (g_2 connected to anode, g_3 connected to cathode):

Max. Anode Voltage	250 volts
Max. Anode Dissipation	1·75 watts

3.5 Inter-electrode Capacitances (measured with no external shield):

PENTODE CONNECTED:

C_{in}	4·25 pF
C_{out}	4·0 pF
$C_{g1,a}$	0·01 pF max.

TRIODE CONNECTED:

C_{in}	3·2 pF
C_{out}	6·7 pF
$C_{g,a}$	1·1 pF

3.6 Characteristic Curves: Curves are included in this report which show:

Anode current versus anode voltage (I_a/V_a) at various values of control grid voltage with a screen voltage (V_{g2}) of 125 volts, No. 308·215. Similar curves for a screen voltage of 100 volts are shown on No. 308·216, for V_{g2} 75 volts, No. 308·217 and for V_{g2} 50 volts, No. 308·218.

Anode current versus control grid voltage at various values of screen grid voltage, No. 308·220.

Anode current versus anode voltage with the valve connected as a triode, No. 308·219.

Mutual conductance and impedance versus control grid voltage for the valve connected as a pentode No. 308·221.

Mutual conductance, impedance and amplification factor versus grid voltage for the valve connected as a triode, No. 308·222.

4.0 Typical Operation:

4.1 PENTODE CONNECTED (g_3 connected to cathode):

Heater Voltage	6·3	6·3	volts
Anode Voltage	100	250	volts
Screen Voltage	100	100	volts
Grid Voltage	—3	—3	volts
Cathode Bias Resistor	1100	1100	ohms
Anode Current	2·0	2·1	mA
Screen Current	0·7	0·6	mA
Anode Impedance	1·5	2·4	MΩ
Mutual Conductance	1·1	1·25	mA/V
Inner Amplification Factor	20	20	
Grid Voltage for 1/100 g_m at V_{g1} = —3	—8	—9	volts

4.2 TRIODE CONNECTED (g_2 connected to anode, g_3 connected to cathode):

Heater Voltage	6·3	volts
Anode Voltage	250	volts
Grid Voltage	—8	volts
Anode Current	6·5	mA
Mutual Conductance	1·72	mA/V
Anode Impedance	11600	ohms
Amplification Factor	20	

5.0 Operation as a Resistance Capacity Coupled AF Amplifier:

5.1 PENTODE CONNECTED: In the table below are given typical operating conditions under various conditions of anode load and supply voltage which yield an output with approximately 5% distortion.

Anode Supply Voltage		100			300		volts
Anode Load Resistor	100	220	470	100	220	470	kΩ
Cathode Bias Resistor	1·3	3·3	5·6	0·56	1·5	2·2	kΩ
Series Screen Resistor	0·47	1·5	2·8	0·47	1·5	2·8	MΩ
Succeeding Stage Grid Resistor	1·0	1·0	1·0	1·0	1·0	1·0	MΩ
Peak Output Voltage	21	28	31	70	92	100	volts
Voltage Gain	65	80	140	104	124	185	volts

Included in this report are curves of anode and screen current versus control grid voltage taken with a supply voltage of 250 volts and various values of anode load resistor. The characteristics for an anode load of 100 kΩ are given on No. 308·225, for 220 kΩ on No. 308·224 and for 470 kΩ on No. 308·223. The method of using these curves for calculating the resistance capacity coupled amplifier performance is as follows:

As an example, assume it is desired to operate with a load resistor of 220 kΩ and a succeeding valve grid leak of 1 MΩ. It can be seen from the curve that control grid current sets in at about —0·5 volts, so that the bias should be chosen to prevent excursion into voltages lower than this. If a value of —2·0 volts is selected, a reasonably linear I_a/V_{g1} characteristic is obtained with the screen grid operating at 50 volts. With such an operating point the anode current is 0·48 mA, and the screen current 0·23 mA. The cathode bias resistor will be $\frac{2\cdot0 \times 1000}{0\cdot48 + 0\cdot23}$ or 2800 ohms. The series screen resistor will be $\frac{200 \times 1000}{0\cdot23}$ or 0·87 MΩ.

Allowing a peak input voltage of 0·3 volt, the grid will swing from —2·3 to —1·7 volts, giving an anode current swing of 0·32 mA to 0·68 mA, or 0·36 mA peak to peak. In a 220 kΩ load this corresponds to an output voltage of 79 volts peak to peak or 39·5 volts peak. The voltage gain is then 131 times.

As allowance must be made for the following grid leak of 1 MΩ, these figures must be reduced by a factor of $\frac{10^6}{10^6 + 0\cdot22 \times 10^6}$ or 0·82. The stage gain is then 108 times and the output voltage 32·5 volts peak.

The distortion may be estimated by inspection of the relative stage gains at the positive and negative peaks of the signal. The gain at —2·3 volts is

$$\frac{(0\cdot48 - 0\cdot32) \times 220 \times 0\cdot82}{0\cdot3} \text{ or } 96\cdot5 \text{ times.}$$

The gain at —1·7 volts is $\frac{(0\cdot68 - 0\cdot48) \times 220 \times 0\cdot82}{0\cdot3}$ of 120 times.

The distortion is then $\dfrac{120 - \left(\dfrac{120 + 96\cdot5}{2}\right)}{120 + 96\cdot5} \times 100 = 5\cdot3\%.$

5.2 TRIODE CONNECTED: The valve may be used as a low μ triode resistance capacity coupled amplifier where the requirements for low hum and noise outweigh these for high gain. In the table below are given typical operating conditions under various conditions of anode load and supply voltage which yield an output with approximately 5% distortion.

Anode Voltage		100			300		volts
Anode Load Resistance	100	220	470	100	220	470	kΩ
Cathode Bias Resistor	7·5	14·5	20·0	6·0	14·0	18·6	kΩ
Succeeding Stage Grid Resistor	0·5	1·0	1·0	0·5	1·0	1·0	MΩ
Peak Output Voltage	22	26	28	88	96	105	volts
Stage Gain	12	13	14	13	14	14	times

A curve, No. 308·226, is included in the report, which shows the relation between the various valve parameters and control grid voltage under conditions of RC coupled operation with various values of anode load resistance.

The method of using this curve for calculating performance is as follows. If it is desired to use an anode load of 220 kΩ with a supply of 250 volts, inspection of the curves indicates a reasonably linear portion over the region of grid voltage —2 to —8 volts. Assuming an operating point at —5 volts the anode impedance and amplification factor are shown as 27·2 kΩ and 17 respectively. The anode load is effectively in parallel with the following valve grid leak, and if this is 1 MΩ the effective load is

$$\frac{220 \times 1000}{1220} \text{ or } 180 \text{ k}\Omega.$$

The stage gain is then $\frac{\mu R_a}{R_a + r_a} = \frac{17 \times 180}{207{\cdot}2}$ or 14 times.

The distortion may be estimated in the same way as for pentode operation by calculating the stage gain at the extremes of the input signal.

6.0 Low Hum Applications:

6.1 PENTODE CONNECTED: Due to the extensive internal screening very little magnetic and electrostatic hum pick-up occur in the electrode structure. The single ended construction, however, admits the introduction of hum voltages through the capacity and leakage between control grid and heater-leads in the glass button base and valve holder. The hum pick-up due to this will be dependent on the relative values of grid/cathode circuit impedance and stray impedance between grid and heater. The base leakage, and to some extent the capacity, will be subject to considerable variation from valve to valve due to small impurities in, and oxide films on, the surface of the glass. Assuming one side of the heater is earthed, the peak voltage will be approximately 9 volts between grid and the other side of the heater. If a grid circuit impedance of 100 kΩ is assumed, it will be seen that an effective impedance of 10^{11} ohms between grid and heater will introduce nearly 10μV of hum into the grid circuit.

A curve is given, No. 308·231, which shows the maximum hum level referred to the grid plotted against the percentage of valves giving this level, or less, with a grid circuit impedance of 100 kΩ. From this curve it can be estimated how many samples from a large batch will have a hum level below a certain value. It will be seen that to expect a hum level not greater than 50μV would be reasonable, as 90% of the valves would be better than this, but that a requirement for 5μV would give only a 5% yield.

In order to achieve low hum levels from the valve in early stages of an amplifier, precautions must be taken to see that the valve is not situated in any AC fields from chokes, transformers or heater wiring. Similar precautions must obviously be taken with the input wiring, and decoupling earth returns pertaining to the stage should be returned to a single point and not distributed around the chassis forming closed loops liable to couple with AC magnetic fields.

An external screen is not normally necessary for this valve unless it is subject to severe external magnetic fields. A small improvement may be observed if a valve holder with a screening skirt is used, as it provides additional screening where the grid pin enters the base of the valve. A valve holder with low leakage and capacity should be used, and where one side of the heater is earthed, pin 4 should be used for this purpose, so that the live heater pin is remote from the control grid. The cathode by-pass condenser should have as high a capacity as possible to reduce the introduction of hum into the cathode circuit by way of heater-cathode capacity and leakage.

A considerable reduction in hum level may be achieved by returning the earth, not to one side of the heater, but to the slider of a low resistance potentiometer connected across the heater terminals. By this means some of the hum introduced by valve base leakage and capacity may be balanced out. Curve No. 308·227 shows the maximum hum voltage referred to the grid plotted against percentage of the valves with the control adjusted for minimum hum in each case. 90% of the valves show a hum level lower than 25μV, and 100% of the valves are better than 40μV.

The figures quoted are with a grid resistor of 100 kΩ. Wherever possible the grid circuit impedance should be limited to this order to obtain the lowest hum level. If a higher impedance is used there is more possibility of electrostatic and leakage pick-up by the grid. In practice, grid resistors up to 5MΩ in value may be used with only a 50% increase in hum level due to internal coupling in the valve.

6.2 TRIODE CONNECTED: The same considerations apply as in Par. 6.1 for pentode connections. The Curve No. 308·229 shows hum level plotted against percentage of valves using a 100 kΩ grid leak with the valve triode connected. A hum balancing resistor across the heater was employed. 90% of the valves have a hum level referred to the grid of less than 15μV, and the distribution is such that over 70% of the valves can be expected to be better than 5μV. This, for a miniature valve with single ended construction, is about the lowest limit which can be expected from a mass produced valve.

Both pentode and triode hum figures are for a typical RC coupled amplifier using an anode load of 100 kΩ or more, and operating the valve with an anode current of less than 1 mA. If the valve is operated into a choke or transformer load, the anode current should be held below 1·5 mA if a low level of hum is important.

7.0 Microphony: It is not possible to specify the microphony level because this is so much dependent on the circumstances of the application. The valve has been designed with a very rigid structure to minimise the effect of vibration, but there will always be some movement of individual grid wires when vibrated at their resonant frequency. By careful design, all low frequency resonances due to loose electrodes have been removed, so that there are no internal resonances below 1000 c/s. This is shown on the Curves No. 308·232 and 308·233, which indicate the amplitude of the resonances when the valve is vibrated across the major and minor axes respectively. The frequency of vibration was varied from 10 to 3000 c/s with a constant acceleration of 2·5g.

It is interesting to note that the amplitude of vibration to produce an acceleration of 2·5g varies from 0·25 in. at 10 c/s to approximately 0·001 in. at 150 c/s, while at 5000 c/s the peak amplitude is only 2 millionths of an inch. Most of the higher frequency vibrations are heavily damped by the chassis and valve holder mounting. The use of an anti-microphonic type of valve holder usually eliminates vibration effects at these frequencies.

Where the valve is being used at the limit of its sensitivity it is important to minimise as far as possible by flexible valve holder mountings all mechanical and acoustical vibrations. This is particularly important where the valve is included in the same cabinet as the loudspeaker, or a motor such as in magnetic tape recorders and sound film projectors.

8.0 Valve Shot noise (Hiss): A certain amount of random noise will be generated in the valve by the random arrival of electrons at the anode, and this is further increased by the partition of the cathode current between anode and screen, as the random collection of electrons by the screen must have its effect as an increased variation in the number of electrons arriving at the anode. This is inherent in the valve and cannot be entirely eliminated. A major contribution to valve noise, however, is noise produced by leakage between electrodes over the mica insulators and in the base. Also a poorly activated cathode can produce a noise voltage swamping the normal valve noise.

