

Fig. 8

PHILIPS

SERVICE NOTES

for the amplifier

AG 9008*With the Compliments of...***RADIO WHOLESALERS LTD.**

P.O. Box 527

INVERCARGILL

1956

For A.C. mains supply

Controls

From left to right:

1. Mains switch.
2. Bass control.
3. Volume control.
4. Treble control.
5. Selector switch (
 - a. tuner
 - b. R.I.A.A.
 - c. F.F.R.R.
 - d. H.M.V. (old)

At the rear of the apparatus is a pick-up switch (SK4).

Upper position : Magneto-dynamic pick-upLower position : Crystal pick-upConsumption and mains voltages

92 Watt at 220 V (50 ~).

110-127-145-165-220-245 V.

Hum level

-60 dB with respect to 6 W + 6 W output.

Fuses

Z2, Z3 = 500 mA

Z4, Z5 = 10 A

Z6 = 160 mA

Power outputMeasured across a load resistance of 800+800 Ω .Bass channel6 Watts at 6% distortion
(frequency = 90 c/s)Treble channel6 Watts at 6% distortion
(frequency = 4000 c/s)Valves

B1 : ECC83

B2 : PCL82

B3 : EL86

B4 : EL86

B5 : EL86

B6 : EL86

Record corrections.

Records do not have a linear frequency response curve. Various recording characteristics are used.

The most important ones have been represented in fig.1. If one wishes to have quality reproduction, it will be necessary to correct these characteristics when playing back.

When the pick-up follows the recording characteristic (e.g. the magneto-dynamic pick-up) the play-back correction should be the mirror image of the recording characteristic (see fig.2) so that the overall characteristic becomes straight.

Of course this only holds good when the remainder of the play back equipment has a straight characteristic.

Characteristic 1 in fig.1 is the R.I.A.A. recording curve;
the new Philips long play records are recorded according to this curve.

Characteristic 2 is the F.F.R.R. curve of Decca

Characteristic 3 is the old H.M.V. recording curve, the new H.M.V. records are recorded according to the New Orthophonic characteristic which is identical to the R.I.A.A. curve.

The old long play records are all recorded according to different characteristics, these curves are mainly equal to the R.I.A.A. curve (except H.M.V.). In these cases the compensation switch can therefore be adjusted to the R.I.A.A. curve and reset as the case may be with the tone controls.

A few details about the circuit diagram.

The AG 9008 is a quality amplifier which amongst other things is suitable for the connection of a

1. crystal or magneto-dynamic pick-up
2. tuner or magnetophone.

The amplifier is equipped with a continuously variable bass and treble control. Further a switch (SK3) is incorporated, with which adaptation can be obtained to 3 recording characteristics, viz.: R.I.A.A., F.F.R.R. and H.M.V. (old).

The amplifier is designed according to the bi-amplifier principle.

The double output stage is realised here with the so-called "single ended push-pull output stage" with the valves (2x EL86) for each channel.

The pre-amplifier which drives both output stages via the cross-over filter, has been built-up around the valve PCL82.

Both the bass and treble controls have been incorporated in this circuit.

The cross-over filter has its cross-over point at 450 c/s. By cross-over point is understood that frequency whereby equal power is developed in each channel.

The input of the control stage for the output valves is formed by a volume control of 500 k Ω with 2 taps (R48-R48a-R48b).

With low positions of the volume control the high notes as well as the low notes are reinforced a little, so that a better matching to the auditory organs is obtained.

This is because with small intensities of sound, our ears perceive tones in the middle range more easily than bass or treble notes.

The input of the volume control is switched by the correction switch (SK3) either to the tuner input or via a few simple filters to the output of the pick-up correcting pre-amplifier with valve ECC83. These filters which consist of a few R.C. elements give a matching to the above mentioned recording characteristics which differ a few dB's from each other.

The correcting pre-amplifier with valve B1 (ECC83) is switchable for magneto-dynamic or crystal pick-up (with a half-moon switch at the rear side of the chassis).

The switch has been dimensioned in such a way that the output voltage is the same for both pick-up types.

