RADIOTRONICS

AMALGAMATED WIRELESS VALVE CO. PTY. LTD.

BOX No. 2516BB, G.P.O., SYDNEY

TECHNICAL BULLETIN No. 108 **23rd December, 1940**

In this issue:—

AT the approach of our eighth anniversary and on the eve of the festive period the management and staff of Amalgamated Wireless Valve Coy. Pty. Ltd. are pleased indeed to extend best wishes to all readers of Radiotronics Bulletins.

We trust that the technical standard of our presentations during the past twelve months has been found helpful and that the matter dealt with has in some measure been instrumental in creating fresh incentive to continue research in an art, the successful development of which offers much to modern civilisation.

Let us fervently hope that the New Year will bring with it a cessation of the present turmoil, leading to a lasting peace among nations of the world.

THE CALCULATION OF CATHODE BIAS RESISTORS

The ordinary calculation for cathode bias resistors in which the resistance is found by dividing the specified grid voltage in volts by the specified plate current in amperes is only correct when the plate current under maximum signal conditions is the same as that under no signal conditions. In the case of a single class A_1 power triode this is approximately true and the slight increase of plate current at maximum signal has only a small effect on either the power output or distortion. With an over-biased triode the change of plate current may be considerable and in an extreme case may even make the use of cathode bias impracticable. With a pentode or beam tetrode valve there is also the screen current to be considered, and under maximum signal conditions this tends to rise more rapidly than the plate current. Since the cathode current, which is the current passing through the cathode bias resistor, is the sum of the plate and screen currents, it is necessary to take into consideration the rise

of each of these electrode currents. The problem thus becomes one of determining what value of resistance should be used when the current through the cathode bias resistor (and therefore the voltage drop across it) varies as the strength of signal varies.

The problem is really a complicated one, and the purpose of this article is to assist those who wish to tackle the matter from fundamental lines. Before, however, proceeding with this in detail it might be helpful for those who are not mathematically inclined to give a general description of the principles involved.

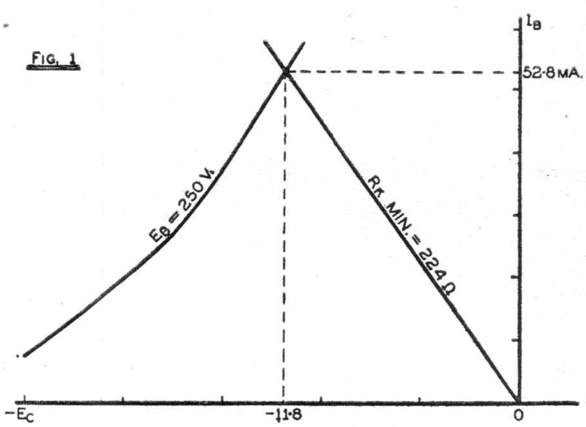
If the cathode bias resistor is calculated from the total cathode current at no signal, the bias at maximum signal will be greater than the optimum and the maximum power output, in general will be decreased. If, on the other hand, the cathode bias resistor is calculated so as to give the correct bias at maximum signal, the bias at no signal may be so low as to cause excessive dissipation at either the screen or the plate with deleterious results to the valve. The problem is also complicated by the fact that commercial values of resistors do not always suit the resistance values specified in the valve data sheets. It therefore becomes a matter of selecting the nearest resistance. The safest course, if no calculations are undertaken to make an accurate check, is to use a resistance on the high side. This means that the valve will be protected from damage although the maximum power output may be slightly decreased. This, we believe, is the usual practice at the present time.

Receiver manufacturers producing large numbers of receivers of a particular type may find it worth their while to use the exact optimum value of resistance, even though it may not be a commercial size. For this reason the exact values are given on valve data sheets instead of the nearest commercial resistance values.

Where no values of cathode bias resistance are given in the valve data it may not be safe to use cathode bias, and in fact there are cases where fixed bias only is permitted. In these cases the fluctuation of plate current from no signal to maximum signal is usually considerable, and no value of cathode bias resistance can be used which will give a satisfactory maximum power output and, at the same time, protect the valves from injury under no signal conditions. In most cases typical operating conditions are published both for fixed and cathode bias, as for example in Radiotron loose leaf data sheets for types 6F6, 6F6-G (issued April, 1940) and 6L6, 6L6-G (issued September, 1940). The data sheet for 6V6, 6V6-G has not yet been amended to include the cathode bias resistor, but it may be taken that this can be calculated for class A_1 single valve conditions on the basis of the maximum signal cathode current. This case is considered in further detail below.