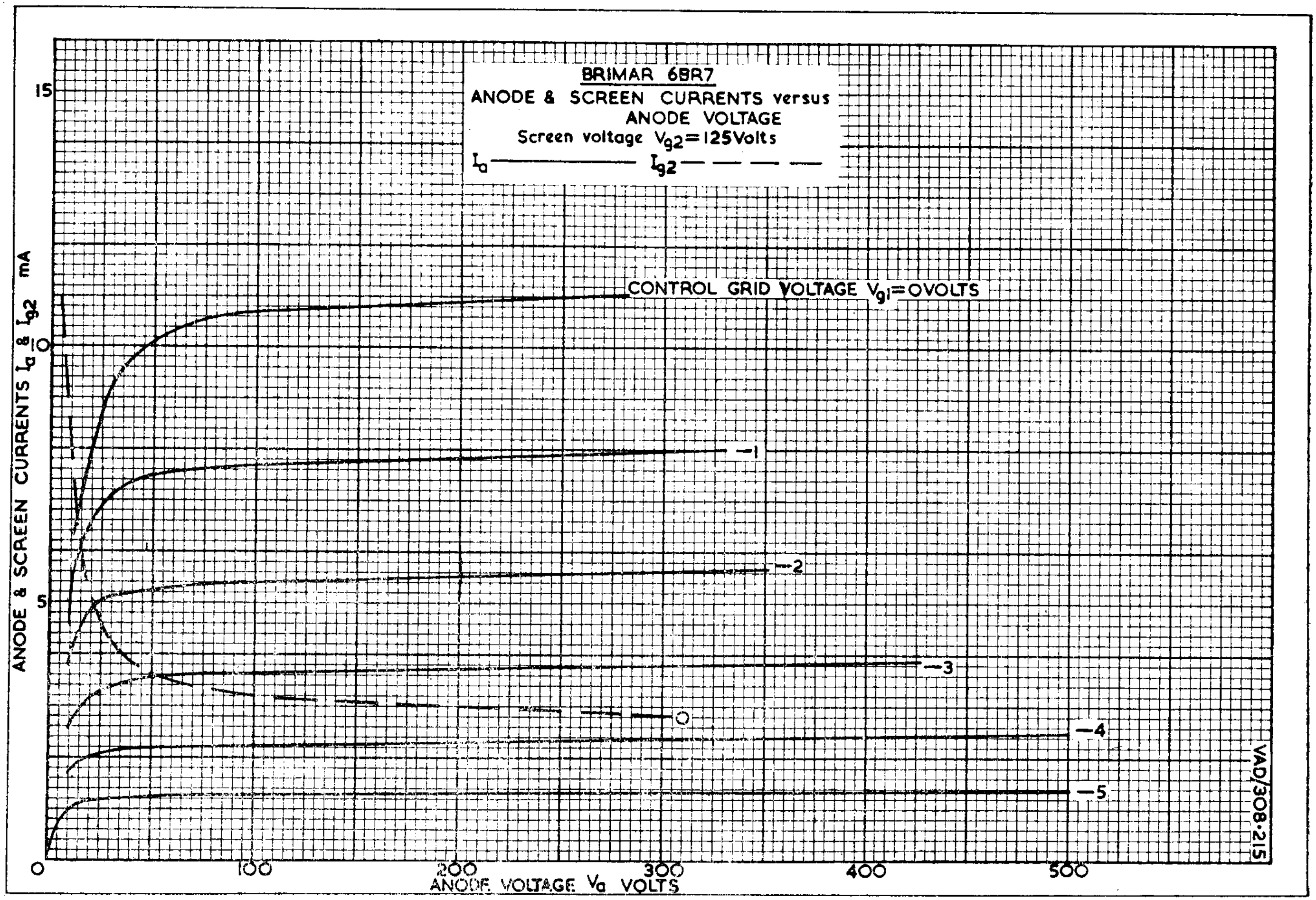
The shot noise in the 6BR7 has been reduced to a minimum by careful design, and the noise due to leakage controlled by careful assembly and inspection. A certain amount of leakage noise is unavoidable in a mass produced valve, and this reveals itself as a small variation in noise level from valve to valve.

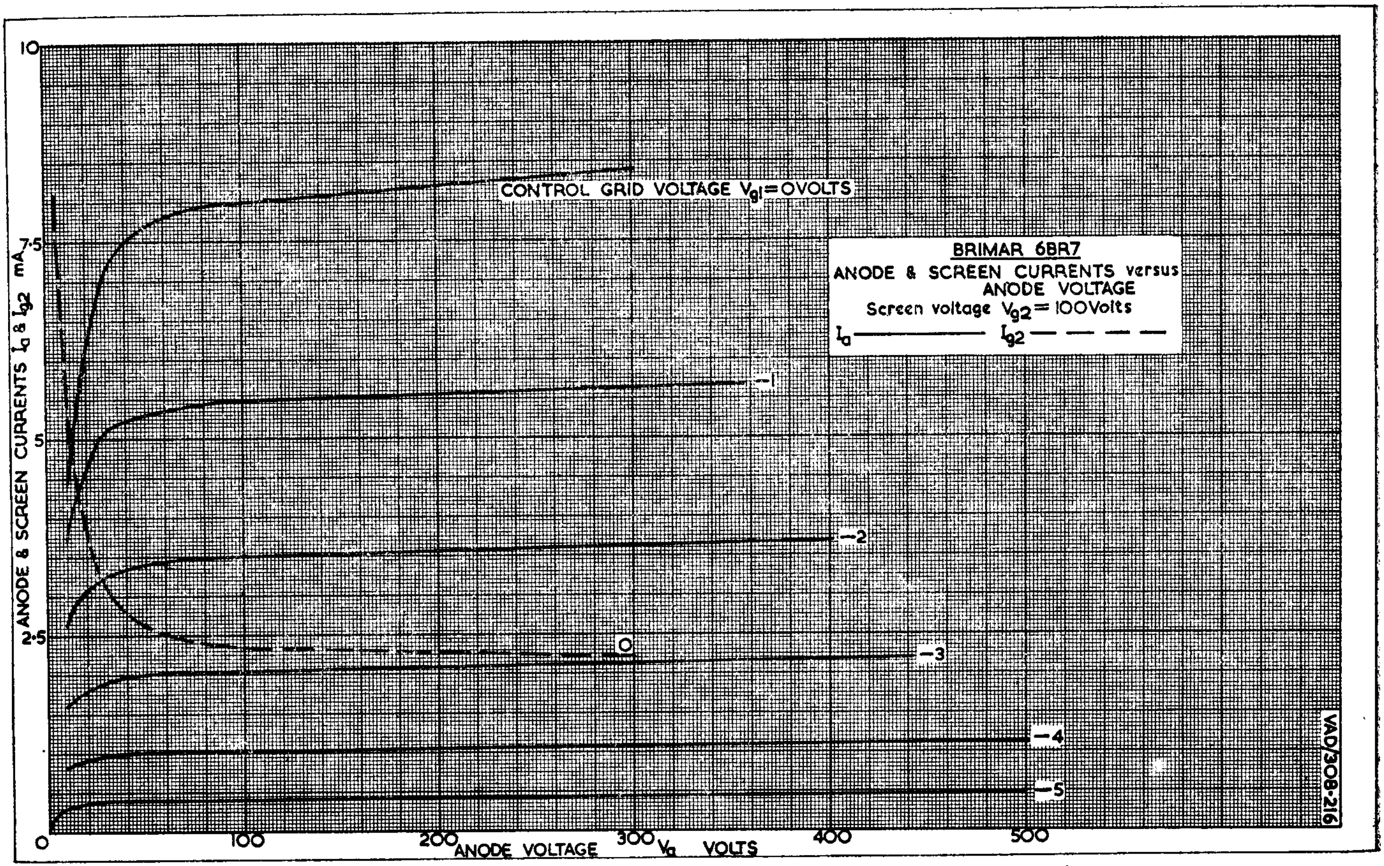
The curve No. 308·228 shows the maximum hiss voltage plotted against the percentage of valves, using a grid resistor of 100 kΩ and a bandwidth of 10 kc/s. The curve is very steep and indicates that a hiss level on the grid always lower than 7μV is to be expected.

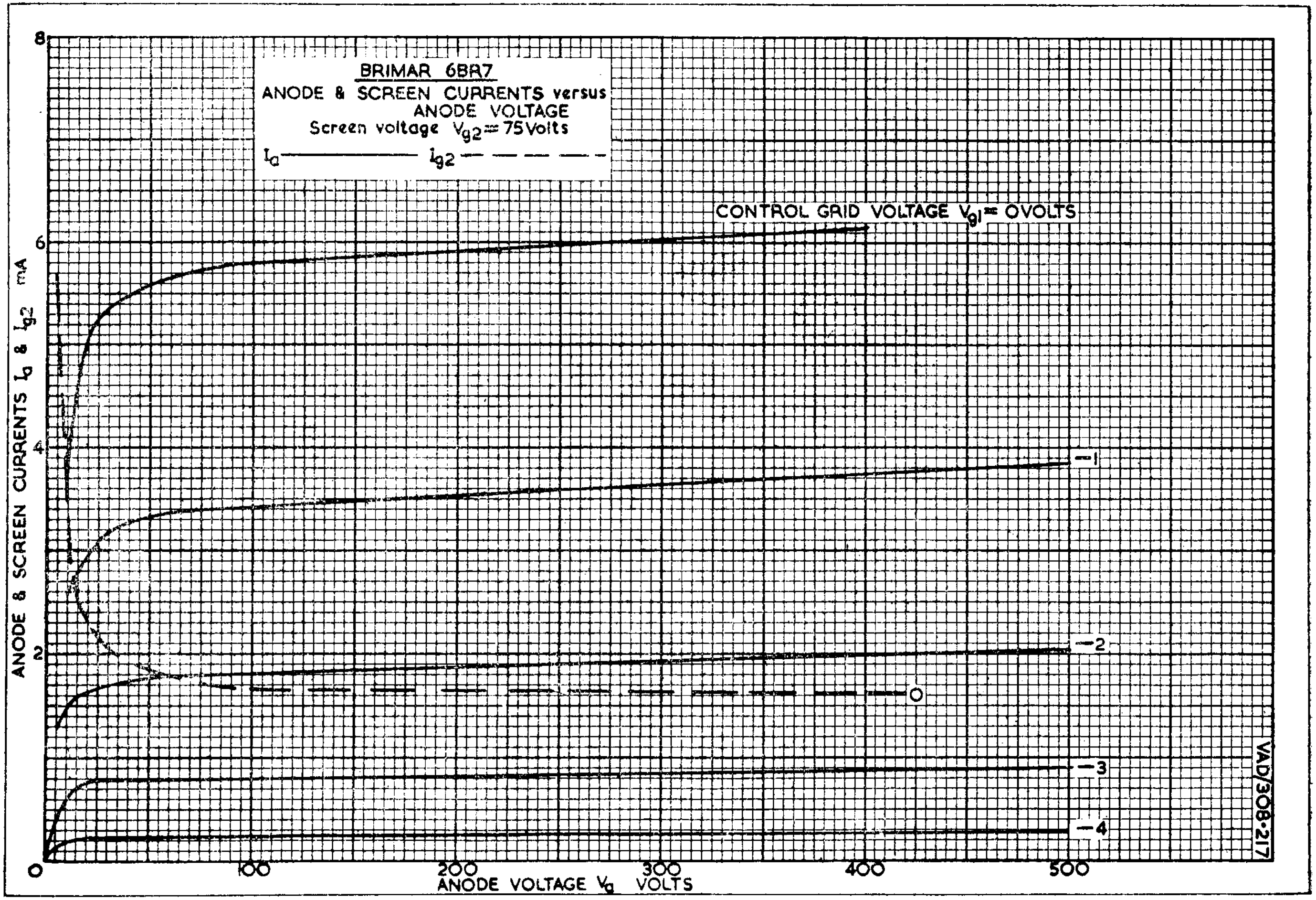
The Curve No. 308·230 shows the same parameters with the valve triode connected. Here partition noise has been eliminated. As would be expected the higher noise levels are unaltered because they are due mainly to leakage which is not greatly affected by whether the valve is triode or pentode connected. The lower noise level is reduced, and in fact falls below the thermal agitation noise generated by the 100 kΩ grid resistor, which in a 10 kc/s bandwidth at 20° C is about 4μV.

