RADIOTRONICS

AMALGAMATED WIRELESS VALVE CO. PTY. LTD.

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

TECHNICAL BULLETIN No. 81 **15th NOVEMBER, 1937**

In this issue:—

THE APPLICATION OF RADIOTRON 6V6G

Radiotron 6V6G may be used with only slight circuit modifications in most standard circuit designs. As compared with type 42 or 6F6G, there is an increase of power output from 3 to 4.25 watts and also an additional grid sensitivity which will assist the sensitivity of the receiver or alternatively enable a higher degree of inverse feedback to be applied for the same overall sensitivity. The application to a simple radio receiver circuit is described elsewhere in this issue, but it is also possible to apply the 6V6G in push-pull class AB1. With a plate voltage of 250, a bias of —15 volts and a load resistance of 10,000 ohms plate to plate, an output of 8.5 watts is obtainable. If the plate voltage is increased to 300 volts, the power output rises to 13 watts. It will be seen therefore that the 6V6G opens up interesting possibilities for push-pull amplifiers delivering a reasonably large power output. It is hoped at some later date to publish details of an amplifier arrangement using Radiotron 6V6G valves in push-pull.

A single 6V6G draws a higher plate plus screen current than a single 42 or 6F6G, and for full voltage operation it will be necessary to use a heavier power supply system. If it is desired to use the 6V6G without increasing the size of the transformer, it is possible to operate it at lower plate and screen voltages so that the total power consumption is equal to that of the 42. Under these conditions, the undistorted power output will be very similar to that delivered by a 42, but the voltage will be appreciably lower than 250 volts.

If self-bias is used, the grid circuit may have a resistance not exceeding 0.5 megohm, but with fixed bias the grid circuit resistance should not exceed 50,000 ohms. Unless transformer coupling is used, it will generally be found necessary to use self-bias in order to permit the use of a reasonably high grid circuit resistance. The heater voltage should not fluctuate more than 10% above the rated value under any conditions of operation.

Radiotron 6V6G is particularly adapted to use in automobile receivers where the total current drain from the A battery should be a minimum. The low heater current (0.45A.) and high overall efficiency make it particularly attractive for this application. It is also applicable in the case of battery operated receivers where charging facilities are available or where a local lighting plant is used. If the full output is not required, the 6V6G may be operated from a fairly low plate supply voltage and still deliver a reasonably large output.

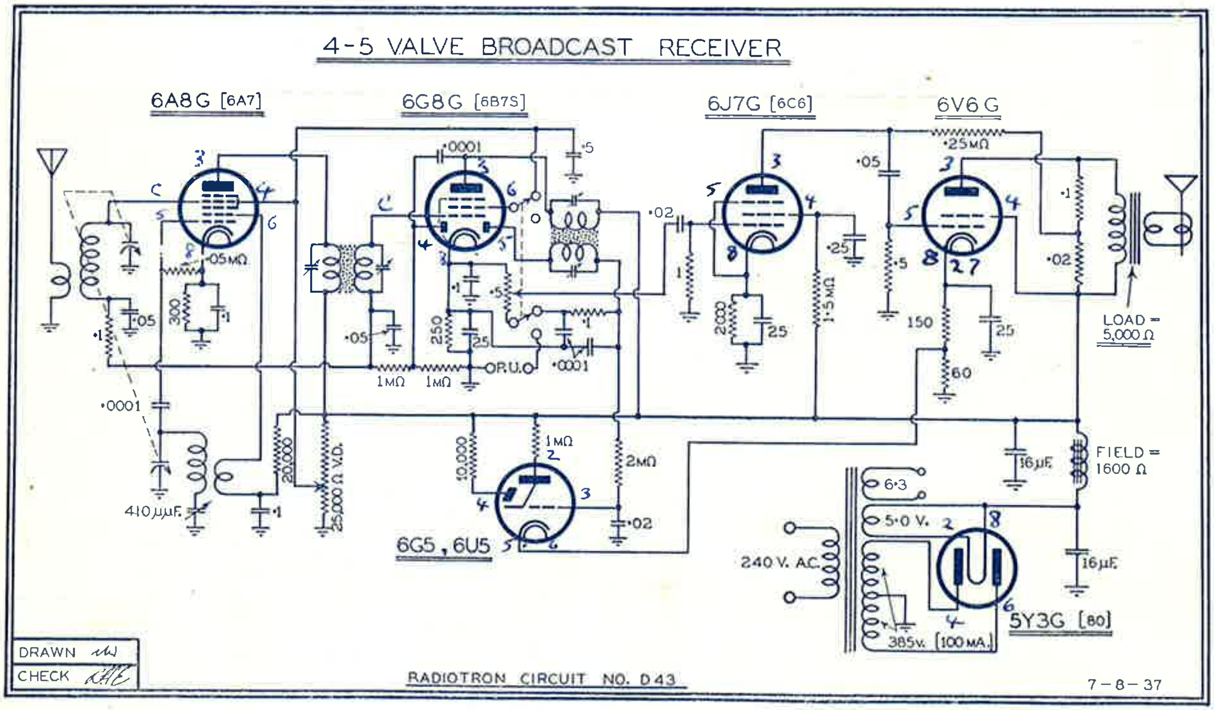
A further valuable application of the 6V6G is in Public Address Amplifiers. A very compact and reasonably portable amplifier may be arranged with a single high gain resistance coupled pentode stage followed by a single 6V6G. If the first stage is a Radiotron 1603, an input of 0.1 volt is sufficient to give the full output of 4.25 watts. Radiotron 1603 is recommended in preference to a 6C6 since it is considerably less microphonic, the two types being identical electrically. If operation from a low level microphone is required a pre-amplifier using another 1603 (operating either as triode or pentode) may be added. The heaters of such an amplifier may be supplied from a 6 volt accumulator, the total heater current being quite small.