Cathode bias has the effect, as compared with fixed bias, of decreasing the difference between the cathode current at maximum signal and that at no signal. This is sometimes of advantage since the drain on the power pack is steadier and the rise of voltage, resulting from a decrease in plate current at no signal, will be less pronounced.

In the foregoing remarks it has been assumed that the cathode current at maximum signal is greater than that at no signal. Although this is normally the case it is not necessarily so and under some conditions of loading, for example with pentodes or beam power tetrodes, it is possible for the plate current at maximum signal to be less than that at no signal. This case has not been described in detail since it is an abnormal condition, and any considerable decrease in cathode current at maximum signal is normally a sign of incorrect operating conditions.



Graphical Method

As a convenient example take type 6V6-G for which the following values have been published in the Data Sheet dated April, 1940:

Plate Dissipation	12 max. watts
Screen Dissipation	2 max. watts
Plate Voltage	250 volts
Screen Voltage	250 volts
Grid Voltage	–12.5 volts
Zero-Sig. Plate Current	45 mA.
Max.-Sig. Plate Current	47 mA.
Zero-Sig. Screen Current	4.5 mA.
Max.-Sig. Screen Current	7 mA.
Load Resistance	5000 ohms
Max.-Sig. Power Output	4.5 watts

First consider the maximum-signal condition. The total cathode current is 47 + 7 = 54 mA., and the grid voltage is –12.5 volts, so that the cathode bias resistor should be 12.5/.054 = 232 ohms. This must now be checked under

(Continued on next page).

THE EFFECT OF A SHIELD CAN ON THE INDUCTANCE OF A COIL.

An approximate formula giving the effect of a shield can on the inductance of a coil is given on page 148 of the Radiotron Designer's Handbook. An even simpler formula has recently been developed by A. G. Bogle*, of the University of Oxford, and is given below as a matter of interest.

Let L = inductance of coil without shield can.

$\triangle L$ = decrease in inductance due to shield can.

l = length of coil.

g = radial gap between coil and screen can = a — b.

a = radius of screen can.

b = radius of coil.

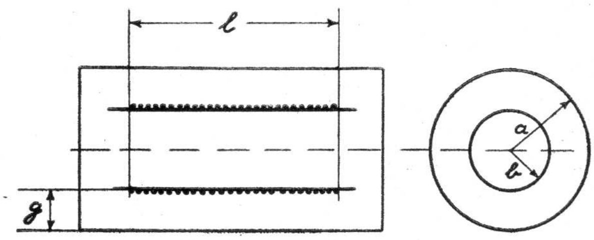
Then
$$\frac{\triangle L}{L} = \frac{l/g}{(l/g) + 1.55} \cdot \frac{b^2}{a^2}.$$

This formula is stated to be accurate within about 2% provided that

1. Both coil and shield can are cylindrical.
2. The gap between the end of the shield can and the coil is not less than the radial gap g.

* A. G. Bogle, "The Effective Inductance and Resistance of Screened Coils", Journal I.E.E. (London), Vol. 87, No. 525, September (1940), pp. 299-316.

It is interesting to note that the gap between the ends of the shield can and the coil has no effect on the inductance provided that it is not less than the radial gap. The formula holds equally for an infinitely long cylindrical tube without ends. A small eccentricity of the coil inside the screen can has only a second-order effect on the inductance.



With a coil and shield can other than cylindrical, the same formula may be used with probably the same order of accuracy if b^2 is taken as the cross-sectional area of the coil and a^2 is the cross-sectional area of the shield box. The same requirement holds regarding the gap between the end of the coil and the shield box being not less than that between the side of the coil and the shield box.

The Calculation of Cathode Bias Resistors

(Continued from preceding page).

zero-signal conditions to see whether it can be permitted or whether a higher resistance must be used.

Under zero-signal conditions it is possible to use the static characteristic curves. Triode plate characteristics for type 6V6-G have been published (Radiotron 6V6-G Data Sheets, Sheet 4, reverse side). These are not in a form in which they can be used accurately, and it is desirable to derive from them the triode mutual characteristic shown in Figure 1 for a plate voltage of 250 volts.