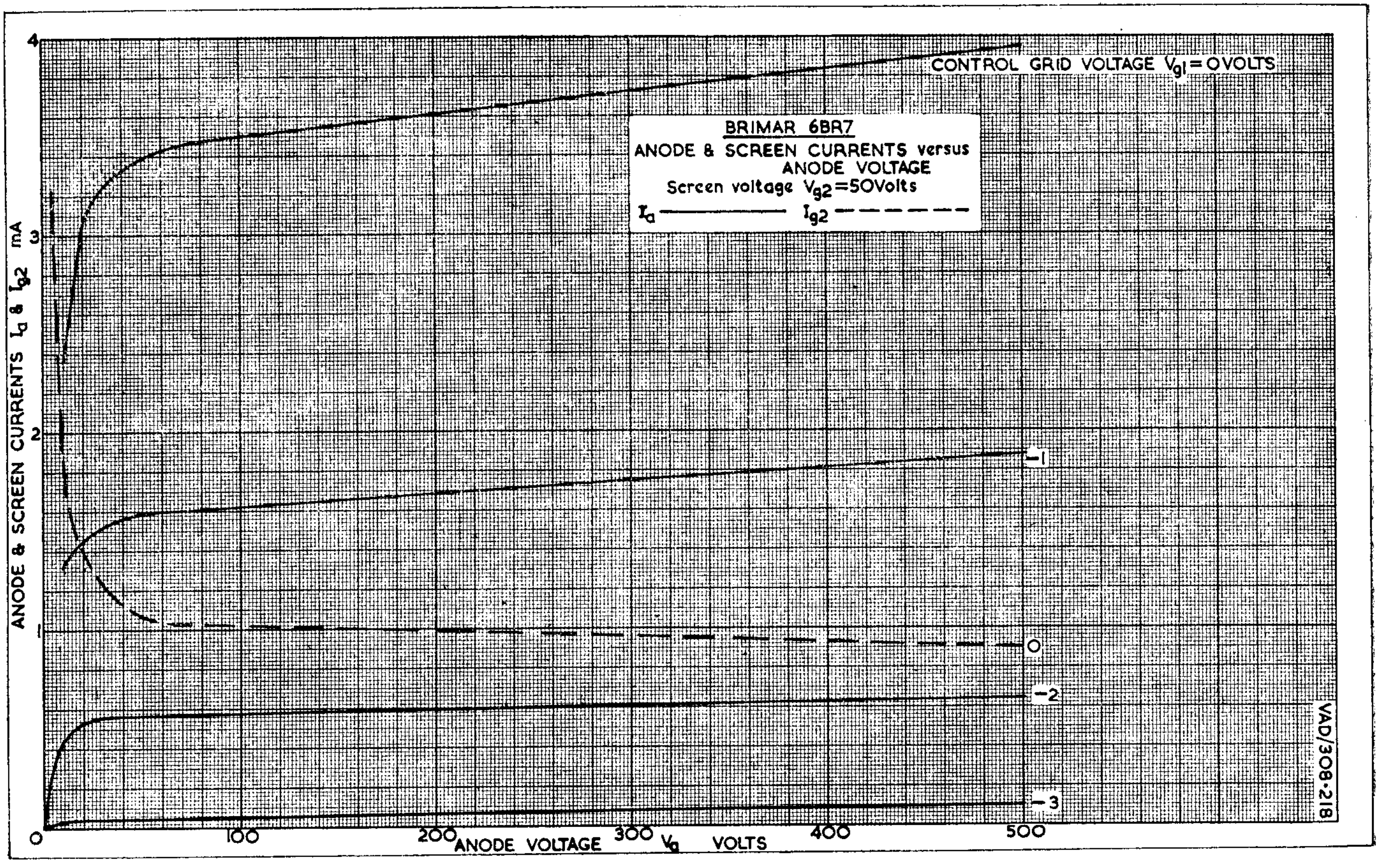
9.0 Conclusions: While it is not claimed that the 6BR7 has exceptionally low noise properties, it can be stated that it is a very great improvement over average normal valves. Individual samples taken at random from a large batch can be expected to give consistently good performance. As with normal receiving type valves, by selection, it is possible to find individual samples of outstanding performance, but whereas with normal types the average product is many times inferior to the selected samples in the case of the 6BR7 the average product is little different from the best samples selected.

In spite of this, care must be taken when designing prototype equipment for high gain, low noise applications, to ensure that the design is not finalised from the experience acquired from a single sample of the 6BR7.

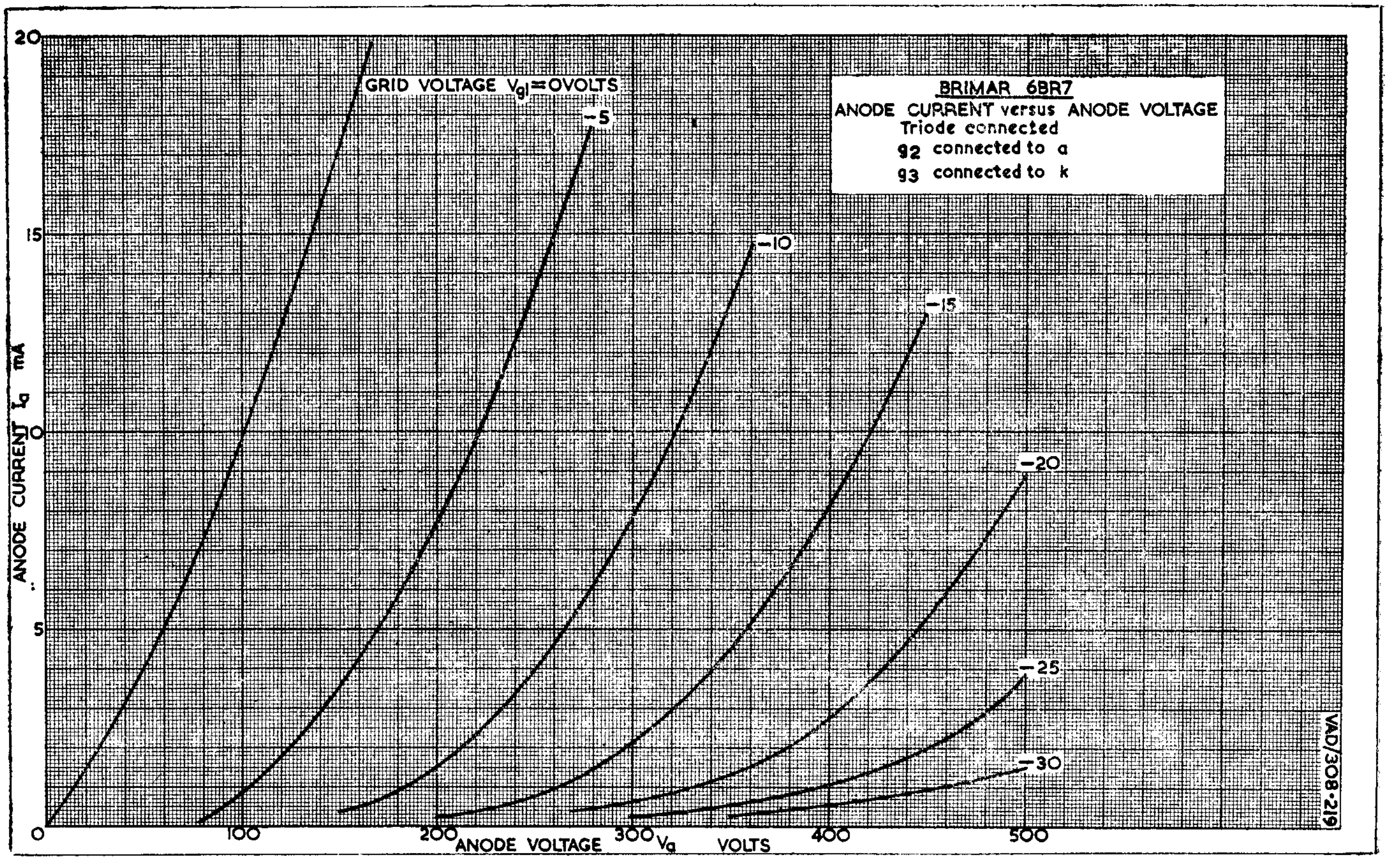

BRIMAR 6BR7
ANODE & SCREEN CURRENTS versus
ANODE VOLTAGE
Screen voltage Vg2=125Volts
Ia
Ig2
CONTROL GRID VOLTAGE Vg1=OVOLTS
-1
-2
-3
0
-4
-5
15
10
5
0
100
200
300
400
500
ANODE & SCREEN CURRENTS Ia & Ig2 mA
ANODE VOLTAGE Va VOLTS
VAD/308·215

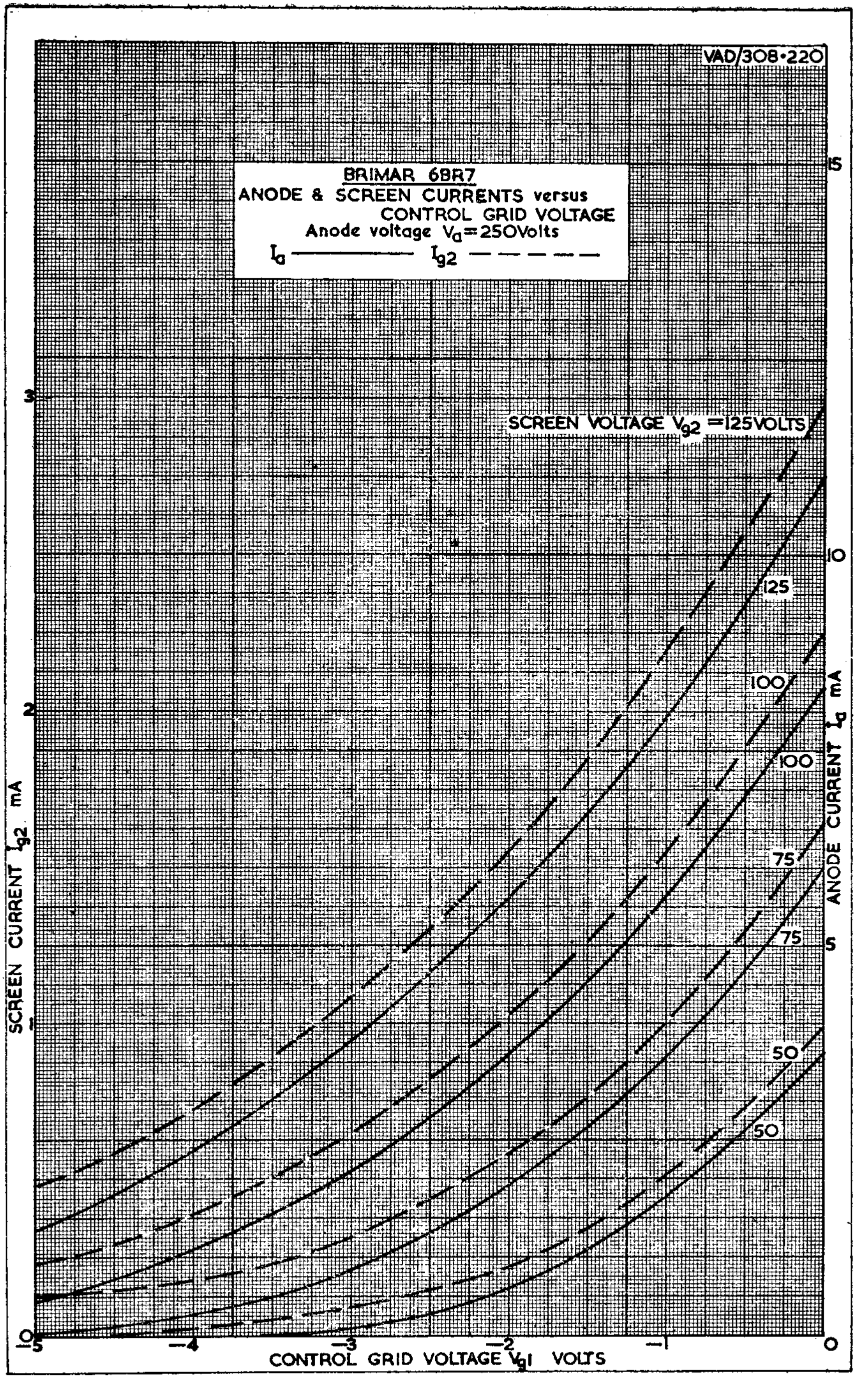

BRIMAR 6BR7
ANODE & SCREEN CURRENTS versus ANODE VOLTAGE
Screen voltage V_{g2} = 100 Volts
I_a ——— I_{g2} – – –
CONTROL GRID VOLTAGE V_{g1} = 0 VOLTS
-1
-2
0
-3
-4
-5
ANODE & SCREEN CURRENTS I_a & I_{g2} mA
10
7·5
5
2·5
0
100
200
300
400
500
ANODE VOLTAGE V_a VOLTS
VAD/308-216