5-VALVE A.C. RECEIVER USING RADIOTRON 6V6G

The release of Radiotron 6V6G enables a receiver of good fidelity to be constructed so as to deliver a power output greater than that of the conventional 3-watt receiver. When correctly used, Radiotron 6V6G is capable of a power output of 4.25 watts for a single valve and by the application of series inverse feed-back it is possible to obtain this output with reduced distortion.

Radiotron Circuit D43, as shown below, is in general similar to circuit D42, except that the 42 output stage has been replaced by the new 6V6G. It will also be noticed that the other valves in the set have been specified as being of the G series, although the older glass equivalents are given in brackets for convenience in reference. It is thought that the G series will generally be preferred owing to the standardisation of sockets which they make possible. The valves used in the receiver are 6A8G, 6G8G, 6J7G, 6V6G and 5Y3G. An R.F. stage could be added with advantage, but has not been shown in the circuit diagram in order to retain simplicity. Several points of interest in this circuit will be noted. The fact is particularly stressed that it is preferable to use the 20,000 ohm anode grid dropping resistor for the 6A8G in place of a tapping on the voltage divider, since the dropping resistor gives a self-regulating effect. For a very similar reason, the target voltage applied to the 6G5 or 6U5 Magic Eye is supplied through a 10,000 ohm dropping resistor, which is designed to prevent unduly high current from flowing in this circuit. With an average valve, the voltage on the target is approximately 220 volts, this being chosen in order to provide long life from the Magic Eye and in order to prevent the maximum voltage of 250 volts from being exceeded under any conditions of supply mains fluctuation. The new construction of the 6G5 and 6U5, incorporating the space charge grid in the target section, will give considerably longer life to the Magic Eye and also provide a more uniform target current. Cases of early failures of Magic Eye Tuning Indicators are generally attributable to excessively high target current which, in certain extreme cases, results in the target becoming red hot. The precautions outlined above are designed to eliminate any possibility of such happening.

There is no reason why this circuit should not be used for short-wave reception, although the performance would not be so good as with a receiver having higher overall sensitivity. The circuit is intended as an illustration of one application of the 6V6G, but is not by any means a comprehensive design since the 6V6G may be applied to practically any standard circuit in place of a pentode. The total current drawn by the 6V6G is only about 10 mA. greater than that of the 42.



This circuit provides 10% **effective** inverse feedback. It will be noted that the divider across the load indicates a higher degree of feedback since the shunting effect of the plate

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RADIOTRON BATTERY AMATEUR RECEIVER