The correction for the output voltage of the pick-up as a function of the frequency is such that for the various recording characteristics only a certain attenuation of definite frequency ranges is necessary via the above mentioned filters, in other words, in the circuit around B1 and B1' the maximum required bass and treble of all recording characteristics together is corrected.

Via the filters which are controlled by SK3, a matching is obtained to the 3 characteristics.

Hum and rattle.

As selenium cells are used in the rectifying circuit, which as is known, have a very low internal resistance, strong current pulses arise in the supply transformer. These current pulses can be found again as small voltage pulses in the heater voltage.

Pin 5 of the ECC83 transfers these pulses to pin 7 (grid B1') via the valve holder capacity, so that a rattle is audible in the treble channel. By coupling the pulse of pin 4 (being in phase opposition) to the pulse of pin 7, via the wiring capacity, this rattle can be removed entirely. This can be done as follows (if rattle causes trouble).

The filament lead of pin 4 is bent a little towards pin 7, or it is pushed a little away from same, so that the rattle becomes nil.

The selecting switch.

Position	
1	Tuner
2	R.I.A.A.
3	F.F.R.R.
4	H.M.V. (old)

Position 1 : Tuner.

In this position the tuner input is connected via C15 (22K) to the top of the volume control. C15 is intended for blocking a possible D.C. voltage in the input signal. This is because with a tuner often a cathode follower circuit is used and this has a leakage current of a few μ A.

The output of the pre-amplifier (ECC83) is shortcircuited across R51, C46 and C27 because the point of junction R51, C46, C27 is put to earth via SK3. This is not a 100% shortcircuit, but this is done, because otherwise B1 and B1' could start oscillating at a very low frequency (3-8 c/s). This is a result of the interconnected cathodes of B1 and B1'.

Position 2 : R.I.A.A. (see fig.3).

In this position the pick-up pre-amplifier unit is connected via C46, R51 to the top of the volume control.

C46 and R51 are intended for matching the output voltage of the pre-amplifier to the R.I.A.A. curve. The input of the tuner has been earthed in this position of SK3.

Position 3 : F.F.R.R. (see fig.4).

Now C27 is connected in series with C46, R51 and at the same time C38 is connected in parallel with C46, R51.

C27 gives an attenuation of the bass range, C38 gives a reinforcement of the treble range.

So F.F.R.R. gives a little more treble and less bass than R.I.A.A. The input of the tuner is shortcircuited via C15 in this position.

Position 4 : H.M.V. (old) (see fig.5).

C27 is shortcircuited, so that the low notes are less attenuated; at the same time C38 is switched off and in place of it C48 is connected in parallel with C46, R51. This gives a reinforcement of the treble range.

The tuner input is again connected to earth via C15.

Bass-control.

Part of the anode A.C. voltage of B2' is taken from R28 and applied to the grid via C22, C20 and R47.

C22 and C20 have a low impedance for high frequencies, so that the negative feedback for the high frequencies is independent of the position of the sliding contact of R47.

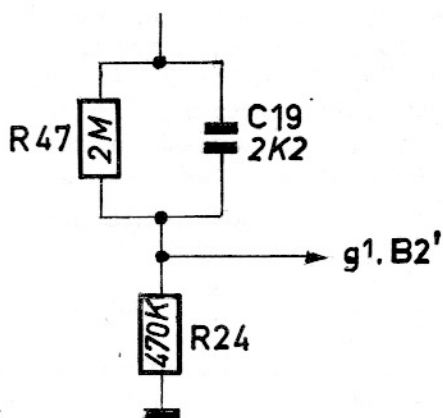
C22 and C20 can be overbridged more or less with R47, this has no influence on the high frequencies of the negative feedback signal, but it has for the low ones.

C22 and C20 have a large impedance for low frequencies. If the sliding contact of R47 is in the upper position, the low frequencies receive only a small amount of negative feedback. The result of this is that the low notes are favoured above the rest of the frequency spectrum. When the sliding contact of R47 is moved downwards, the negative feedback for the low notes becomes stronger and stronger, so that the low notes are reinforced less and less.