BRIMAR 6BR7
ANODE & SCREEN CURRENTS versus ANODE VOLTAGE
Screen voltage V_{g2} = 75 Volts
I_a ———— I_{g2} — — — —
CONTROL GRID VOLTAGE V_{g1} = 0 VOLTS
−1
−2
0
−3
−4
ANODE & SCREEN CURRENTS I_a & I_{g2} mA
ANODE VOLTAGE V_a VOLTS
0
2
4
6
8
100
200
300
400
500
VAD/308·217

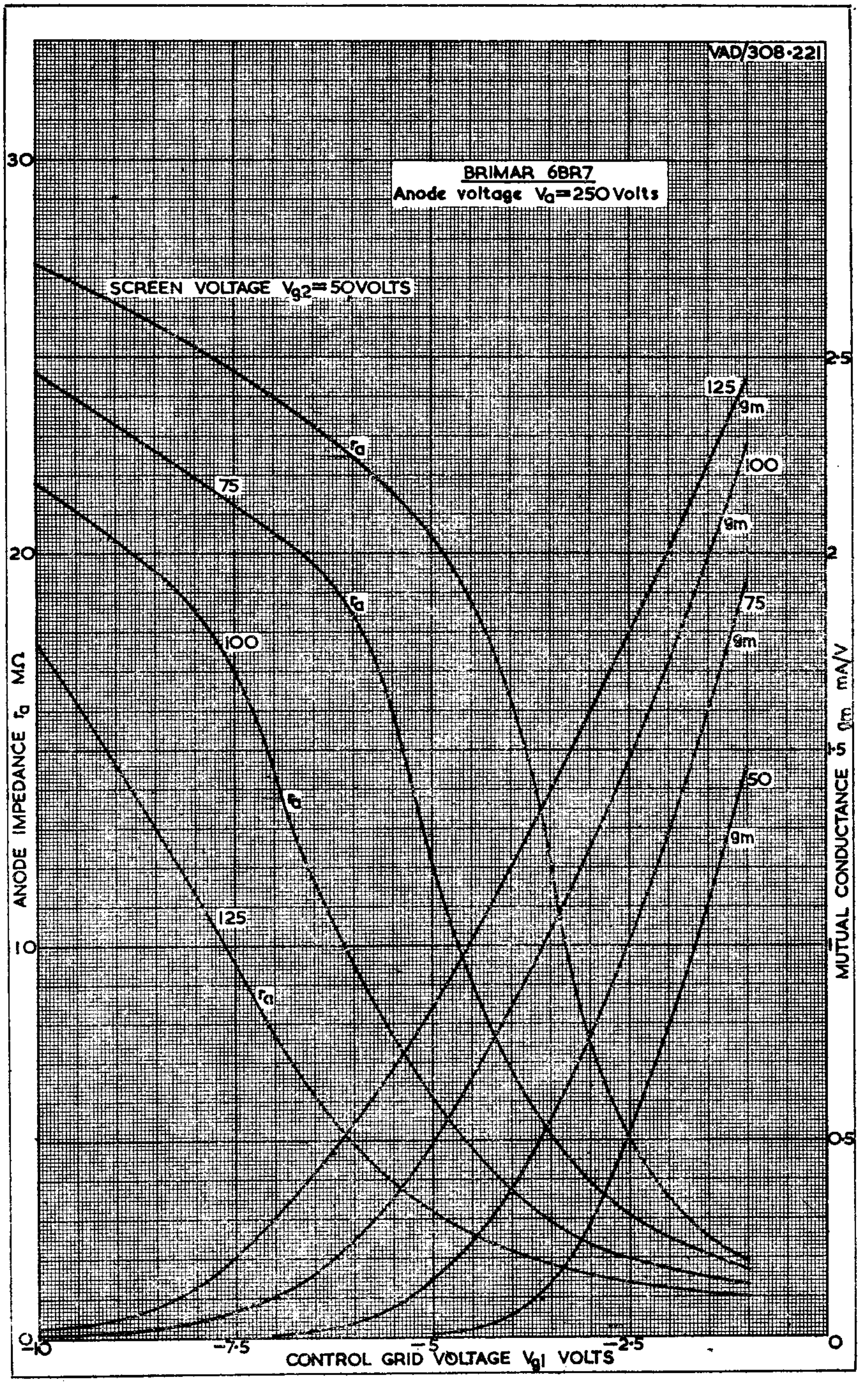


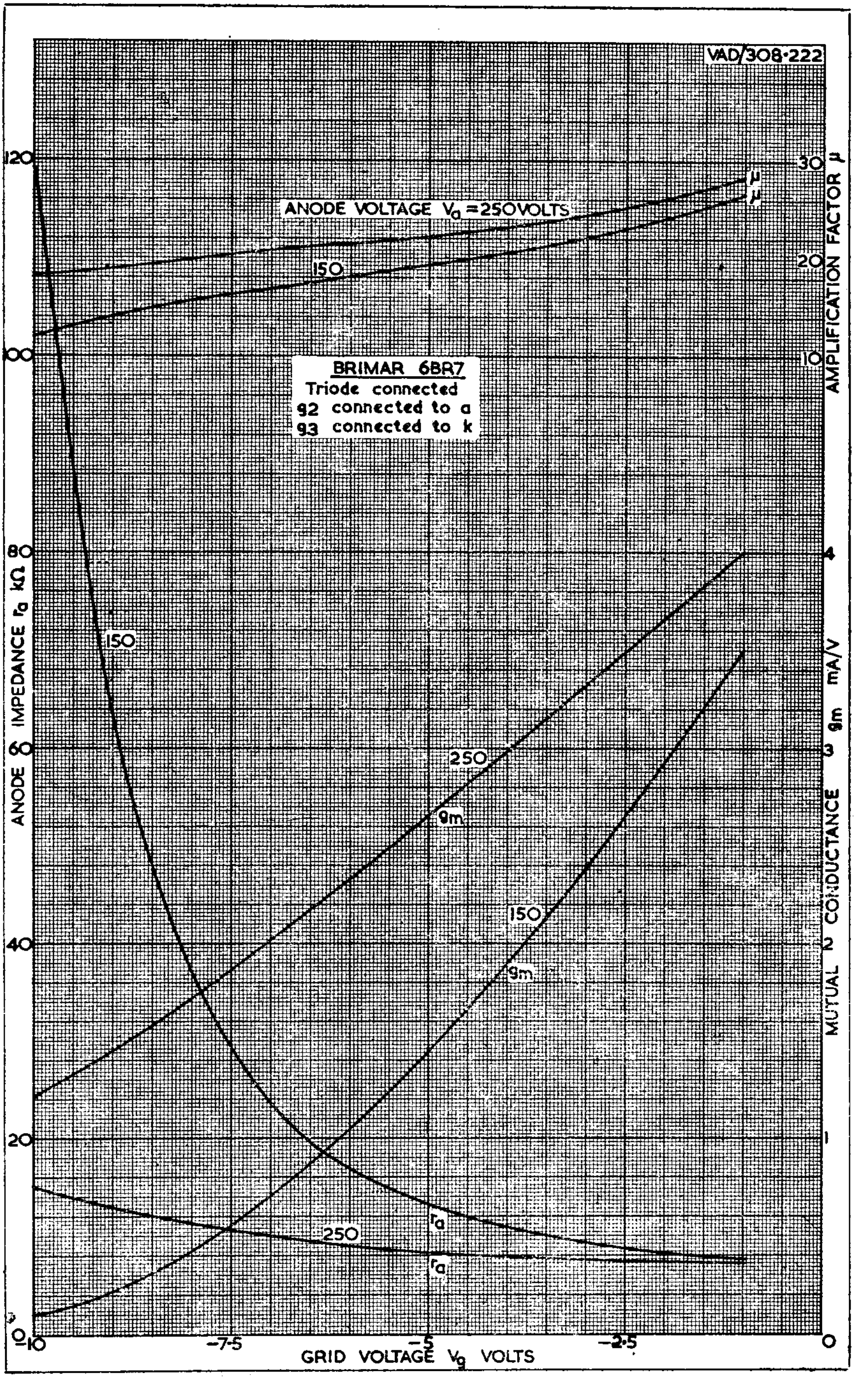
BRIMAR 6BR7
ANODE & SCREEN CURRENTS versus ANODE VOLTAGE
Screen voltage V_{g2}=50Volts
I_a
I_{g2}
CONTROL GRID VOLTAGE V_{g1}=0VOLTS
ANODE & SCREEN CURRENTS I_a & I_{g2} mA
ANODE VOLTAGE V_a VOLTS
0
100
200
300
400
500
1
2
3
4
-1
0
-2
-3
VAD/308·218