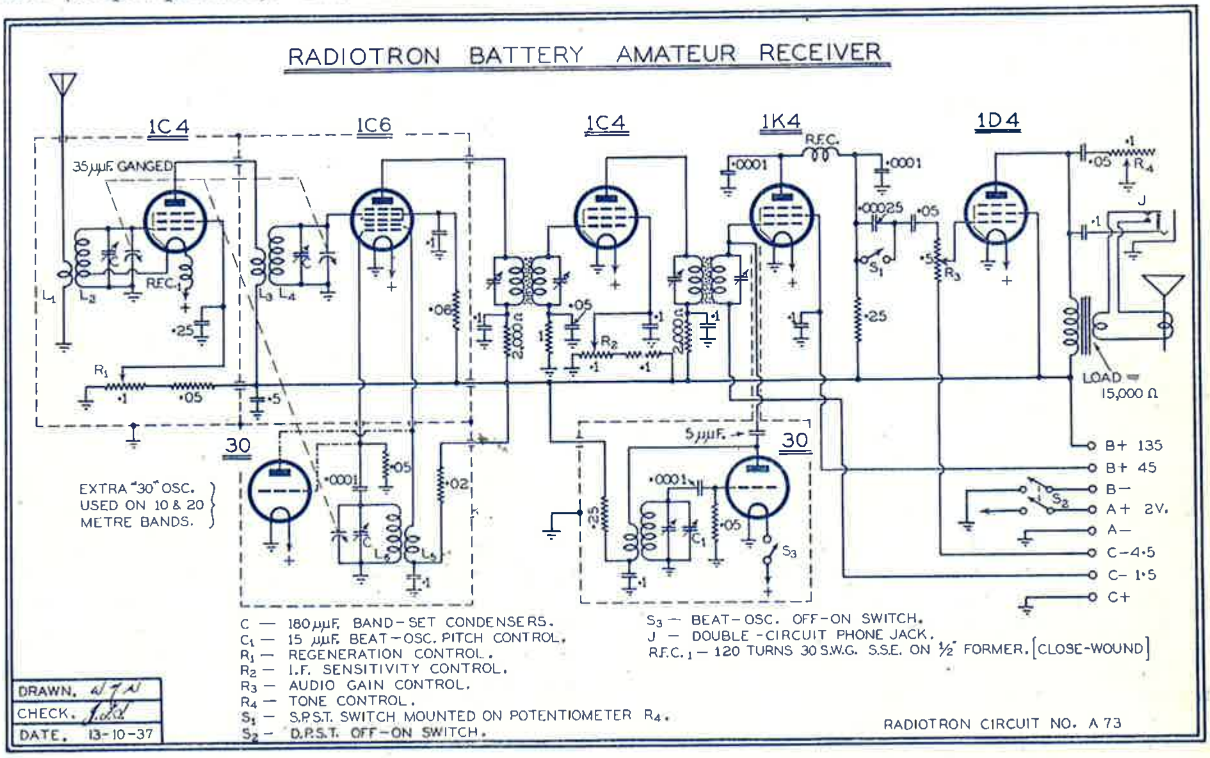
The success following the description of the Radiotron Senior and Junior Amateur Receivers described in Radiotronics 75 has encouraged a version for battery users. The battery circuit here described is similar in many respects to the Junior Amateur Receiver and its performance is so good that the battery user will not find that he is handicapped by lack of a power supply. The circuit incorporates five amplifying valves using types 1C4 (R.F.), 1C6 (converter), 1C4 (I.F.), 1K4 (second detector) and 1D4 (output pentode). Two additional valves are also used, both being type 30, the first being a beat oscillator for CW reception and the second an additional oscillator used on the 10 and 20 metre bands only. These valves may be replaced by the new G series if so desired and the types would then be 1M5G (R.F.), 1C7G (converter), 1M5G (I.F.), 1K5G (second detector), 1L5G (power pentode), 1H4G (beat oscillator) and 1H4G (extra oscillator).

It is rather unusual that a receiver of this kind with a single I.F. stage is capable of giving such high gain, but a closer examination will disclose that precautions have been taken which will give a high overall gain together with extremely sharp selectivity.

The R.F. stage is arranged with filament circuit regeneration, which is controllable by means of a screen potentiometer. A choke is used in one leg of the filament, the other end of the filament being returned to earth through the tapping on the coil. By careful adjustment of this regeneration control, it has been found possible to obtain gains between the aerial and the grid of the 1C6 of 125 times on the 80 metre band, 96 times on the 40 metre band and 80 times on the 20 metre band. It was not found possible to obtain full regeneration on the 10 metre band and the gain from the aerial to the 1C6 grid was consequently considerably lower.

The 1C6 or 1C7G converter is operated under standard conditions, as recommended for short-wave band, but on the 10 and 20 metre bands an additional oscillator (30 or 1H4G) is connected in parallel with the oscillator section. This does not affect the operation of the 1C6 except that it increases the strength of the oscillations in the oscillator section.