If the sliding contact is in the lower position, C22 and C20 are short-circuited, so that all frequencies now obtain an equally strong feedback.

Up to now we have not yet spoken about C19 with the bass control. In the lower position of the sliding contact of R47 all frequencies receive equally strong feedback, so that the output signal of B2' should be straight.

This is not the case, however, as C19 operates as coupling capacitor in this position.



This can be understood as follows: C19 and R47 which are now connected in parallel, form together a much greater impedance for low frequencies than R24. From this it follows that the low frequencies are attenuated with respect to the high ones. When the sliding contact of R47 goes upwards again, the influence of C19 becomes smaller and smaller, so that the low notes are less attenuated.

The influence of the filter C22-R25, C20-R24 becomes greater and greater, as a result of which the high frequencies obtain a stronger feedback, whereby the low notes are favoured.

Treble control.

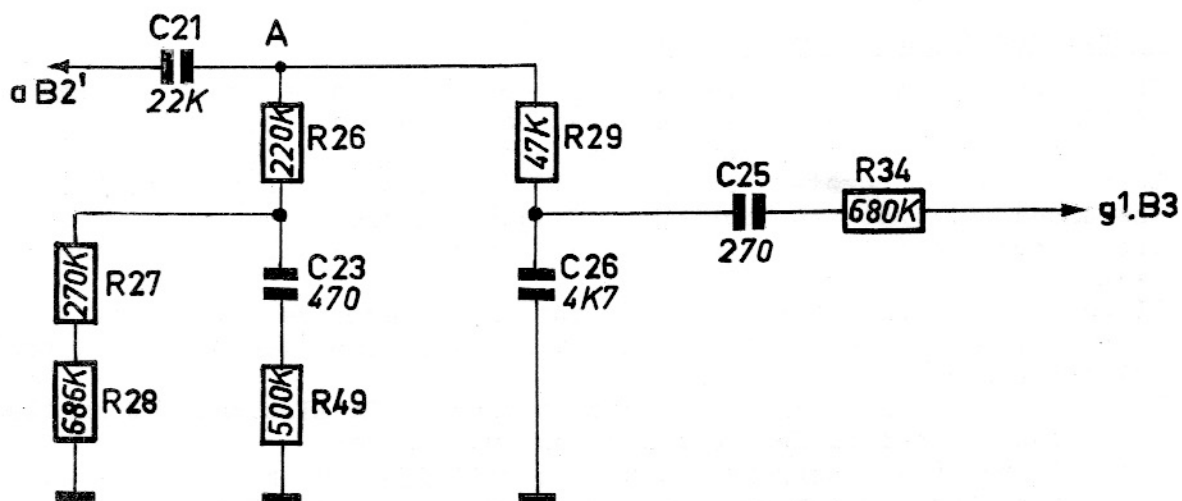
R49 is the treble control. C23 and R49 (wholly or partially) are connected in parallel with R27 and R28.

For low notes this parallel connection has no influence, this is due to the small capacitance of C23.

B4 and B3 form the output stage for high notes. The necessary control signal is applied to $g1$ of B3.

If the sliding contact of R49 is in the lower position, we get the situation below.

Only the parts which are of importance for this treble control, have been indicated.



We see that the anode A.C. voltage of B2' is between point A and earth, via a parallel and series connection of resistors and capacitors. R29 and C26 form a voltage divider. As the impedance of C26 is much smaller for high notes than the impedance of R29, the high notes will be attenuated. So B3 receives few high notes. When the sliding contact of R49 now goes upwards, C26 is disconnected from earth and part of R49 is connected between earth and C26. The high notes are therefore attenuated less and less. When the sliding contact of R49 is in the upper position, the high notes are no longer attenuated. Now we shall have to examine the influence of C23.

C23 is now connected in parallel to R27-R28. C23 has a small impedance for high notes with respect to R27-R28.