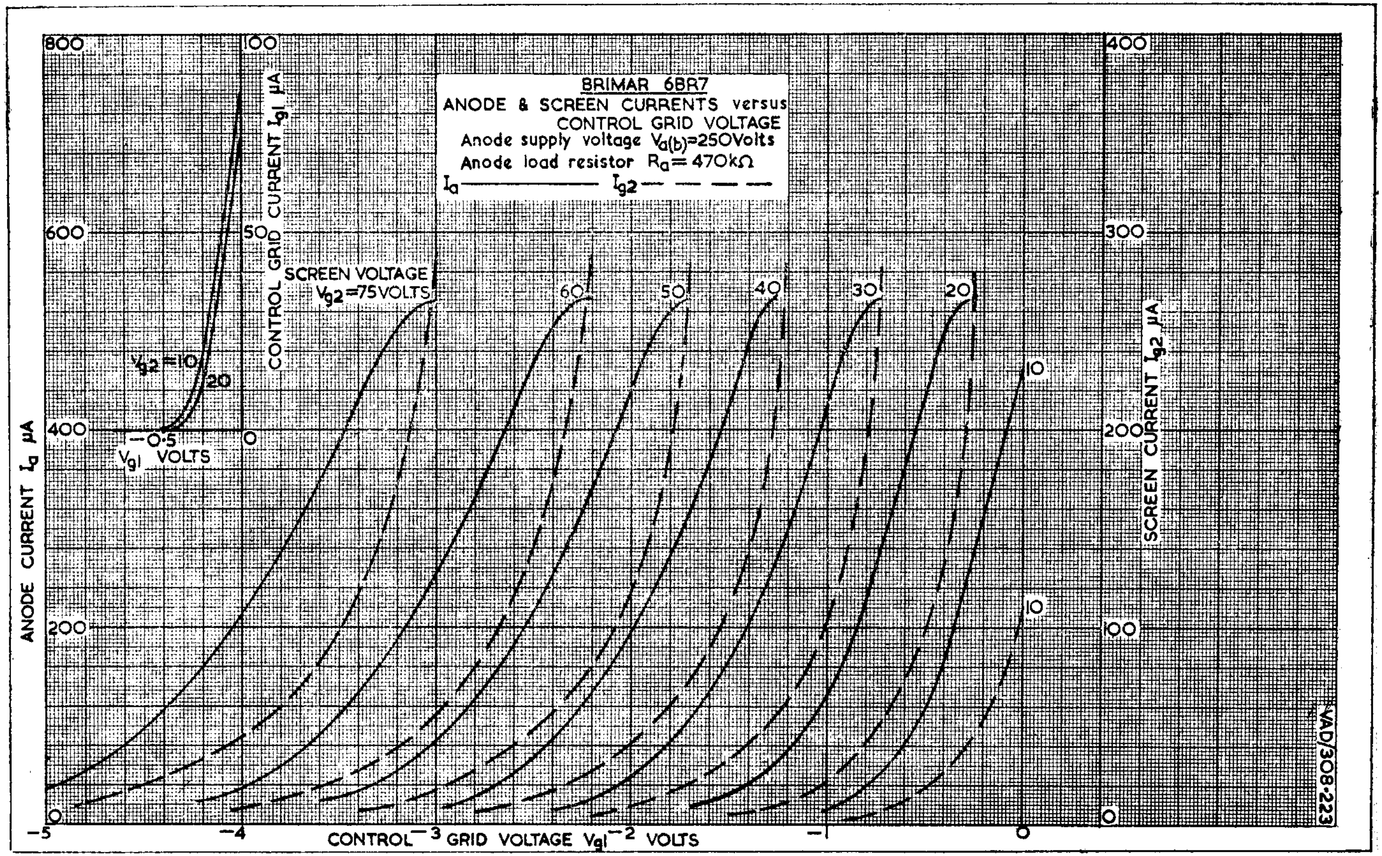

BRIMAR 6BR7
ANODE CURRENT versus ANODE VOLTAGE
Triode connected
g2 connected to a
g3 connected to k
GRID VOLTAGE Vg1=0VOLTS
-5
-10
-15
-20
-25
-30
ANODE CURRENT Ia mA
ANODE VOLTAGE Va VOLTS
0
5
10
15
20
100
200
300
400
500
VAD/308·219



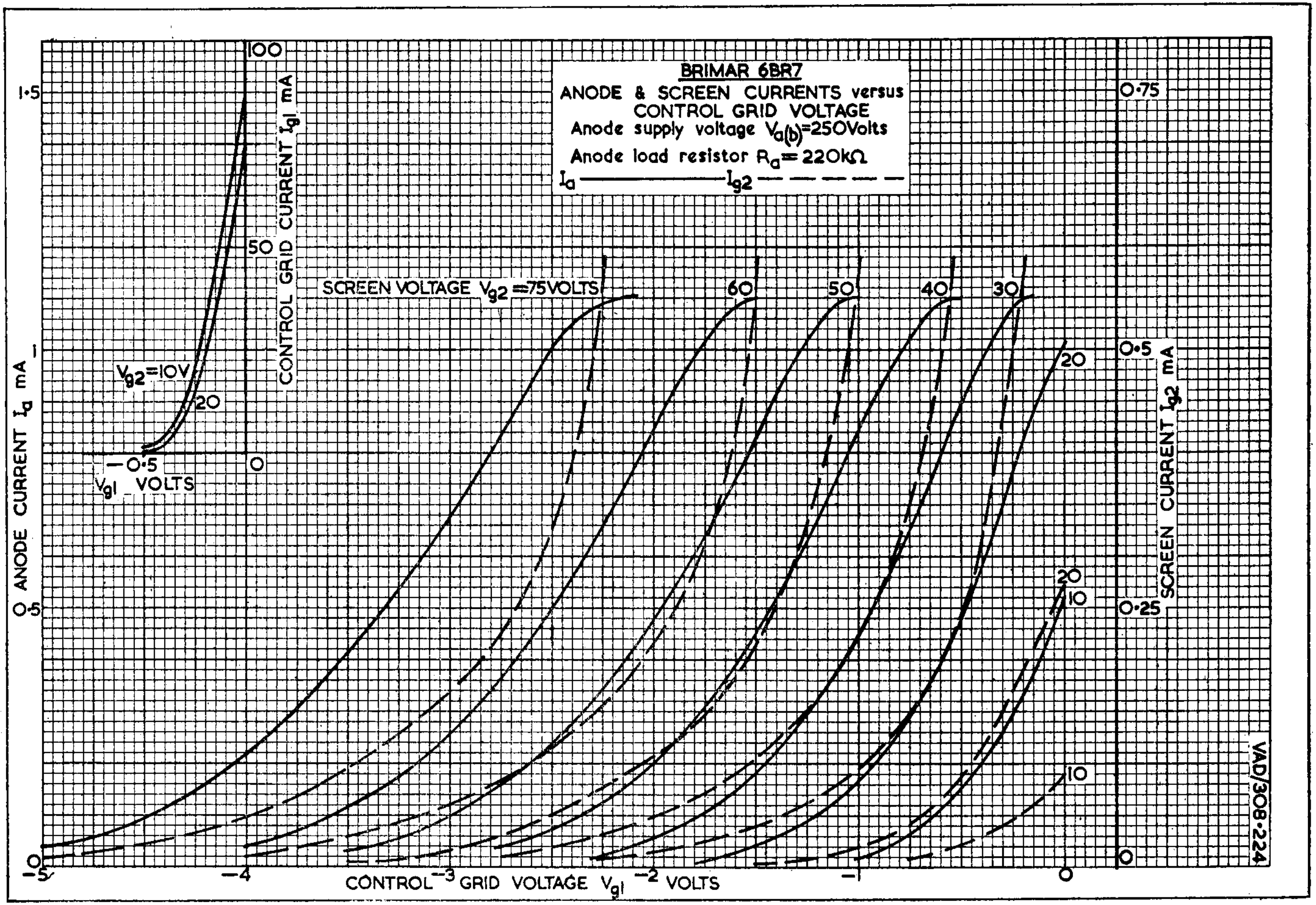
VAD/308·220
BRIMAR 6BR7
ANODE & SCREEN CURRENTS versus CONTROL GRID VOLTAGE
Anode voltage Va=250Volts
Ia ——— Ig2 – – – –
SCREEN VOLTAGE Vg2 =125VOLTS
125
100
100
75
75
50
50
SCREEN CURRENT Ig2 mA
ANODE CURRENT Ia mA
CONTROL GRID VOLTAGE Vg1 VOLTS
−5
−4
−3
−2
−1
0
1
2
3
5
10
15

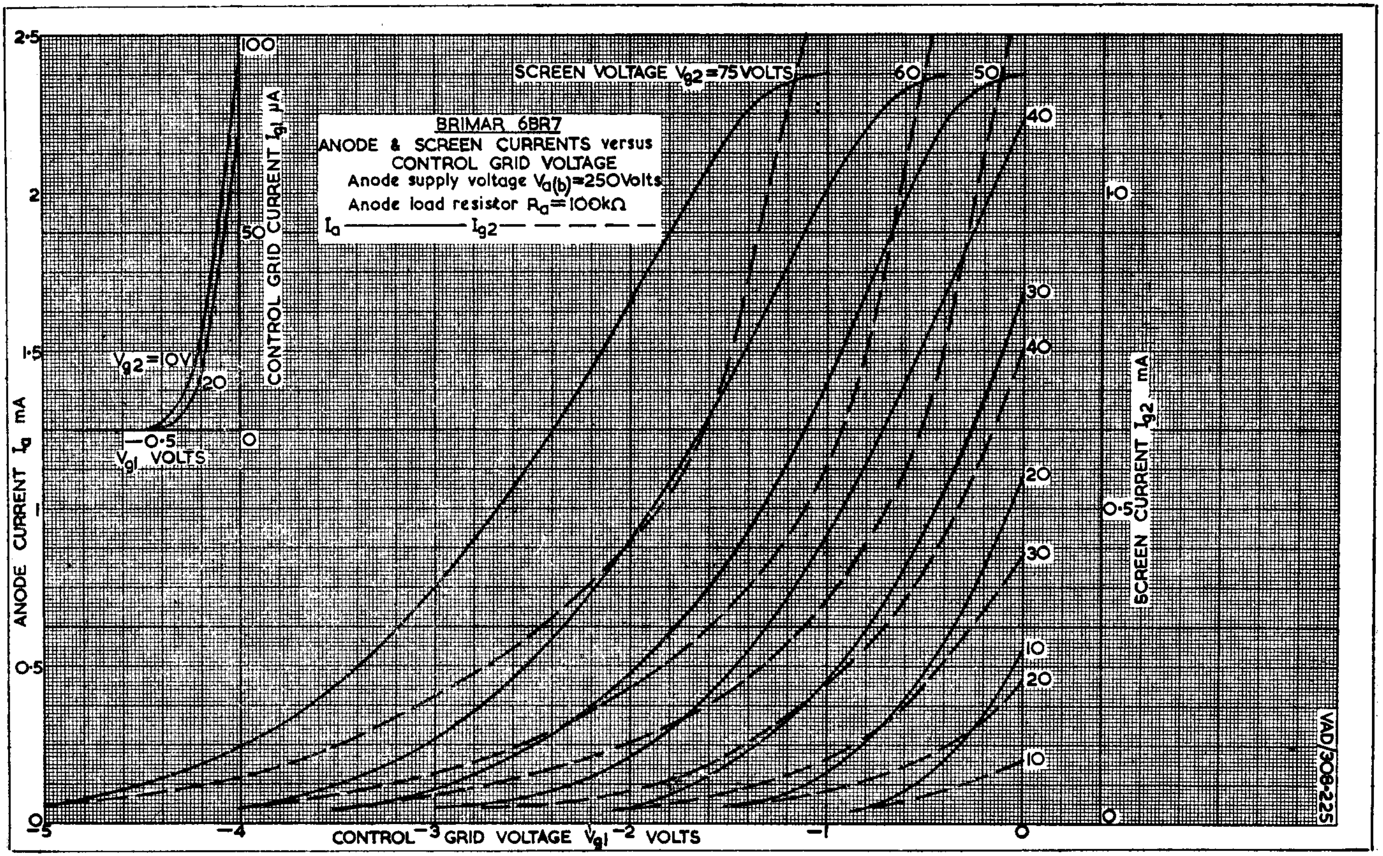

VAD/308·221
BRIMAR 6BR7
Anode voltage Va=250 Volts
SCREEN VOLTAGE Vg2=50 VOLTS
75
100
125
ra
gm
ANODE IMPEDANCE ra MΩ
MUTUAL CONDUCTANCE gm mA/V
CONTROL GRID VOLTAGE Vg1 VOLTS
30
20
10
0
2·5
2
1·5
1
0·5
-10
-7·5
-5
-2·5
50


VAD/308·222
ANODE VOLTAGE Va = 250 VOLTS
150
μ
μ
BRIMAR 6BR7
Triode connected
g2 connected to a
g3 connected to k
AMPLIFICATION FACTOR μ
ANODE IMPEDANCE ra kΩ
MUTUAL CONDUCTANCE gm mA/V
150
250
gm
150
gm
ra
250
ra
120
100
80
60
40
20
0
30
20
10
4
3
2
1
0
-10
-7·5
-5
-2·5
GRID VOLTAGE Vg VOLTS