Iron core I.F. transformers are used in order to increase the gain and the selectivity. In most conventional broadcast receivers the secondary of the I.F. transformer is seriously loaded by the diode current and the selectivity and gain suffer as a consequence. In this circuit anode bend detection has been used with the result that a high input impedance is obtained in the second detector and the remarkably good selectivity figure (for the I.F. Channel alone) of 29 KC band width at 1,000 times has been obtained in the set. This selectivity is assisted by the very high plate resistance of the 1C4. No. A.V.C. is used in this



circuit, since it would not be practicable to apply this without increasing the damping on the second I.F. transformer, and thereby giving a very much poorer all-round performance. If a second I.F. stage had been used, it would have been possible to apply A.V.C., but this addition was not thought to be justified in view of the very limited use of A.V.C., which in any case would not be used on C.W. An I.F. gain control is used on the screen of the I.F. valve and this should be used intelligently in conjunction with the control on the R.F. and audio stages. In general, it will be found desirable to use the maximum convenient setting on the R.F. stage and to reduce the settings of the I.F. and audio controls except for very weak signals. It will be noticed that de-coupling resistors and condensers are used in the plate supply circuits of the converter and I.F. stages.

The 1K4 or 1K5G second detector operates at a bias of —1.5 volts and a screen voltage of 45. An R.F. choke and suitable R.F. by-pass condensers are used to prevent R.F. getting into the audio amplifier. A very small grid coupling condenser (.00025 μF) is used for the purpose of reducing the bass response to assist in C.W. reception. This is switched in at the bass end of the tone control. A tone control to cut off the higher audio frequencies is also useful in aiding C.W. reception. An audio volume control is arranged in the grid circuit of the 1D4 or 1L5G valve. The loudspeaker should preferably be mounted away from the chassis in order to avoid microphonic effects, which are inclined to be troublesome on the shorter wave-bands. Provision is made for another loud-speaker or a pair of head 'phones to be plugged in if desired.

The beat oscillator is connected to the grid of the second detector through a very small condenser, having a capacitance of 5$\mu\mu$F., which, if not obtainable as a fixed condenser, may be arranged by means of twisted leads. The coils in the beat frequency oscillator may be from a standard 465 KC I.F. transformer. The trimming condenser across the primary should be removed and an additional condenser C1 added in parallel across the secondary. This condenser C1 forms a pitch control and it should therefore be mounted on the panel so as to be readily controllable. A switch is arranged in the filament circuit of the beat oscillator valve so that it may be switched out of service when not required.

Coil data is shown in the table and no further description should be required. The total current drain with gain controls at maximum is:

1C4 R.F.	3.0 mA
1C6 converter	4.8 mA
30 high frequency oscillator	1.0 mA
1C4 I.F.	2.5 mA
1K5 second detector ..	0.2 mA
30 beat frequency oscillator	0.5 mA
1D4 output	7.5 mA
Total	19.5 mA

This current drain will hardly ever be reached in practice, since it only occurs when all volume controls are at maximum and with the additional H.F. oscillator and the beat frequency oscillator both in operation.

The overall sensitivity (absolute measurement) from the aerial terminal is:—

2μV on the 80 metre band.
2.6 μV on the 40 metre band.
3.5 μV on the 20 metre band.
Approximately 50 μV on the 10 metre band.

The equivalent noise-level voltage, that is, the noise voltage which produces in the presence of a 30% modulated signal a noise output equal to the signal output, is approximately 0.7 μV. on all bands. With C.W. reception the equivalent noise-level voltage may be calculated on the basis of 100% modulation, and is therefore $0.3 \times 0.7 = 0.21$ Volt.

Image ratios on the 80, 40, 20 and 10 metre bands are 250, 200, 150 and 30 respectively.

There are no points of difficulty in this circuit and it may be built by anyone reasonably experienced in receiver construction. Two points will be found of special importance,

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Coil Winding Details

	Aerial.			R.F.		Oscillator.	
Band.	L_1	L_2	Tap.	L_3	L_4	L_5	L_6
1	9 (a)	33 (b)	1 (f)	25 (a)	33 (b)	10 (a)	36 (b)
2	5½(a)	15¼(c)	¾(f)	11 (a)	15 (c)	5 (a)	15½(c)
3	2½(a)	5¾(d)	⅝(f)	4½(a)	5½(d)	4 (a)	5 (d)
4	7 (a)	8 (e)	1½(f)	7 (a)	8 (e)	4½(a)	6 (e)

(a) 30 S.W.G. D.S.C. wire, interwound in secondary starting from bottom.
(b) 28 S.W.G. Enam. wire, wound 32 T.P.I. on 1¼" former.
(c) 20 S.W.G. Tinned Copper wire, wound 10 T.P.I. on 1¼" former.
(d) 18 S.W.G Tinned Copper wire, wound 6 T.P.I. on 1¼" former.
(e) 20 S.W.G. Tinned Copper wire, wound 10 T.P.I. on ½" former.
(f) Tap on Secondary, counted from bottom.