At a bias of –12.5 volts the plate current is stated as 45 mA. and the plate dissipation is therefore 250 x .045 = 11.25 watts, the maximum rating being 12 watts. Similarly at a bias of –12.5 volts the screen current is stated as 4.5 mA. and the screen dissipation is therefore 250 x .0045 = 1.125 watts, the maximum rating being 2 watts. If the bias is decreased gradually it is evident that both plate and screen dissipations will increase, but the plate dissipation will reach its maximum rating (12 watts) earlier than the screen will reach its maximum. At this point the screen dissipation will be approximately increased in the same proportion as the plate dissipation, that is it will be 1.125 x 12/11.25 = 1.2 watts.

The total dissipation at this point is thus 12 + 1.2 = 13.2 watts which is equivalent to a cathode current of 13.2/250 = .0528 ampere or 52.8 mA. This is then the maximum cathode current which can be permitted, and is therefore clearly marked on Figure 1. As shown by Figure 1 this is equivalent to a bias of –11.8 volts and a cathode resistor (R_K min.) of 11.8/.0528 = 224 ohms.

The conclusion reached from this rather involved manipulation is that the cathode bias resistor must have a resistance not less than 224 ohms. Now it was previously calculated that a cathode bias resistor of 232 ohms was desirable for maximum power output and since this is greater than 224 ohms it can be used without the maximum ratings being exceeded at zero-signal.

A similar procedure may be adopted for the remaining two sets of typical operating conditions and the final result will be as set out in the following table:—

Plate Voltage	180	250	315 volts
Screen Voltage	180	250	225 volts
Peak A-F Grid Voltage	8.5	12.5	13 volts
Cathode Resistor ..	250	232	317 ohms

RADIOTRON A-F POWER AMPLIFIERS

A good selection of A-F power amplifier valves is available in the Australian-made Radiotron range. For ease of reference a table has been prepared showing these valves in order of power output, and grouped as power triodes and beam power tetrodes and pentodes. Each group has been sub-divided into single valve and push-pull operation, while a few cases of parallel and push-pull parallel operation have also been shown.

TYPE	PLATE VOLTS	SCREEN VOLTS	PEAK A-F GRID VOLTS	BIAS RESISTOR OHMS	PLATE CURRENT mA.	SCREEN CURRENT mA.	PLATE LOAD IMP. OHMS	POWER OUTPUT WATTS
POWER TRIODES—Single Valve Class A_1.								
6J7-G*	250	—	8	1230	6.5	—	22,000	0.275
6B8-G*	250	—	20	2500	8	—	20,000	0.35
6F6-G*	250	—	20	650	31	—	4,000	0.8
6V6-G*	250	—	15	400	37.5	—	3,500	1.0
45	250	—	50	1470	34	—	3,900	1.6
6V6-G*	300	—	20	513	39	—	4,800	1.65
45	275	—	56	1550	36	—	4,600	2.0
2 type 45	250	—	50	735	68	—	2,000	3.2
in parallel	275	—	56	775	72	—	2,300	4.0
POWER TRIODES—Push-Pull Class A_1.								
6F6-G*	250	—	40 (g-g)	325	62 (total)	—	8,000 (p-p)	1.6
6V6-G*	250	—	30 ,,	200	75 ,,	—	7,000 ,,	2.0
45	250	—	100 ,,	735	68 ,,	—	7,800 ,,	3.2
6V6-G*	300	—	40 ,,	256	78 ,,	—	9,600 ,,	3.3
45	275	—	112 ,,	775	72 ,,	—	9,200 ,,	4.0
6V6-G*	300	—	50 ,,	†	42 ,,	—	6,000 ,,	4.75
4 type 45	250	—	100 ,,	370	136 ,,	—	3,900 ,,	6.4
push-pull parallel	275	—	112 ,,	390	144 ,,	—	4,600 ,,	8.0
BEAM POWER TETRODES AND PENTODES—Single Valve Class A_1.								
6B8-G	200	100	5.0	970	3.8-4.1	1-1.1	39,000	0.31
6J7-G	250	100	2.5	600	2.8-3.3	0.7-0.9	56,000	0.38
6B8-G‡	250	125	6.25	880	5.3-5.6	1.4-1.5	35,000	0.54
6V6-G	250	100	5	250	17.5-18.4	0.7-1.3	14,000	1.5
6F6-G	250	250	16.5	410	34-35	6.5-9.7	7,000	3.1
6F6-G	285	285	20	440	38-38	7-12	7,000	4.5
6V6-G	250	250	12.5	232	45-47	4.5-7	5,000	4.5
6V6-G	315	225	13	317	34-35	2.2-6	8,500	5.5
BEAM POWER TETRODES AND PENTODES—Push-Pull Class A_1.								
6F6-G	250	250	33 (g-g)	205	68-70 (total)	13-19.4 (total)	14,000 (p-p)	6.2
6F6-G	285	285	40 ,,	220	76-76 ,,	14-24 ,,	14,000 ,,	9.0
6V6-G	250	250	25 ,,	116	90-94 ,,	9-14 ,,	10,000 ,,	9.0
6V6-G	250	250	30 ,,	§	70-79 ,,	5-13 ,,	10,000 ,,	10.0
6F6-G	315	285	58 ,,	320	62-73 ,,	12-18 ,,	10,000 ,,	10.5
6V6-G	315	225	26 ,,	158	68-70 ,,	4.4-12 ,,	17,000 ,,	11.0
PUSH-PULL PARALLEL (4 valves):—								
6V6-G	250	250	25 (g-g)	58	180-188 (total)	18-28 (total)	5,000 (p-p)	18.0
6V6-G	315	225	26 ,,	79	136-140 ,,	8.8-24 ,,	8,500 ,,	22.0