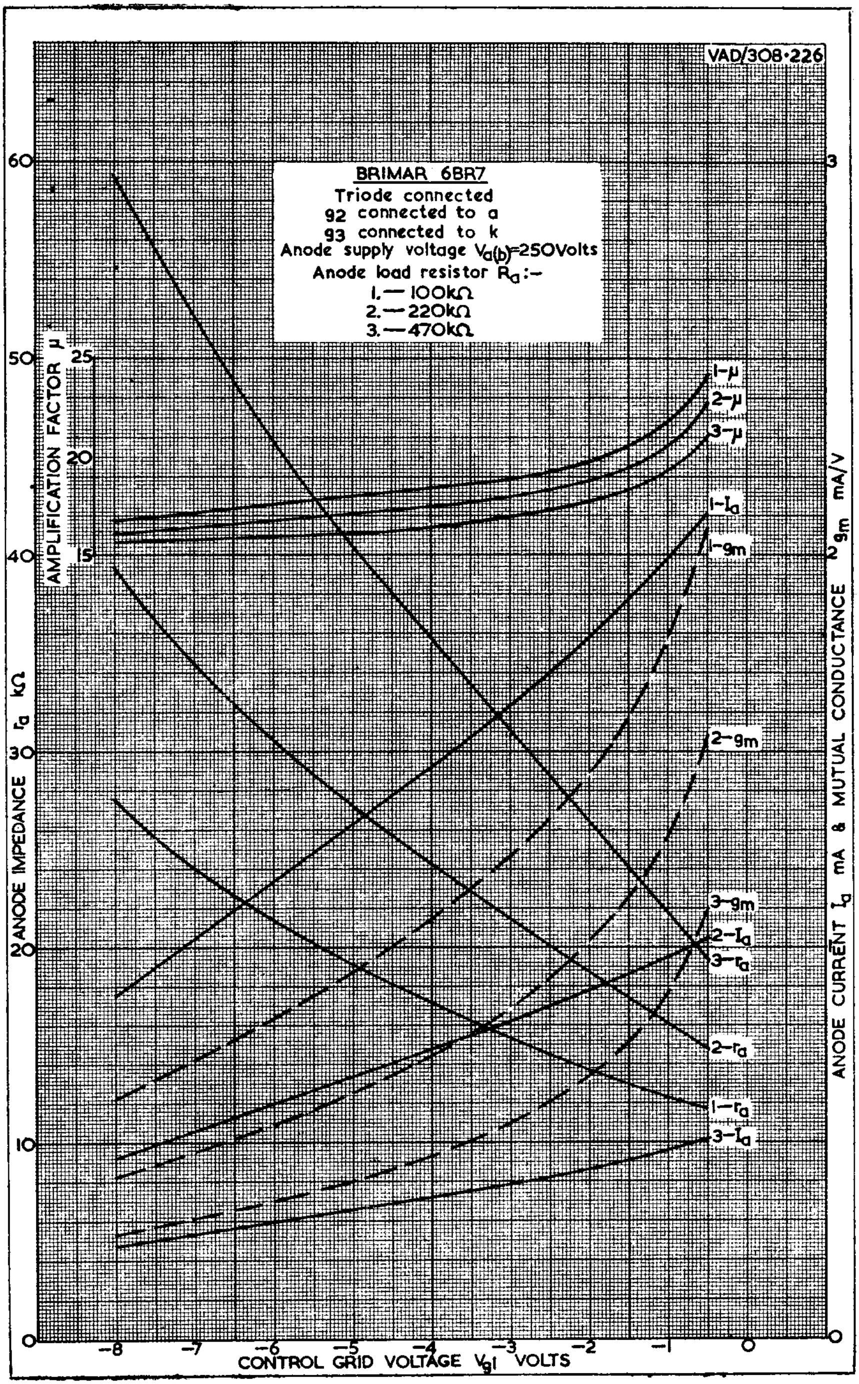


BRIMAR 6BR7
ANODE & SCREEN CURRENTS versus CONTROL GRID VOLTAGE
Anode supply voltage Va(b)=250Volts
Anode load resistor Ra=470kΩ
Ia ———— Ig2 — — —
SCREEN VOLTAGE Vg2=75VOLTS
60
50
40
30
20
10
10
Vg2=10
20
−0·5
Vg1 VOLTS
CONTROL GRID CURRENT Ig1 μA
100
50
0
ANODE CURRENT Ia μA
800
600
400
200
0
SCREEN CURRENT Ig2 μA
400
300
200
100
0
−5
−4
−3
−2
−1
0
CONTROL GRID VOLTAGE Vg1 VOLTS
VAD/308-223

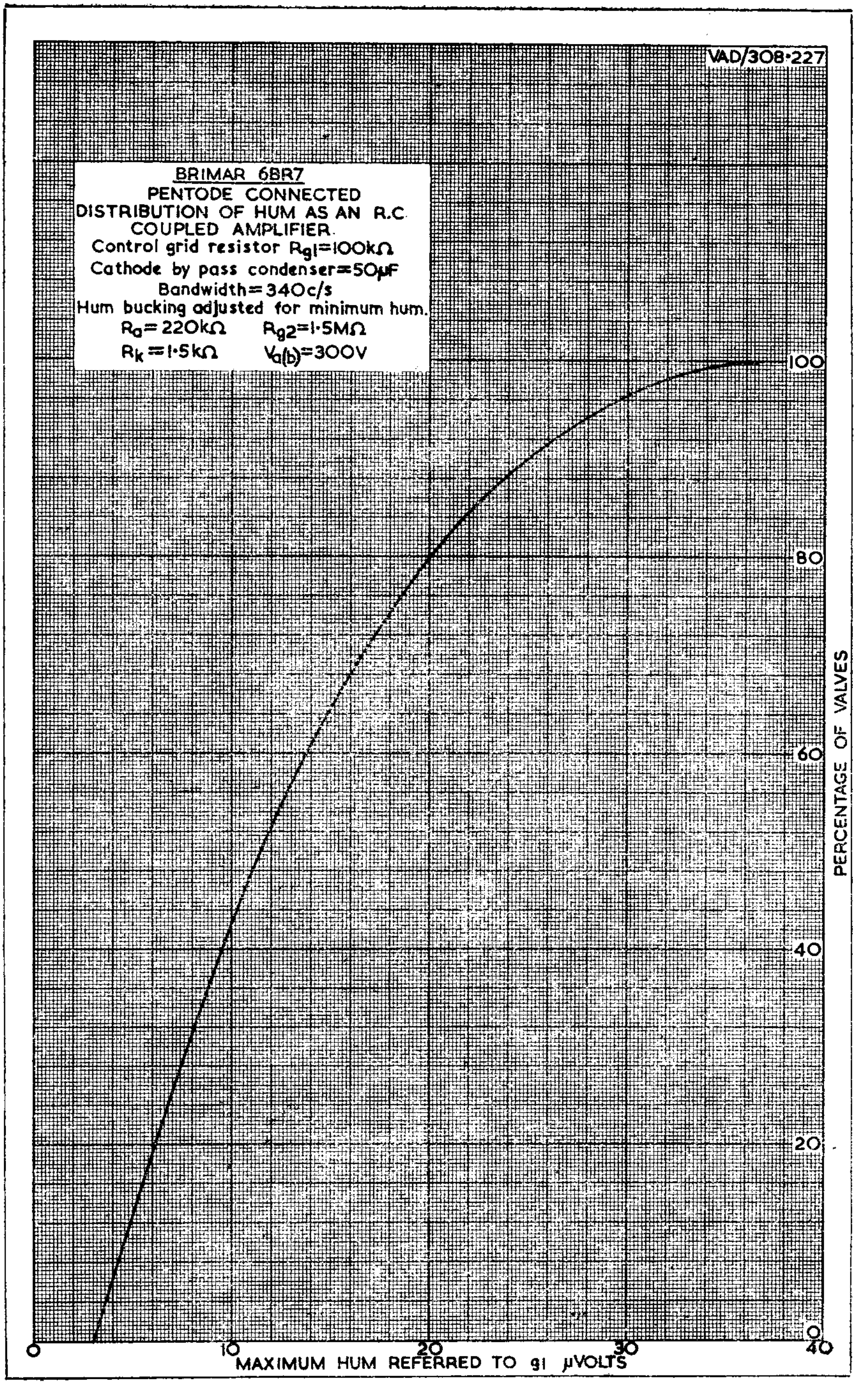

BRIMAR 6BR7
ANODE & SCREEN CURRENTS versus CONTROL GRID VOLTAGE
Anode supply voltage $V_{a(b)}$=250Volts
Anode load resistor R_a= 220kΩ
I_a —— I_{g2} – – –
SCREEN VOLTAGE V_{g2} =75VOLTS
60
50
40
30
20
10
V_{g2}=10V
CONTROL GRID CURRENT I_{g1} mA
100
50
0
−0·5
V_{g1} VOLTS
ANODE CURRENT I_a mA
1·5
1
0·5
0
SCREEN CURRENT I_{g2} mA
0·75
0·5
0·25
CONTROL GRID VOLTAGE V_{g1} VOLTS
−5
−4
−3
−2
−1
VAD/308·224



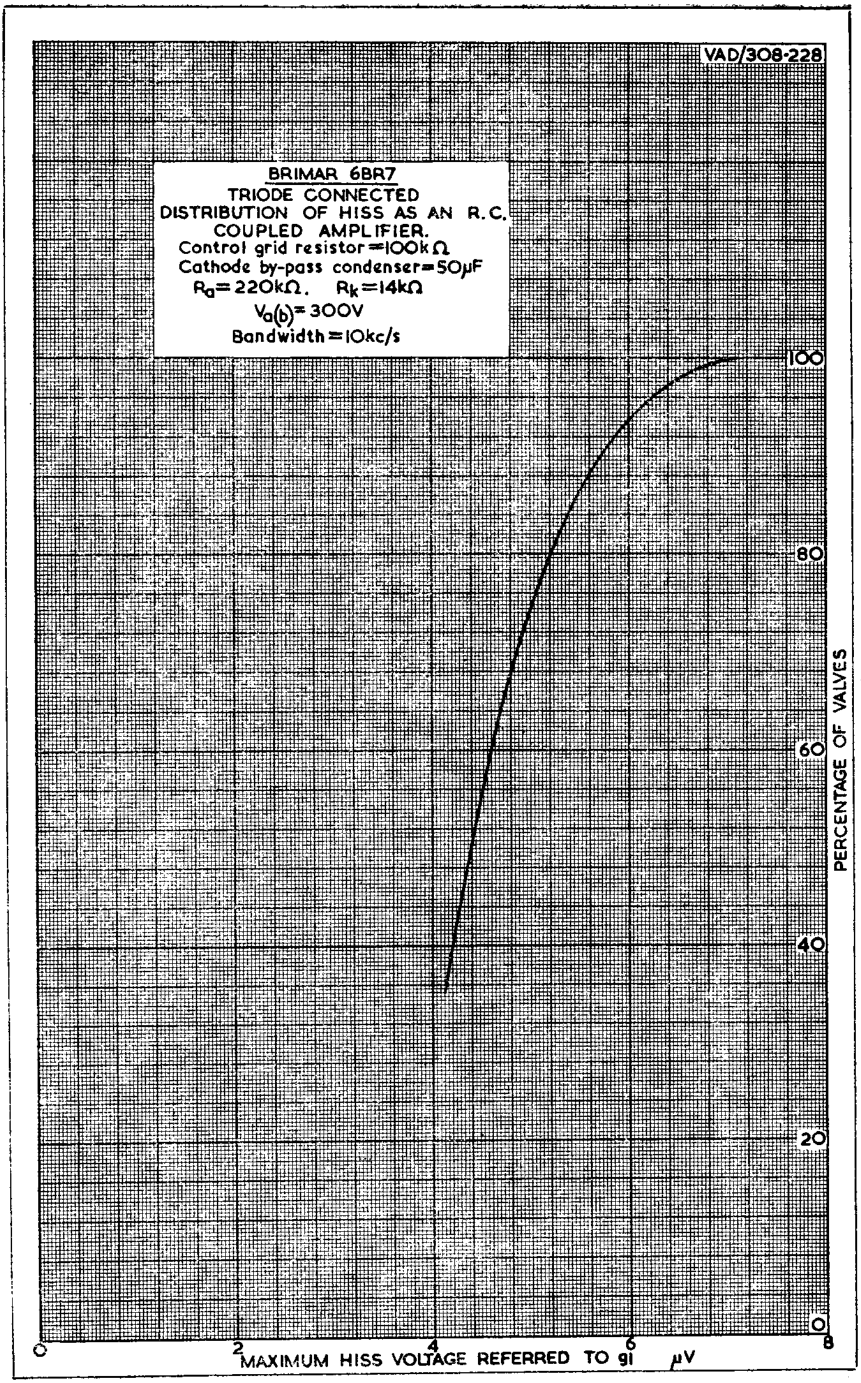
BRIMAR 6BR7
ANODE & SCREEN CURRENTS versus CONTROL GRID VOLTAGE
Anode supply voltage $V_{a(b)}$=250 Volts
Anode load resistor R_a=100kΩ
I_a ———— I_{g2} — — — —
SCREEN VOLTAGE V_{g2}=75 VOLTS
60
50
40
30
40
20
30
10
20
10
V_{g2}=10V
20
—0·5
V_{g1} VOLTS
100
50
0
CONTROL GRID CURRENT I_{g1} μA
ANODE CURRENT I_a mA
2·5
2
1·5
1
0·5
0
SCREEN CURRENT I_{g2} mA
1·0
0·5
0
−5
−4
−3
−2
−1
0
CONTROL GRID VOLTAGE V_{g1} VOLTS
VAD/308-225