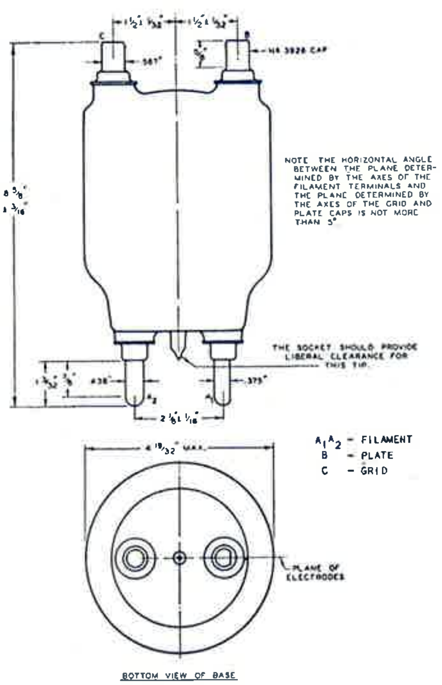
RADIOTRON 833 — NEW HIGH POWER TRIODE

A new Radiotron transmitting valve, type 833, has been released for operation at plate voltages up to 3,000 volts, with a maximum plate input of 1250 watts and maximum plate dissipation 300 watts. The filament draws 10 amperes at 10 volts and the amplification factor is 35. Under typical operating conditions a maximum power output of 1,000 watts is obtainable under class C telegraphy conditions. Maximum input ratings may be used on frequencies as high as 30 megacycles, but excellent results may be obtained at higher frequencies with reduced inputs.

Radiotron 833 is not by any means a conventional type of valve. Since it has been designed for ultra high frequency operation the usual base has been omitted and four connections are brought out by separate seals through the glass envelope. The two filament leads are brought out at one end and the grid and plate connections at the other. It is due to this extremely efficient construction that the resonant frequency of the grid-plate circuit is as high as 200 megacycles, this being remarkable in such a large valve. The valve, including filament pins and grid and plate caps, is $8\frac{5}{8}''$ long by $4\frac{19}{32}''$ maximum diameter.

The interelectrode capacitances are:—Grid to plate 6.3 $\mu\mu$F, grid to filament 12.3 $\mu\mu$F, plate to filament 8.5 $\mu\mu$F.

OUTLINE DRAWING



Radiotron 833.

HIGHER RATINGS FOR RADIOTRON 807

Higher ratings have been announced for a new construction of Radiotron 807, which incorporates improved screening and also enables a higher plate voltage and dissipation to be used. Distinct improvements have been made in the construction of the valve and the plate is supported by ceramic insulators in order to withstand the higher plate voltages. The screening has been improved in order to reduce the tendency towards self-oscillation when used as a buffer.

The new ratings show the interelectrode capacitances to be 0.2$\mu\mu$F. maximum grid to plate (with external shielding), 11$\mu\mu$F. input capacitance, 7$\mu\mu$F output capacitance. The maximum voltage has been increased from 400 to 600 volts, the maximum input to 60 watts, the maximum plate dissipation to 25 watts. On maximum voltage the following outputs are obtainable under typical operating conditions:—Class AB2 push-pull audio amplifier 80 watts (2 valves); class B linear amplifier 12.5 watts; plate modulated class C telephony amplifier 24 watts and class C telegraphy amplifier or oscillator 37.5 watts. When used under plate modulated conditions, the maximum plate voltage is 475 volts, maximum screen voltage 300 volts, maximum plate input 40 watts and maximum plate dissipation 16.5 watts. The screen maximum input and dissipation remain as previously. The Australian price of the valve having the new construction remains unchanged at £2 nett.

RADIOTRON BATTERY AMATEUR RECEIVER

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these being firstly the mechanical strength and rigidity of the chassis and all components and secondly the layout with respect to length of wiring and the position of components with respect to one another. Attention paid to these two points will insure excellent results.