The negative feedback voltage across R28 is therefore small for high frequencies, in other words, the negative feedback voltage decreases with increase in frequency. The high notes are therefore favoured. The negative feedback voltage reaches the grid of B2' via C22, C20. When the sliding contact of R49 goes downwards, a resistor is connected in series with C23, as a result of which the impedance for high frequencies becomes greater and this means that the high frequencies obtain more negative feedback, as a result of which they are less favoured.

The Bi-Ampli principle.

Here the high and low notes for the output stage are divided, whereby the high notes and low notes each have their own output stage and loudspeaker (s).

On point B in the circuit diagram all frequencies are still present. B3 is controlled via the filter C25-R34-R31-R35-R32-C29.

The above filter attenuates the low notes very strongly, so that B3 and B4 receive practically only high notes.

B5 is controlled via R33-C28 and R18-R61 and R38. The combination R33-C28 attenuates the high notes very strongly. B5 and B6 therefore only receive low notes.

B5 and B6 form, just like B3 and B4, a so-called single ended push-pull circuit, the working of which will be explained later on. B3 and B4 obtain negative feedback via R59 in the grid circuit of B3. B5 and B6 obtain negative feedback via R60-C39 in the grid circuit. This reduces distortion.

Single ended push-pull circuit.

As B3 and B4 operate in the same manner as B5 and B6, the working of B3 and B4 only, will be discussed here (see fig.6).

Only the most essential parts have been drawn.

B4 and B3 are connected in series. If no signal is applied to B3, the anode currents are therefore of equal value.

The cathode resistors are also equal, so that the valves have the same bias.

If we suppose that the grid of B3 obtains a negative pulse at a certain moment, the anode current of B3 decreases. The voltage across R42 therefore becomes smaller.

From this it follows that the grid voltage of B4 also becomes smaller. The anode current of B4 therefore becomes greater.

Via C33 and the loudspeaker a current will flow which is equal to the difference of the momentary values of $I_{a4} - I_{a3}$. (I_{a4} = anode current of B4) (I_{a3} = anode current of B3).

The above follows from the first law of Kirchhoff, which states:

"The algebraic sum of the instantaneous values of all currents at a definite point (here point S) is zero at every instant.