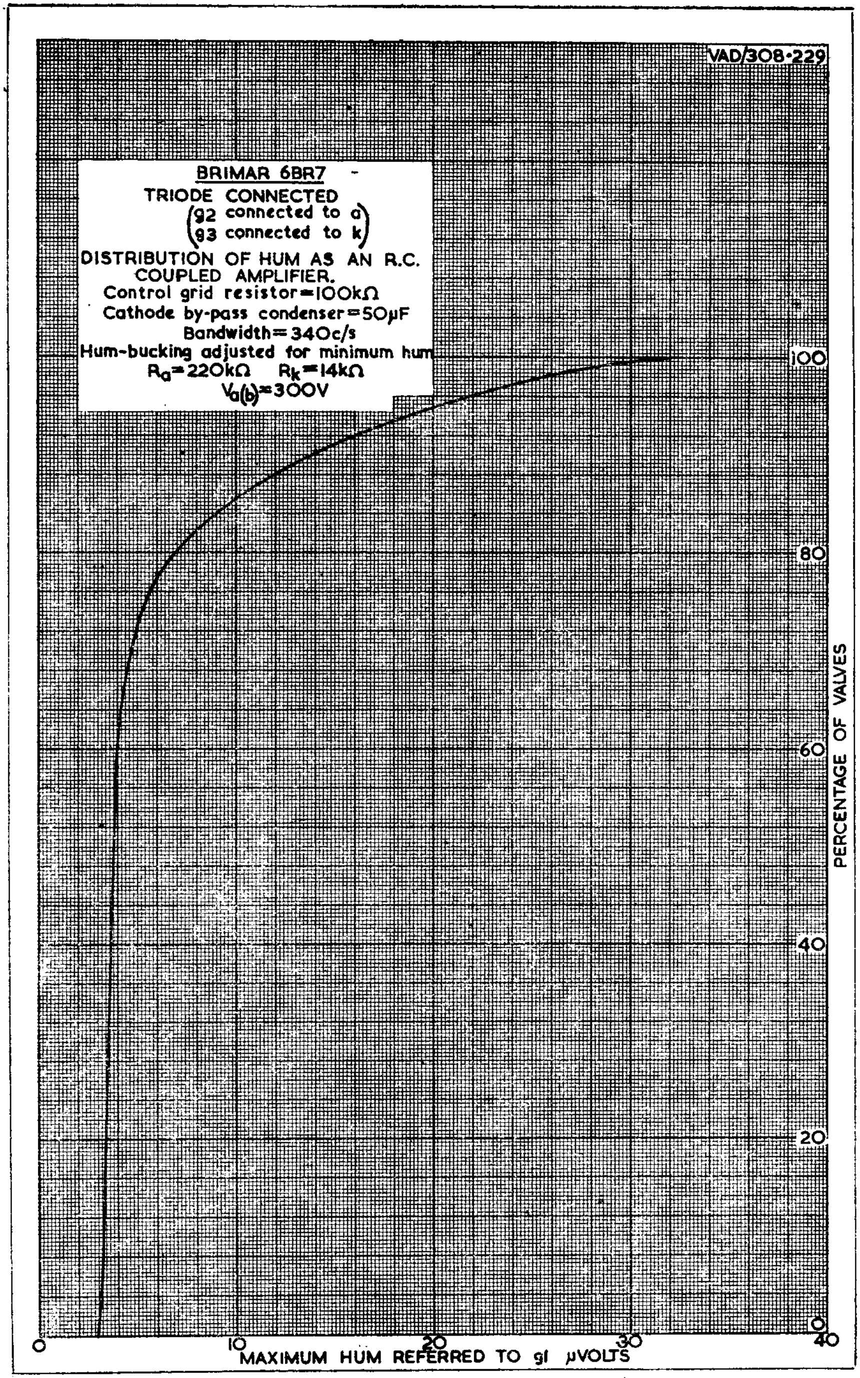


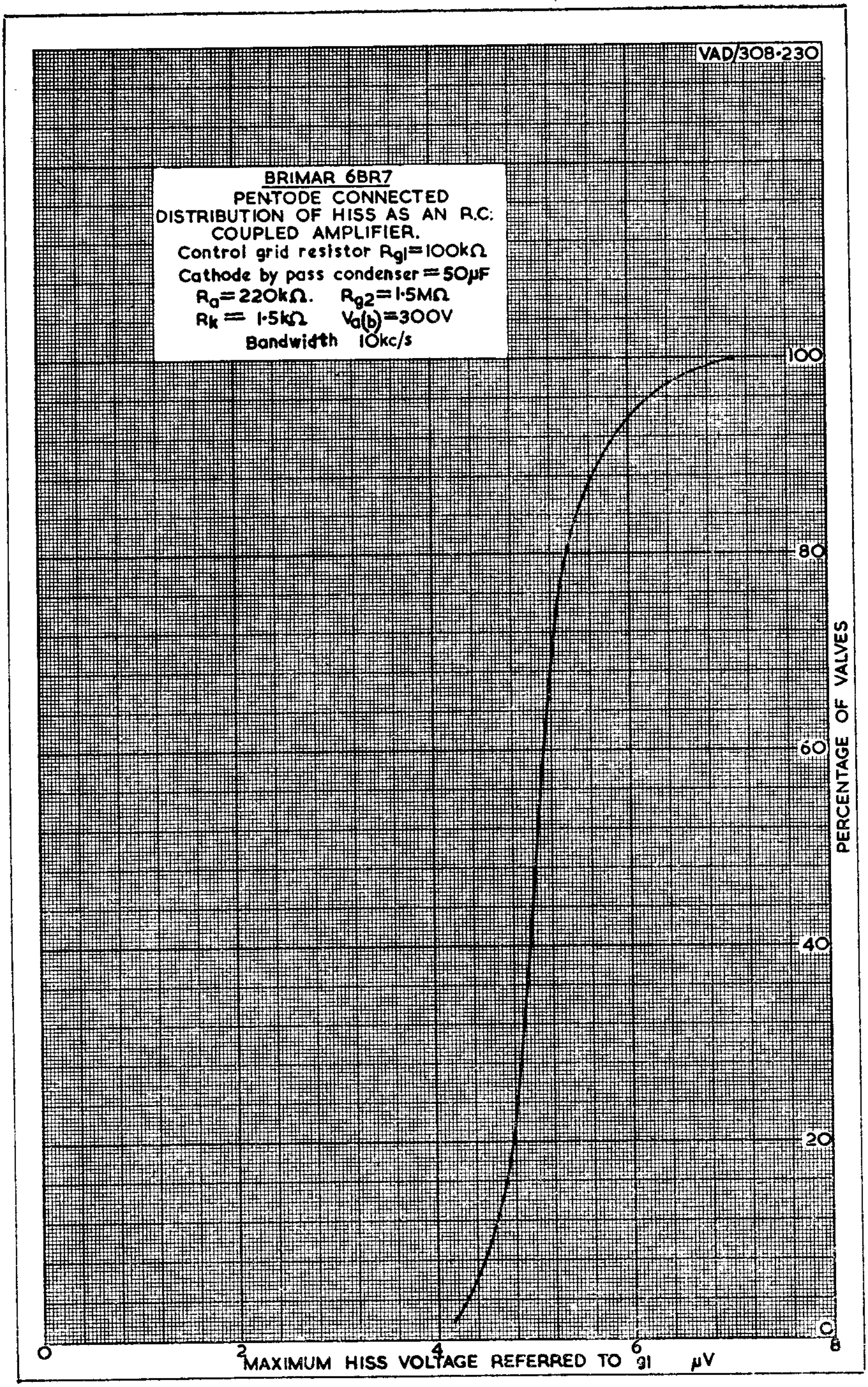
VAD/308·226
BRIMAR 6BR7
Triode connected
g2 connected to a
g3 connected to k
Anode supply voltage Va(b)=250Volts
Anode load resistor Ra:-
1.—100kΩ
2.—220kΩ
3.—470kΩ
AMPLIFICATION FACTOR μ
ANODE IMPEDANCE ra kΩ
ANODE CURRENT Ia mA & MUTUAL CONDUCTANCE gm mA/V
CONTROL GRID VOLTAGE Vg1 VOLTS
1-μ
2-μ
3-μ
1-Ia
1-gm
2-gm
3-gm
2-Ia
3-ra
2-ra
1-ra
3-Ia
60
50
40
30
20
10
0
25
20
15
3
2
0
-8
-7
-6
-5
-4
-3
-2
-1
0