The method of adjusting the band-set condensers on the ten-metre band, where there is a tendency to interlocking in the converter stage, is as follows:—Adjust the setting of the oscillator band-set condenser by tuning a "marker" station to approximately the desired point on the tuning dial. Then adjust the R.F. band-set condenser. This will often result in slight detuning of the signal, in which case the R.F. band-set condenser should be re-adjusted to peak the noise level. The "marker" station may then be correctly retuned with the main tuning gang, and tracking will be satisfactory over the band.

DESIGN OF A.V.C. FILTER CIRCUITS

Although many of the A.V.C. filter circuits used in present day receivers appear to be giving satisfactory results, little attention seems to have been directed towards their design. Some more important of the numerous factors which govern the design of such filters will be considered in this article.

The purpose of an A.V.C. filter is to smooth out the audio frequency components from the A.V.C. diode voltage and to provide an effective R.F. short circuit from the controlled grid returns to earth, while maintaining their mean potentials at the controlling (negative) voltage. Fig. 1 shows an outline circuit of a network of resistances and capacitances which tends to fulfil the requirements.

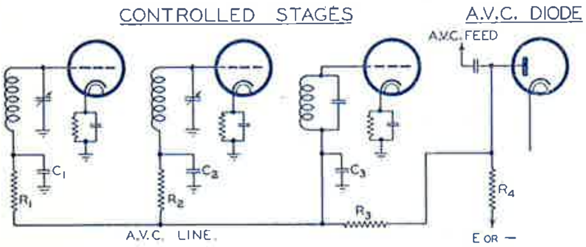

FIG. 1.

When the signal intensity increases, the D.C. component of the voltage across the load resistor R_4 becomes greater, and a current flows through the main filter resistor R_3 until the condensers have acquired voltages equal to that across R_4. When an EMF is applied to a condenser through a resistance, it is a well known physical fact that it will *never* become charged to the value of the applied EMF, for as the charge builds up, the potential difference across the resistance is reduced, and the charging current becomes less and less, so decreasing the charging rate. It is obvious that where either the capacitance or the resistance is small, the time taken for the condenser to acquire any specified potential will be less. The product of capacitance and resistance in a simple filter is known as the time constant, and it is the time taken for the potential across the condenser to become equal to $E(1 - 1/\varepsilon)$ where E is the applied EMF and ε is the base of Naperian logarithms (2.718).

When an A.V.C. system must compensate for rapid fading the time constant should be as small as possible. A limit is set, however, by the modulation which is itself extremely rapid periodic fading. It is found that attenuation of 3 dB occurs when the frequency of modulation is reduced to $1/(2\pi RC)$ where RC is the time constant of the circuit.

Two practical factors tend to set limits for the values of resistances R_1 R_2 R_3 R_4. As they are connected between grid and ground, any grid emission tends to produce a positive grid bias, and the cathode may be damaged. **It is recommended that the maximum resistance used in the grid circuit of an R.F. converter or I.F. stage be 3 megohms, and 2.5 and 2 megohms may be used with safety for two and three stages respectively.** These values hold only for stages controlled by A.V.C. The lower limit of resistance is set by loading of the last I.F. stage by the A.V.C. system, as was pointed out in Radiotronics 77, Page 50.

By making the A.V.C. diode load somewhat greater than the filter resistance, the damping effect on the last I.F. stage may be reduced on strong signals. The effective shunting resistance is found to be least for a given total resistance when $R_3 = R_t(\sqrt{3} - 1)/2 = 0{\cdot}366\,R_t$, where $R_t = R_3 + R_4$. If $R_t = 2$ megohms, R_3 and R_4 may be 0·75 and 1·25 megohms, respectively.

In most cases the R.F. coupling between controlled valves may be reduced practically to zero by making R_1 and R_2 about 0.1 megohm each.

The condensers C_1 and C_2 are seen to be in series with the main tuning condensers, and tend to reduce the frequency coverage of the receiver. A lower limit is thereby set for their capacitances.

When R_1 and R_2 are smaller than R_3, the time constant for the circuit may be taken as approximately $(C_1 + C_2 + C_3)\,[R_3 + 1/(1/R_1 + 1/R_2)]$.