* triode connection.
† fixed bias −25 volts.
§ fixed bias −15 volts.
‡ this condition has been calculated by conversion factors only.

It will be seen that power triodes are available to provide an output from 275 milliwatts to 2.0 watts, while two type 45's in parallel are capable of an output of 4 watts. With push-pull power triodes a maximum power output of 4.75 watts is available while four type 45's in push-pull parallel give 8 watts.

Somewhat higher power output is available from pentodes and beam power tetrodes, and the tabulated list extends from 310 milliwatts to 5.5 watts for single valves, and up to 11 watts with push-pull operation. Push-pull parallel operation with four type 6V6-G valves may be used to give a power output up to 22 watts.

With any parallel arrangement it is advisable to use grid stopper resistances and take all the usual precautions against instability. This is particularly necessary in the case of valves having high transconductance such as type 6V6-G.

The plate currents shown for triode valves are in all cases those for zero signal, and a slight rise is to be expected at maximum signal. In the case of the pentodes and beam power tetrodes the plate and screen currents have been shown with two values in each case, that to the left indicating the no signal condition and that to the right the maximum signal condition.

The grid bias is intended to be obtained from a cathode bias resistor in each case except where otherwise shown. In these latter cases self-bias may not be used for reasons outlined in the article in this issue entitled "The Calculation of Cathode Bias Resistors".

In the case of types 6J7-G and 6B8-G as single valve power pentodes, the load resist-

(Continued on next page).

90 VOLT OPERATION OF 2 VOLT VALVES

The Radiotron 2 volt series of valves may be used with a total plate supply of 90 volts where such is desired on account of economy. In such a case the full voltage would be applied to all plates while the screen voltages and grid bias may be adjusted to suit the requirements of the individual designer.

One possible arrangement is to use –3 volts bias throughout the receiver for converter, I.F., second detector and power pentode using types 1C7-G, 1M5-G, 1K7-G and 1L5-G. This requires the full screen voltage of 90 volts on the 1M5-G which under these conditions will draw a plate current of 1.5 mA. and a screen current of .5 mA. approximately. The converter valve under these conditions may be operated, with suitable care in the design of coils, on the short-wave band and should have a screen voltage of approximately 67.5 volts. This latter voltage may be obtained by means of a dropping resistor which is also common to the screen of the 1K7-G.

An alternative arrangement would be to use zero bias for the converter and I.F. valves with –3 volts for the 1K7-G and 1L5-G. Under these conditions the screen voltage on the converter should be from 45 to 55 volts which may also be used on the 1M5-G. This arrangement appears to be more economical as regards B battery drain on the converter valve, but is not satisfactory in its conventional use below 16 metres on the short-wave band.