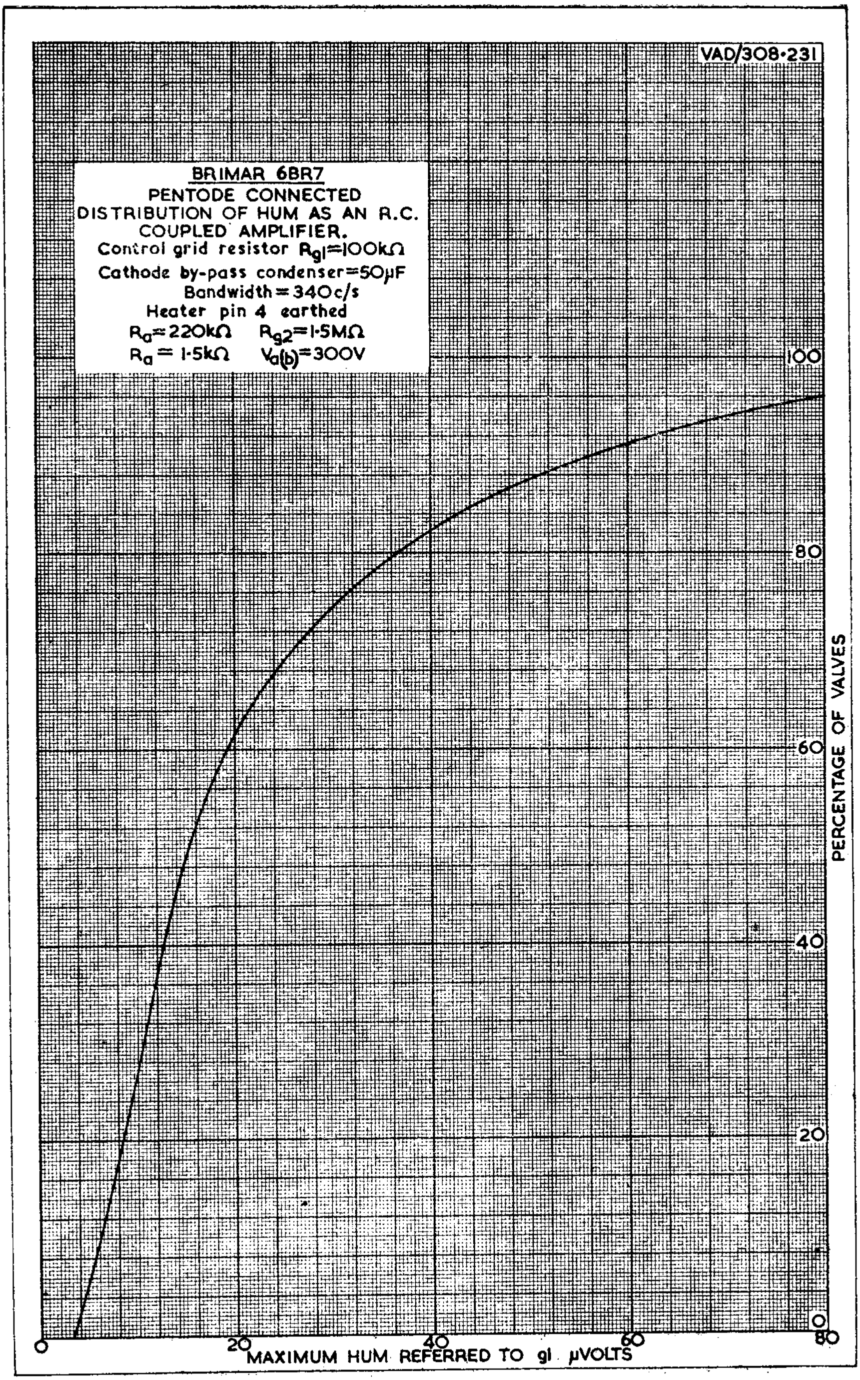


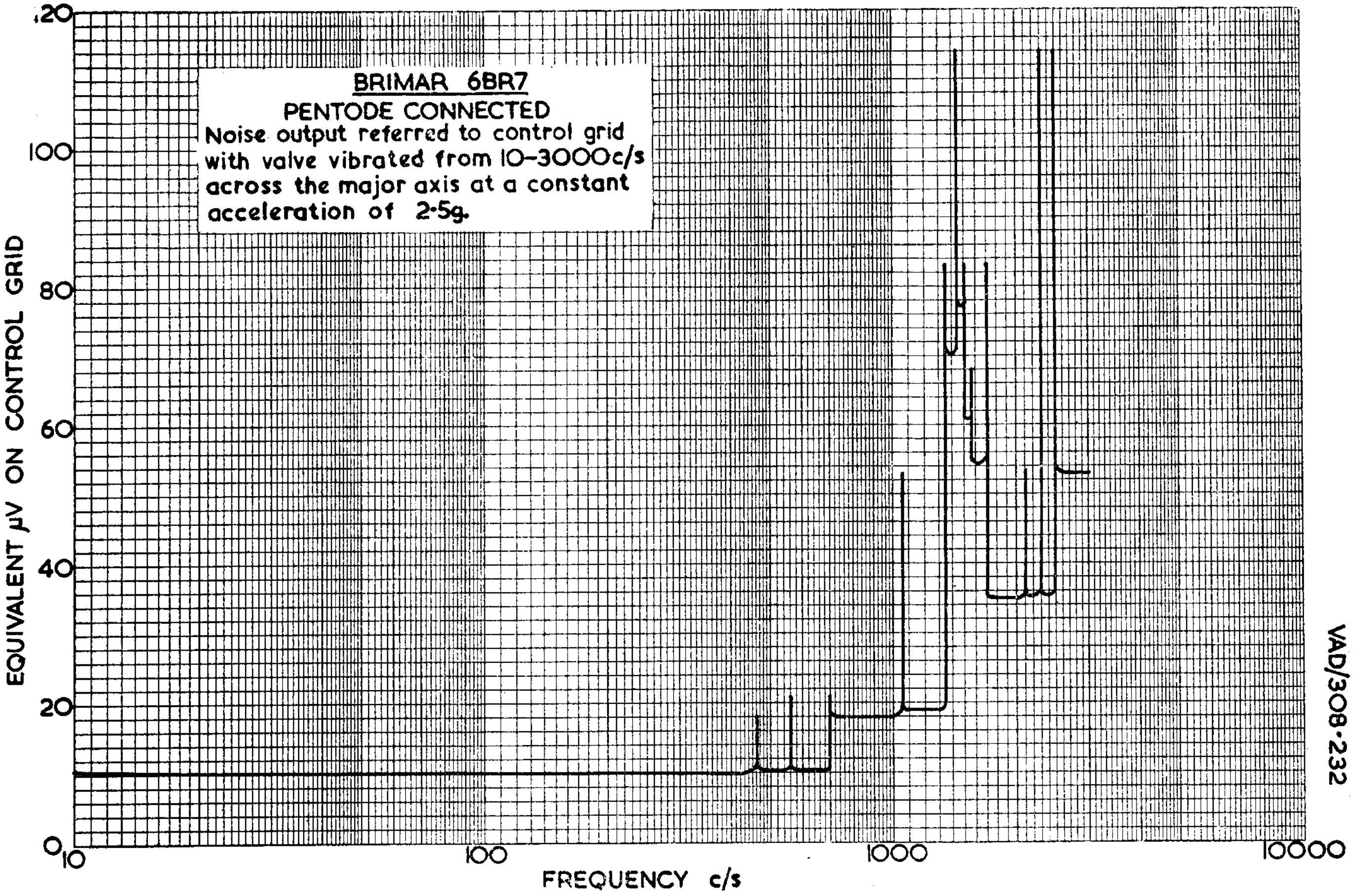
VAD/308·227
BRIMAR 6BR7
PENTODE CONNECTED
DISTRIBUTION OF HUM AS AN R.C.
COUPLED AMPLIFIER.
Control grid resistor Rg1=100kΩ
Cathode by pass condenser=50μF
Bandwidth=340c/s
Hum bucking adjusted for minimum hum.
Ra=220kΩ Rg2=1·5MΩ
Rk=1·5kΩ Va(b)=300V
100
80
60
40
20
0
PERCENTAGE OF VALVES
0
10
20
30
40
MAXIMUM HUM REFERRED TO g1 μVOLTS

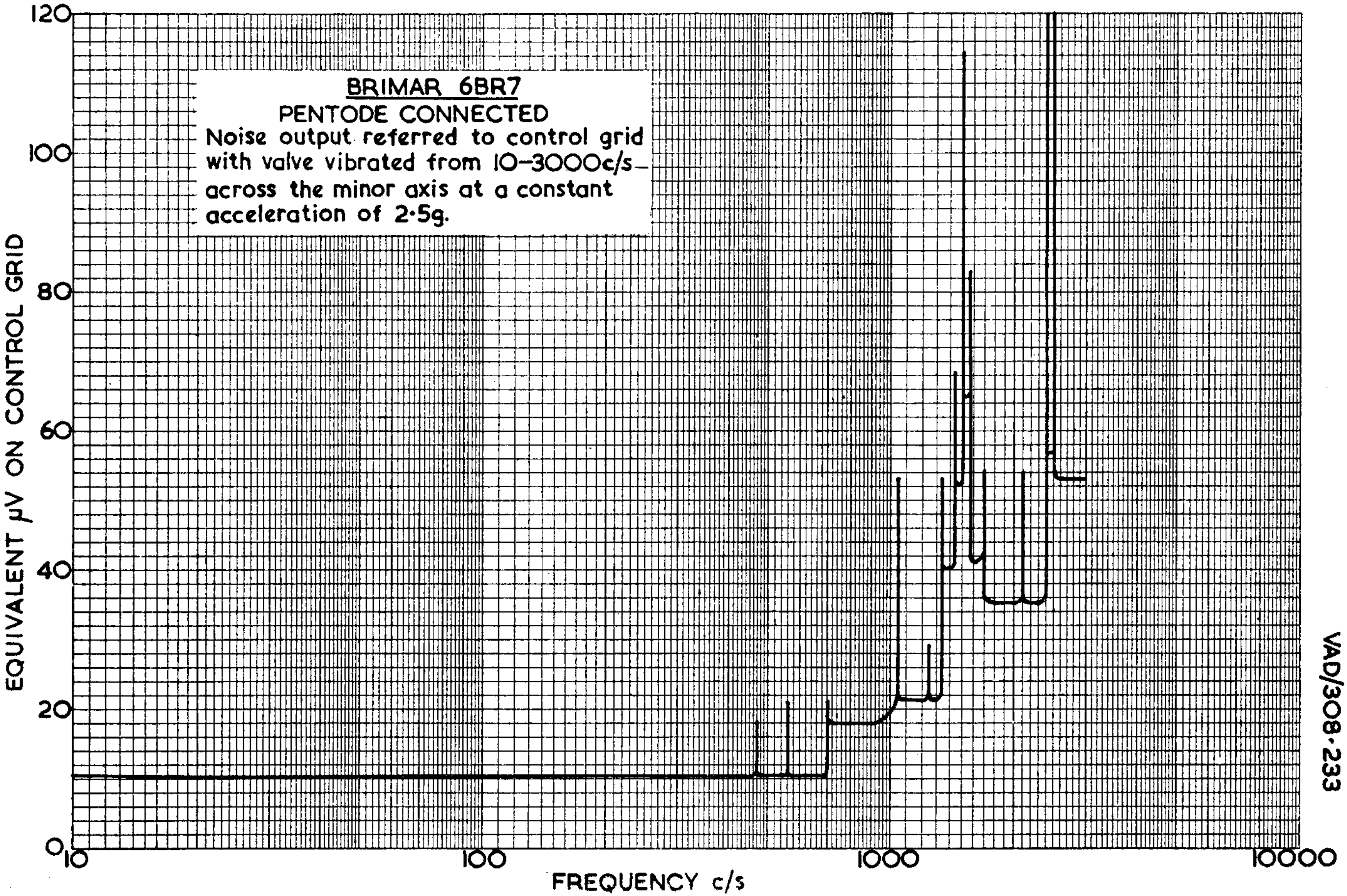

VAD/308-228
BRIMAR 6BR7
TRIODE CONNECTED
DISTRIBUTION OF HISS AS AN R.C. COUPLED AMPLIFIER.
Control grid resistor = 100kΩ
Cathode by-pass condenser = 50μF
Ra = 220kΩ. Rk = 14kΩ
Va(b) = 300V
Bandwidth = 10kc/s
100
80
60
40
20
0
PERCENTAGE OF VALVES
0
2
4
6
8
MAXIMUM HISS VOLTAGE REFERRED TO g1 μV


VAD/308·229
BRIMAR 6BR7
TRIODE CONNECTED
(g2 connected to a)
(g3 connected to k)
DISTRIBUTION OF HUM AS AN R.C. COUPLED AMPLIFIER.
Control grid resistor = 100kΩ
Cathode by-pass condenser = 50μF
Bandwidth = 340c/s
Hum-bucking adjusted for minimum hum
Ra = 220kΩ Rk = 14kΩ
Va(b) = 300V
PERCENTAGE OF VALVES
0
20
40
60
80
100
0
10
20
30
40
MAXIMUM HUM REFERRED TO g1 μVOLTS


VAD/308-230
BRIMAR 6BR7
PENTODE CONNECTED
DISTRIBUTION OF HISS AS AN R.C.
COUPLED AMPLIFIER.
Control grid resistor Rg1=100kΩ
Cathode by pass condenser=50µF
Ra=220kΩ. Rg2=1·5MΩ
Rk= 1·5kΩ Va(b)=300V
Bandwidth 10kc/s
100
80
60
40
20
0
PERCENTAGE OF VALVES
0
2
4
6
8
MAXIMUM HISS VOLTAGE REFERRED TO g1 µV


VAD/308·231
BRIMAR 6BR7
PENTODE CONNECTED
DISTRIBUTION OF HUM AS AN R.C. COUPLED AMPLIFIER.
Control grid resistor R_{g1}=100kΩ
Cathode by-pass condenser=50μF
Bandwidth=340c/s
Heater pin 4 earthed
R_a=220kΩ R_{g2}=1·5MΩ
R_a=1·5kΩ $V_{a(b)}$=300V
100
80
60
40
20
0
PERCENTAGE OF VALVES
0
20
40
60
80
MAXIMUM HUM REFERRED TO g1 μVOLTS


BRIMAR 6BR7
PENTODE CONNECTED
Noise output referred to control grid with valve vibrated from 10-3000c/s across the major axis at a constant acceleration of 2·5g.
120
100
80
60
40
20
0
EQUIVALENT µV ON CONTROL GRID
10
100
1000
10000
FREQUENCY c/s
VAD/308·232


BRIMAR 6BR7
PENTODE CONNECTED
Noise output referred to control grid with valve vibrated from 10–3000c/s— across the minor axis at a constant acceleration of 2·5g.
120
100
80
60
40
20
0
10
100
1000
10000
EQUIVALENT μV ON CONTROL GRID
FREQUENCY c/s
VAD/308·233