If the lowest useful frequency of modulation is 20 ∿, the required time constant is $1/(2 \times \pi \times 20) = 8 \times 10^{-3}$ second. Taking this time constant it is then necessary to find the values of $C_1C_2C_3$. Let $R_1 = R_2 = 0{\cdot}1$ megohm and $R_3 = 0{\cdot}75$ megohm. Then the time constant which has already been fixed as 8×10^{-3} second must be equal to

$$(C_1 + C_2 + C_3)\quad[R_3 + 1/(1/R_1 + 1/R_2)],$$

i.e., $(C_1 + C_2 + C_3)\,[0{\cdot}75 + 1/(1/0{\cdot}1 + 1/0{\cdot}1)] = 8 \times 10^{-3}$,

i.e., $C_1 + C_2 + C_3 = (8 \times 10^{-3})/0{\cdot}8 = {\cdot}01\ \mu F$ working throughout in megohms and microfarads.

Unfortunately, such a value might restrict seriously the band coverage of the receiver, so that values up to 0.1 μF are used generally for C_1 and C_2. The I.F. bypass could with advantage, however, be smaller, and the time constant of the complete network may be reduced somewhat by using .005 μF for C_3. At 465 K.C. the reactance of a .005 μF condenser is less than 70 ohms, and no loss of gain should result from its use, for the dynamic impedance of the I.F. transformer secondary is usually greater than 0.25 megohm.

It may be understood now that where rapid fading may occur, as on short waves, it is sometimes better to restrict the coverage of the wave bands, using more than one short wave band, and to use mica-dielectric A.V.C. bypass

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SERIES INVERSE FEEDBACK

Why a Pentode First Audio Stage is Necessary

It has been pointed out in Radiotronics 78, Page 58, that a triode audio amplifier, such as type 75 or 76, is not suitable for exciting the grid of an output stage, such as a 42, when using series inverse feedback.

A careful examination of Radiotron Circuit D43 given in this issue should provide the explanation. The 0.25 megohm plate load resistor of the 6J7G is connected to a point which, in addition to carrying a steady D.C. voltage, also carries a fraction of the audio voltage on the plate of the 6V6G. This end of the 6J7G plate load resistor is therefore in phase with the plate of the 6V6G and out of phase with the grid of the 6V6G. The other end of this plate load resistor, which is connected to the plate of the 6J7G and the grid of 6V6G, is therefore out of phase with the first end.

Thus, there is a see-saw voltage effect along the plate load resistor, and its effective loading resistance on the 6J7G plate is much less than 0.25 megohm, being more nearly 0.1 megohm through most of the cycle. In a pentode valve the gain is almost directly proportional to the load resistance, and the gain is therefore reduced by the reduction of the effective load. This reduction of gain is necessary in order to obtain degeneration and the advantages of inverse feedback.

If, however, a triode, such as a 75, is substituted for the 6C6, then until the effective load is made less than the plate resistance of the valve, the feedback is practically worthless, as so little gain reduction is possible. Moreover, when the load resistance becomes less than the plate resistance, all triodes tend to distort rather badly.

On the other hand, the usual working load for the pentode is many times less than its plate resistance, and its load may be reduced still further without incurring serious distortion.

An additional factor which must also be considered is that the voltage which is fed back to the grid of the power valve is not equal to the full voltage at the point to which the plate resistor of the audio valve is connected. This is due to the shunting effect of the grid resistor and of the plate resistance of the audio stage.

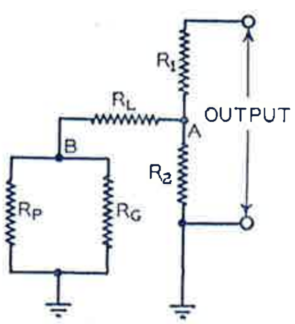

Fig. 2

An examination of figure 2 which is the equivalent circuit for series inverse feed-back arrangement such as in Radiotron Circuits D42 or D43, will show how this effect may be calculated. The resistances R_1 and R_2 are connected across the output load of the power valve and R_L represents the load resistance of the audio valve. R_G is the grid resistor and R_P the plate resistance of the audio valve.

It is evident that at the point A the audio voltage will be—

$$\frac{R_2}{R_1 + R_2}$$

of the output voltage.

This voltage is fed back through the load resistance R_L to the point B corresponding to the grid of the final stage. It will be seen however that the fed-back audio voltage at the point B is shunted by the grid resistor R_G and the plate resistance R_P of the preceding valve. These two resistances in parallel are equivalent to—

$$\frac{R_P \cdot R_G}{R_P + R_G}$$ which may be called R_S.

Allowing for this shunting effect, the effective fed-back voltage at the point B is—

$$\frac{R_S}{R_S + R_L}$$

of the voltage at the point A.