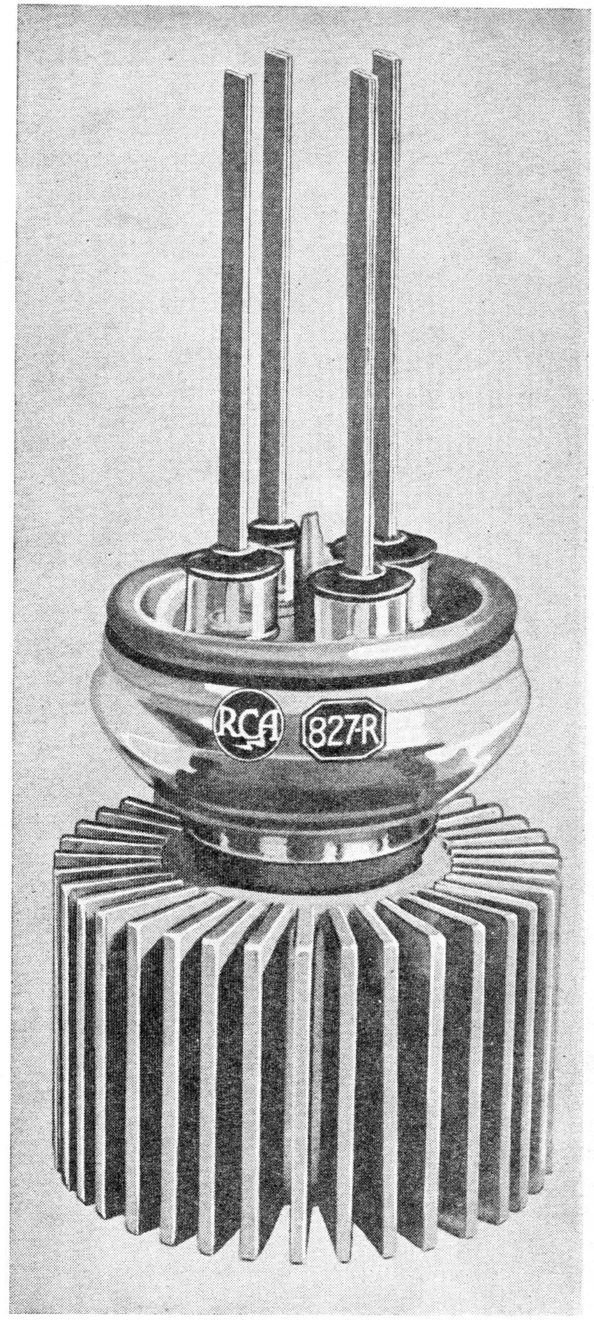
The power output available from type 1L5-G under these conditions is somewhat less than half that with the full 135 volts applied to plate and screen, but may be found quite satisfactory for use with loudspeakers of high sensitivity.

Radiotron A-F Power Amplifiers

(Continued from preceding page).

ance is higher than is normally obtainable in loudspeaker transformers. It is understood that transformers can be wound to order up to a load impedance of 35,000 ohms for a plate current not exceeding about 6mA. In the two cases in which a higher resistance is shown this could be substituted by one of 35,000 ohms with some loss of power output.

This table is not by any means complete and very many more conditions of operation could have been selected. From time to time it is hoped that additional operating conditions will be made available so as to increase flexibility of the Australian-made range.



RADIOTRON 827-R.

Radiotron 827-R was first announced in Radiotronics 106. It is an air-cooled radiator-type transmitting beam power amplifier, having a maximum plate dissipation of 800 watts and suitable for operation at frequencies as high as 110 Mc/s. The above photograph shows clearly the fin-type radiator which is permanently attached to the plate. An air flow of at least 100 cubic feet per minute is required when the valve is operated at maximum plate dissipation and when the ambient temperature does not exceed 45°C. Additional cooling is also required around the grid and filament seals.

OSCILLATOR GRID CURRENTS

In order to obtain the best results from a converter valve the typical operating conditions, as set out in the Radiotron Loose Leaf Data Sheets, should be adhered to as closely as possible. The only one of these values which is likely to prove difficult of attainment in practice is the oscillator grid current which, instead of remaining constant, tends to vary throughout the frequency band. Curves of conversion conductance for types 1A7-GT, 6J8-G and 6K8-G have been published on the data sheets and at a later date it is hoped that similar curves will be published for types 1C7-G and 6A8-G.