Z2	500	mA	A9 999 74/500	C42	100	pF	A9 999 04/100E
Z3	500	mA	A9 999 74/500	C43	10000	pF	A9 999 06/10K
Z4	10	A	R1 750 04	C44	10000	pF	A9 999 06/10K
Z5	10	A	R1 750 04	C45	82	pF	A9 999 04/82E
Z6	160	mA	A9 999 74/160	C46	33	pF	A9 999 04/33E
Z1				C47	8	μF	A9 999 11/P8
S1				C48	2200	pF	A9 999 04/2K2
S2			A3 142 81.0	R1	47	Ω	A9 999 00/47E
S3				R2	47	Ω	A9 999 00/47E
S4				R3	0.22	MΩ	A9 999 01/220K
C1	50	μF		R4	0.22	MΩ	A9 999 01/220K
C2	50	μF	AC 548 0/50+	R5	0.12	MΩ	A9 999 01/120K
C34	50	μF	50+50	R6	22000	Ω	A9 999 01/22K
C3	50	μF		R7	0.82	MΩ	A9 999 01/820K
C4	50	μF	AC 548 0/50+	R8	820	Ω	A9 999 01/820E
C37	50	μF	50+50	R9	0.22	MΩ	A9 999 01/220K
C5	270	pF	A9 999 04/270E	R10	47000	Ω	A9 999 01/47K
C6	0.27	μF	A9 999 06/V270K	R11	0.22	MΩ	A9 999 01/220K
C7	18000	pF	A9 999 06/18K	R12	0.47	MΩ	A9 999 01/470K
C8	10000	pF	A9 999 04/10K	R13	1	MΩ	A9 999 01/1M
C9	100	μF	A9 999 09/B100	R14	1	MΩ	A9 999 01/1M
C10	8	μF		R15	0.56	MΩ	A9 999 01/560K
C24	8	μF	A9 999 11/P8+8	R16	68000	Ω	A9 999 01/68K
C11	82	pF	A9 999 04/82E	R17	1000	Ω	A9 999 01/1K
C12	22000	pF	A9 999 04/22K	R18	0.33	MΩ	A9 999 01/330K
C13	820	pF	A9 999 04/820E	R19	4700	Ω	A9 999 01/47K
C14	100	μF	A9 999 09/B100	R20	1000	Ω	A9 999 01/1K
C15	22000	pF	A9 999 04/22K	R21	0.15	MΩ	A9 999 01/150K
C17	10000	pF	A9 999 04/10K	R22	15000	Ω	A9 999 00/33K+
C18	100	μF	A9 999 09/B100				A9 999 00/27K
C19	2200	pF	A9 999 06/2K2	R23	0.33	MΩ	A9 999 01/330K
C20	3900	pF	A9 999 06/3K9	R24	0.47	MΩ	A9 999 01/470K
C21	22000	pF	A9 999 04/22K	R25	0.68	MΩ	A9 999 01/680K
C22	1800	pF	A9 999 06/1K8	R26	0.22	MΩ	A9 999 01/220K
C23	470	pF	A9 999 04/470E	R27	0.27	MΩ	A9 999 01/270K
C24	Zie C10, see C10 voir C10			R28	0.68	MΩ	A9 999 01/680K
C25	270	pF	A9 999 04/270E	R29	47000	Ω	A9 999 01/47K
C26	4700	pF	A9 999 04/4K7	R31	0.82	MΩ	A9 999 01/820K
C27	8200	pF	A9 999 06/8K2	R32	22000	Ω	A9 999 01/22K
C28	1800	pF	A9 999 06/1K8	R33	0.33	MΩ	A9 999 01/330K
C29	12000	pF	A9 999 06/12K	R34	0.68	MΩ	A9 999 01/680K
C30	100	μF	A9 999 09/B100	R35	1	MΩ	A9 999 01/1M
C31	100	μF	A9 999 09/B100	R36	1000	Ω	A9 999 01/1K
C32	8	μF		R37	150	Ω	A9 999 00/150E
C33	8	μF	A9 999 11/P8+8	R38	1000	Ω	A9 999 01/1K
C34	Zie C1, see C1, voir C1			R39	1000	Ω	A9 999 01/1K
C35	8	μF		R40	150	Ω	A9 999 00/150E
C36	8	μF	A9 999 11/P8+8	R41	6800	Ω	A9 999 00/6K8
C37	Zie C4, see C4, voir C4.			R42	150	Ω	A9 999 00/150E
C38	560	pF	A9 999 04/560E	R44	6800	Ω	A9 999 00/6K8
C39	120	pF	A9 999 04/120E	R45	150	Ω	A9 999 00/150E
C40	82	pF	A9 999 04/82E	R46	2200	Ω	A9 999 00/2K2
C41	56	pF	A9 999 04/56E	R47	2	MΩ	A9 999 16/GE2M
				R48	0.15	MΩ	
				R48a	0.15	MΩ	
				R48b	0.2	MΩ	
							B1 639 54.0