Taking typical values of R_P, R_G and R_L as used in Radiotron Circuit D43 we have—

$R_P = 4$ megohms,
$R_G = 0{\cdot}5$ megohm,
$R_L = 0{\cdot}25$ megohm.

R_S is therefore equal to—

$$\frac{4 \times 0{\cdot}5}{4 + 0{\cdot}5} = 0{\cdot}445 \text{ megohm.}$$

The fed-back voltage at point B is therefore—

$$\frac{0{\cdot}445}{0{\cdot}445 + 0{\cdot}25} = 0{\cdot}64$$

of the voltage at point A.

It is evident that in this particular case only 0.64 of the voltage fed back from point A is effective at the grid of the final stage. In the D42 circuit, in which the grid resistor is 1 megohm, this factor is increased to 0.76 and the percentage of feedback is

$$0{\cdot}76 \times \left(\frac{11{,}000}{100{,}000 + 11{,}000}\right) = 7{\cdot}5\%$$

In the D43 Circuit the percentage of feed-back is

$$0{\cdot}64 \times \left(\frac{20{,}000}{100{,}000 + 20{,}000}\right) = 10{\cdot}7\%.$$

In the general case the percentage of feedback is—

$$\frac{R_2}{R_1 + R_2} \times \left(\frac{R_S}{R_S + R_L}\right) \times 100$$

where $R_S = \dfrac{R_P \cdot R_G}{R_P + R_G}$

RADIOTRON G SERIES

An announcement which will be of interest to all has recently been made by Amalgamated Wireless Valve Co. Pty. Ltd., in the release of a complete G series of octal based glass valves of which a number will be of Australian manufacture. Price revisions have made this G series very attractive, and it is anticipated that they will be very widely used during the coming season.

The complete range is given in a separate leaflet. Those types marked with an asterisk are the initial releases of Australian manufacture, the number of which is to be increased within the next few months. The Australian made types 1C4, 1D4, 1K4, 1K6 and 6B7S are represented in the new series by types 1M5G, 1L5G, 1K5G, 1K7G and 6G8G. Type 1M5G is not identical to the 1C4, since it incorporates a number of improvements, including a higher plate resistance, a higher amplification factor and a better A.V.C. characteristic. The remaining types are identical in every respect to the equivalent glass types. All these new types incorporate the latest improvements in valve manufacturing technique.

Two lesser known types have also been included; the 6B6G, which is an exact equivalent of the 75, and the 6U7G, which is an exact equivalent of the 6D6.

RADIOTRON CHARACTERISTIC CHART

It is expected that copies of the new Radiotron Characteristic Chart will be available almost immediately and copies may be obtained by sending in the card enclosed with this issue complete with name and address and 3d. in stamps to cover cost of handling and mailing. This new Chart is on an altogether new principle and will be found to be invaluable to all users of Radiotron valves. A complete series of G types is included in the new Chart.

This Chart measures 23" x 18" and incorporates four sheets, the first being of selected equipment types complete with all operating conditions, the second and third forming a summary of all types and the fourth a complete socket reference chart. The Chart is arranged to be a convenient size for mounting on the wall or for using on the desk.

REDUCTION IN PRICE

Radiotron 6G5

A reduction in price of the Radiotron 6G5 Magic Eye Tuning Indicator has recently been announced. The new price of this type is 12/6. This reduced price should tend further to extend the application of these useful devices which have already become a standard fitting in many radio receivers. Further uses of these types are being discovered from month to month and they find a place not only in radio receivers but also on many a work bench.

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resistance of the audio valve and the grid resistor of the power valve together decrease the amount of inverse feedback as described elsewhere in this issue.

This circuit as it stands is intended primarily for local station reception, although the sensitivity it sufficiently high to give reasonable interstate reception under normal conditions. If high sensitivity is required, it is recommended that an R.F. stage or, alternatively, an additional I.F. stage using type 6U7G be added. The amplifier section on its own is capable of excellent performance in applications where an output of the order of four or five watts is required.

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condensers of about .004 μF. In some cases, they may be used as padding capacitances to track the circuits of a receiver. The oscillator would then be operated at a frequency *below* the signal circuits and the return lead of the oscillator grid coil would be earthed.

In this table the resistances of R_t, R_3 and R_4 are given in megohms in the commercial sizes nearest to the optimum.

No. of Valves	1	2	3
R_t	3.0	2.5	2.0
R_3	1.0	1.0	0.75
R_4	2.0	1.5	1.25