As a guide to those who prefer data in tabular form, the table below has been prepared so as to give the more important data regarding oscillator grid current. It should be noted that the values of grid currents which are given are for an average valve, and allowance should be made for normal tolerances in both positive and negative directions.

The recommended value of oscillator grid resistor is 50,000 ohms in all cases except for the 1A7-GT in which it is 200,000 ohms. Unless these values are maintained the values of oscillator grid currents will be meaningless since the effective feature is the voltage on the oscillator grid and not the oscillator grid current. However, since the voltage is difficult to measure and requires the use of a valve voltmeter, it is generally found preferable to measure the oscillator grid current.

For each valve type under the published typical operating conditions there is one value of oscillator grid current at which the gain of the converter is a maximum. In the design of a receiver it is desirable for this optimum value to be approached closely for the more important frequencies.

The fourth column shows the recommended limits of oscillator grid currents for an average valve. In many cases these will be found capable of being maintained, and every effort should be made to keep within these limits. If, however, for one reason or another it is not found practicable to keep within these limits the fifth column shows the extreme limits which should not be exceeded owing to the danger of damaging the valve.

This table should be regarded as being tentative only and subject to revision from time to time as more data becomes available. It should, however, prove a useful guide to coil designers and receiver manufacturers.

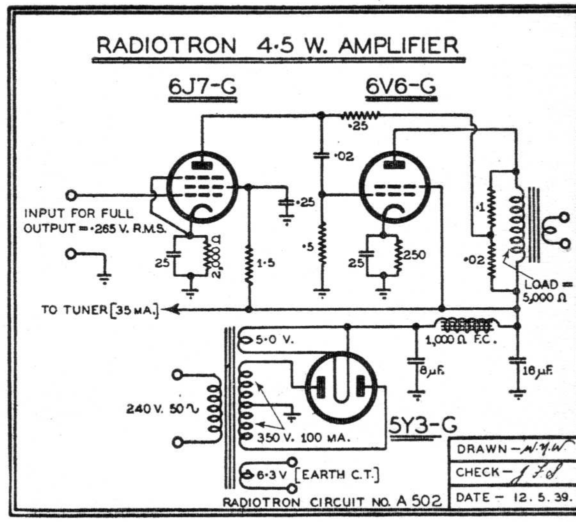
OSCILLATOR GRID CURRENTS OF CONVERTER VALVES

(Tentative Data)

Type.	Oscillator Grid Resistor (ohms).	Oscillator Grid Current (μA.) for Average Valve			Notes.
		For max. gain.	Recommended Limits.	Extreme Limits.	
1A7-GT	200,000	30	20-50	see notes	Cathode current must not exceed 3 mA.
1C6 } 1C7-G	50,000	120	S.W. 60-180 B.C. 90-200	not below 60	Zero bias operation.
1C6 } 1C7-G	50,000	200	——	not below 60	Negative bias operation.
6A7 } 6A8-G	50,000	350	200-500	not below 90	Cathode current must not exceed 14 mA.
6J8-G	50,000	250	150-500	not below 100	
6K8-G	50,000	120	S.W. 100-200 B.C. 100-250	not below 80	