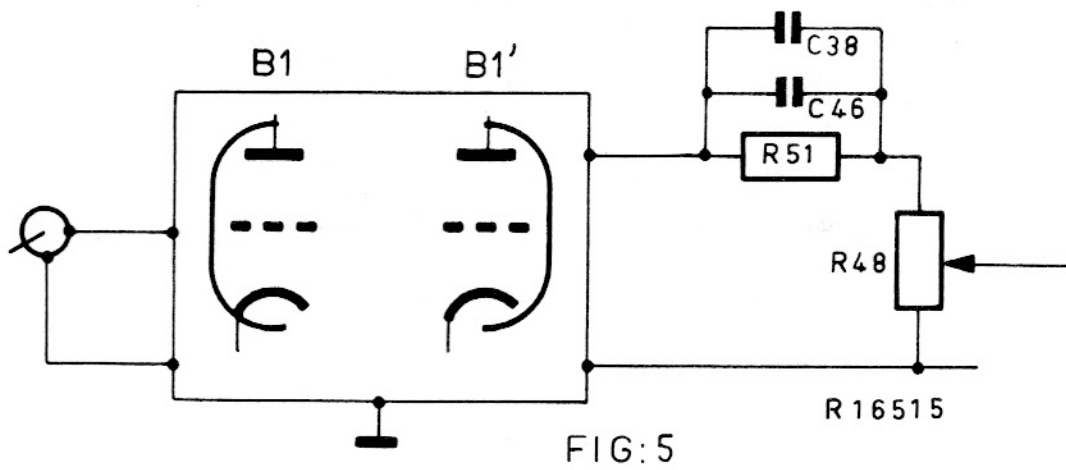
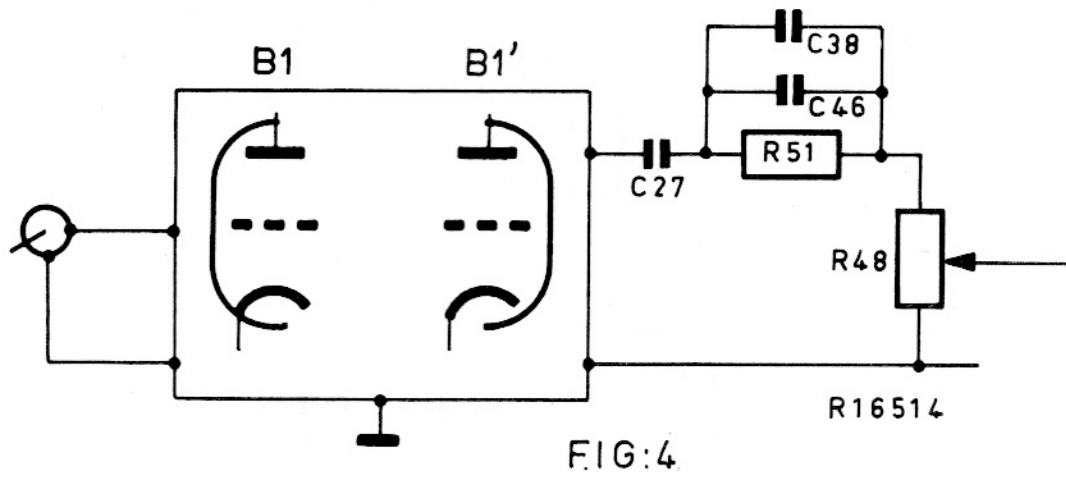
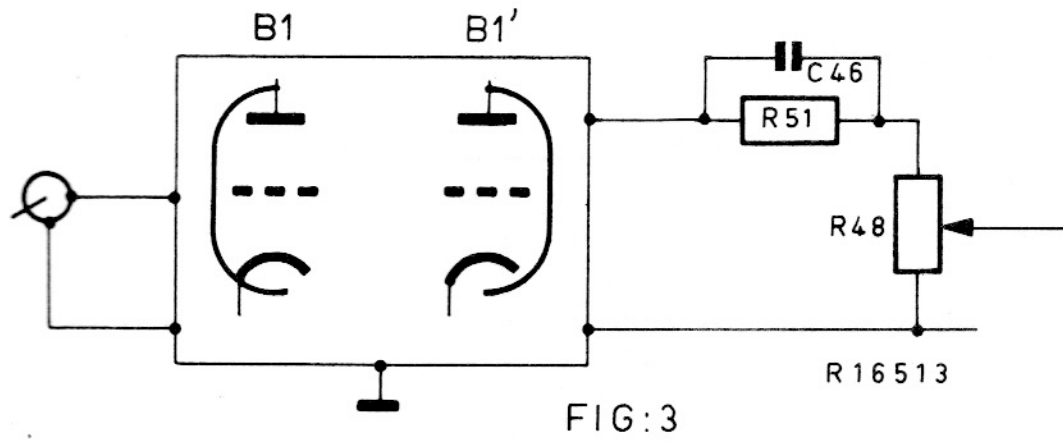
R49