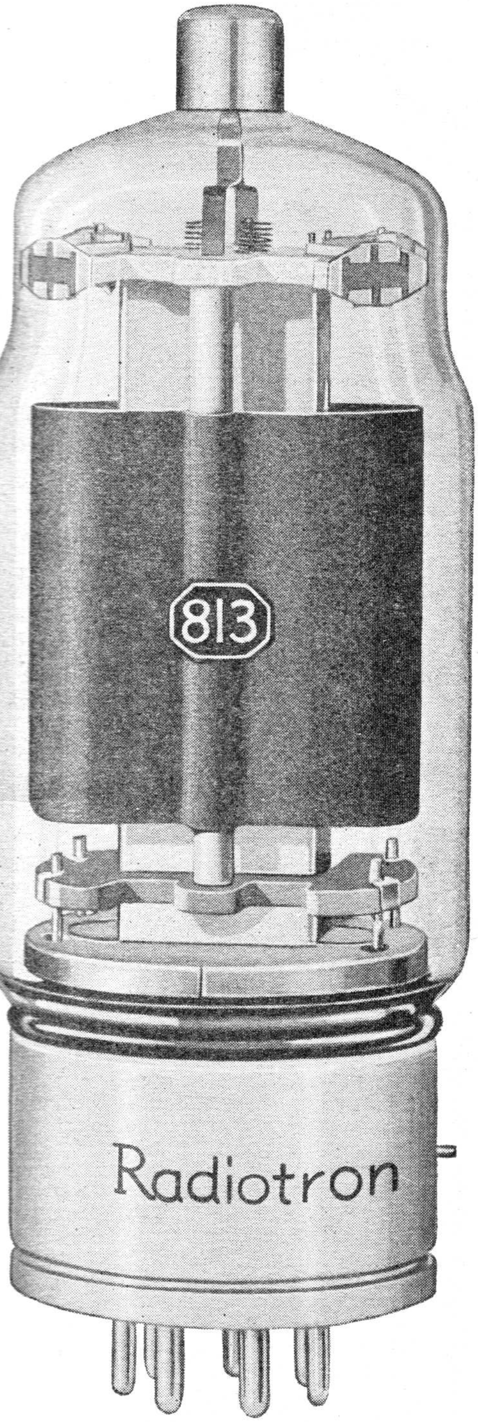
RADIOTRON 4.5 WATT AMPLIFIER

We have frequently received requests for a small, high-quality amplifier suitable for operation from a radio tuner or pickup. With the assistance of a pre-amplifier (to be described next issue) such an amplifier would also be capable of operation from a microphone. There seems to be no doubt that the most suitable valve combination is a 6J7-G resistance coupled pentode exciting a 6V6-G beam power amplifier with negative feedback. A power output



of 4.5 watts with extremely low harmonic distortion and excellent loud-speaker damping is obtainable with Radiotron Circuit A502. The input voltage for maximum power output is 0.265 volt RMS, which is satisfactory for all but a few exceptionally insensitive pickups. In the case of the latter it would be possible to reduce the percentage of negative feedback by decreasing the 0.02 megohm resistor in the voltage divided across the primary of the loudspeaker transformer.

Radiotron 5Y3-G is used as a rectifier and provision is made for 35 mA. for a radio tuner. If this is not required the current should be dissipated in a resistor (7,500 ohms, 10 watts) or other means taken to reduce the supply voltage to 265 volts.



RADIOTRON 813

Radiotron 813 is a beam power transmitting valve of extremely high power sensitivity having a maximum plate dissipation of 100 watts under class C Telegraph conditions. In this service the maximum power output is of the order of 260 watts with a d-c plate voltage of 2,000 volts, a d-c plate current of 180 milliamps and a driving power of 0.5 watt.

For class B telephony the power output is 50 watts, for grid modulated class C telephony 50 watts, and for plate modulated class C telephony 175 watts. The 813 can be operated at maximum ratings at frequencies as high as 30 Mc/s. and at reduced ratings as high as 120 Mc/s. Neutralisation is unnecessary in adequately shielded circuits. More detailed information may be obtained on application.

Type 813 scheduled for local manufacture early in the New Year.

RADIOTRON NEWS

RADIOTRON 1J6-G: A new Data Sheet has been issued giving typical operating conditions particularly suited to Australian conditions.

RADIOTRON 1K5-G: A complete set of curves comprising four Data Sheets have been issued. These curves supersede those originally issued for the old-style equivalent type 1K4.

RADIOTRON 6AD7-G: The voltage ratings of the output pentode section have been increased to correspond to those of type 6F6-G. Plate and screen dissipation ratings remain at 8.5 and 2.7 max. watts respectively.

RADIOTRON 827-R: A photograph of this 800 watt, air-cooled, transmitting beam power amplifier appears elsewhere in this issue.

RADIOTRON 1603: A new Data Sheet has been issued for this type, which is now Australian-made.

The following three new valve types are of English manufacture and a very limited quantity of each has been landed. It is probable that the entire stock will be exhausted by the time this notice is in print, although further shipments may arrive at some later date. These types are intended primarily as replacements for the R.M.A. type numbers which form the second part of the dual designations. In many cases the valves themselves will bear only the first part of the designation, but for ease in reference the whole title will be used.