R51

R57

R58

R49	0.5 MΩ	A9 999 16/GL 50K+450K	R59	0.15 MΩ	A9 999 01/150K
R51	0.12 MΩ	A9 999 01/120K	R60	6.8 MΩ	A9 999 01/6M8
R57	470 Ω 2x	A9 999 00/1K	R61	1.2 MΩ	A9 999 01/1M2
R58	56000 Ω	A9 999 01/56K	R62	33000 Ω	A9 999 01/33K
			R63	47000 Ω	A9 999 01/47K
					47K
					DJ/RT



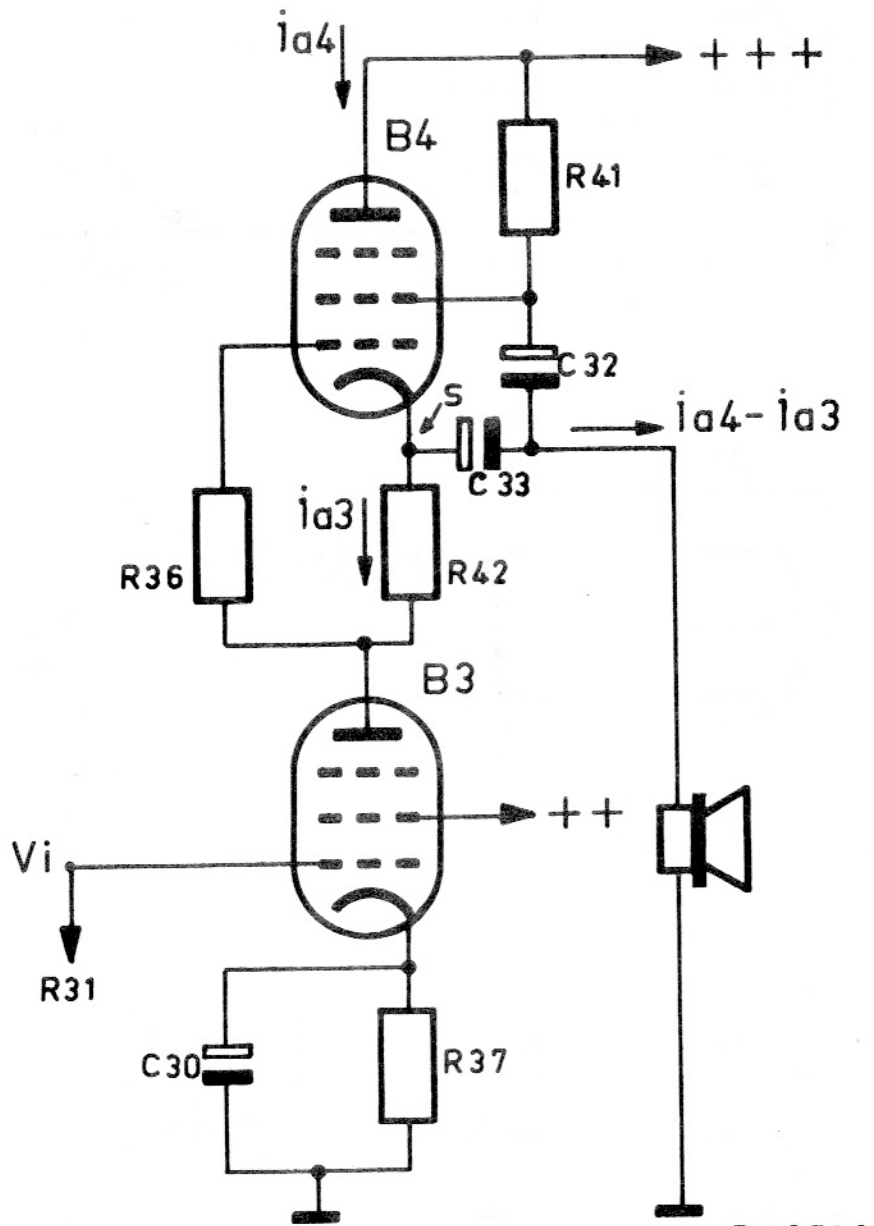


FIG:6

R 16516