RADIOTRON KT32/25L6-G: This is a new valve type, of English manufacture, which is a close equivalent of type 25L6-G and may, in most cases, be used as a replacement for the latter.

RADIOTRON KT66/6L6-G: This is a new valve type, of English manufacture, which is a close equivalent of type 6L6-G and may, in most cases, be used as a replacement for the latter. The most obvious difference between the two types is that the heater current of type KT66/6L6-G is 1.27 ampere instead of 0.9 ampere as for type 6L6-G.

RADIOTRON U52/5U4-G: This is a new valve type, of English manufacture, which is a close equivalent of type 5U4-G and may, in most cases, be used as a replacement for the latter.

VALVE DATA SHEETS

Eight Radiotron Loose Leaf Valve Data Sheets are being released concurrently with this issue. These are:—

1J6-G	1 Sheet (data)
1K5-G	Sheets 2, 3, 4 and 5 (curves)
1M5-G	1 Sheet (data)
1603	1 sheet (data)
Conversion factor curves	1 Sheet

Existing sheets for types 1J6-G (August, 1938), 1K4 (November, 1936) and 1C4 (August, 1936) should be removed from the Data Handbook, together with the conversion factor chart dated May, 1935.

RADIOTRON PHOTOTUBE CHART

A new phototube chart is being released concurrently with this issue of Radiotronics. The chart is suitably punched and folded and is intended to be bound in the Radiotronics folder. It gives in concise and convenient form all essential details of the various Radiotron phototubes. More complete data on individual types or general technical information may be had on request to the Unified Sales-Engineering Service.

CORRECTION TO RADIOTRON CHARACTERISTIC CHART

An error occurred in the overall length for types 1K5-G, 1K7-G, 1L5-G, 1M5-G, given among the Supplementary Australian Types on the first tabulated page of the Radiotron Characteristic Chart dated August, 1939.

Type.	Dimensions. as printed	should read
1K5-G	D8	D14
1K7-G	D8	D14
1L5-G	D10	D15
1M5-G	D8	D14

The following should also be added to the Key to Tube Dimensions:—

Symbol.	Length.	Diameter.
D14	$4\frac{29}{32}''$	$1\frac{9}{16}''$
D15	$4\frac{21}{32}''$	$1\frac{13}{16}''$

RADIOTRON VALVE DATA HANDBOOK

A list of contents for the Radiotron Valve Data Handbook was issued concurrently with Radiotronics 106. A number of subscribers have subsequently written in, pointing out the number of early data sheets affected by the instruction "Data sheets which have been issued in the past but which are not shown in this list should be removed from the handbook, since they are now out of date." In view of this, it is felt that the following explanation is warranted.

During 1939 the methods of rating receiving valves were reviewed by the Radio Manufacturers' Association with the object of eliminating certain unsatisfactory aspects, notably:—

(a) The inconclusive nature of the maximum voltage, current or wattage ratings.
(b) The confusion between "Maximum Ratings" and "Typical Operating Conditions".
(c) The lack of provision against overload under conditions of high line voltage, etc.
(d) The unnecessarily severe limitations on certain voltage amplifying valves.

Following the adoption of the new system* all data sheets previously issued became out of date. (Those issued subsequently and in accordance with the new ratings carry a star in one corner to indicate the fact.) In view of this and of the fact that imported valves may now only be used for replacement purposes, it was considered that the expense of issuing a completely new set of sheets would not be warranted. Instead, every effort is being made to give a maximum amount of data for Australian-made receiving valves.

The sale of transmitting valves is, at present, strictly controlled by law, and there is likewise no point in issuing large numbers of data sheets for transmitting valves. Many of the data sheets issued in the past have since been superseded by others giving new data or dual ratings. (See Radiotronics 101, p. 67).

It is suggested that, in order to avoid confusion and obtain the utmost service from the Valve Data Handbook, the sheets be arranged exactly in the order shown in the contents list. If early sheets are retained for reference purposes, they should preferably be kept in a separate binder and clearly marked "Out of Date."

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* See Data Sheet headed "Receiving Valve Ratings According to New RMA System". Also Radiotronics 102, p. 11.

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