

MODEL ARG334 is an AM/FM Radiogramophone employing six valves plus electronic tuning indicator and metal rectifier. The receiver is housed in a cabinet of modern style incorporating a dual loud-speaker system with Ekco 'Tuned Fidelity.'

Independent Bass and Treble controls with push-pull output and facilities for adding a stereo reproducer are among the special features of this instrument.

MAINS SUPPLY : 200-250 Volts A.C. 50 c/s.

MAINS CONSUMPTION : 54 Watts radio. 65 Watts gram. approx.

WAVEBAND COVERAGE : F.M.	86—100 Mc/s.
M.W. 545—182 Metres	550—1650 Kc/s.
L.W. 2000—1200 Metres	150—250 Kc/s

CONTROLS : Front—VOLUME ON/OFF.

Inside the lid are two concentric pairs, one at either end of the scale, which operate as follows :—

BASS (rear outer), TREBLE (rear inner) ; WAVECHANGE (front inner), TUNING (front outer).

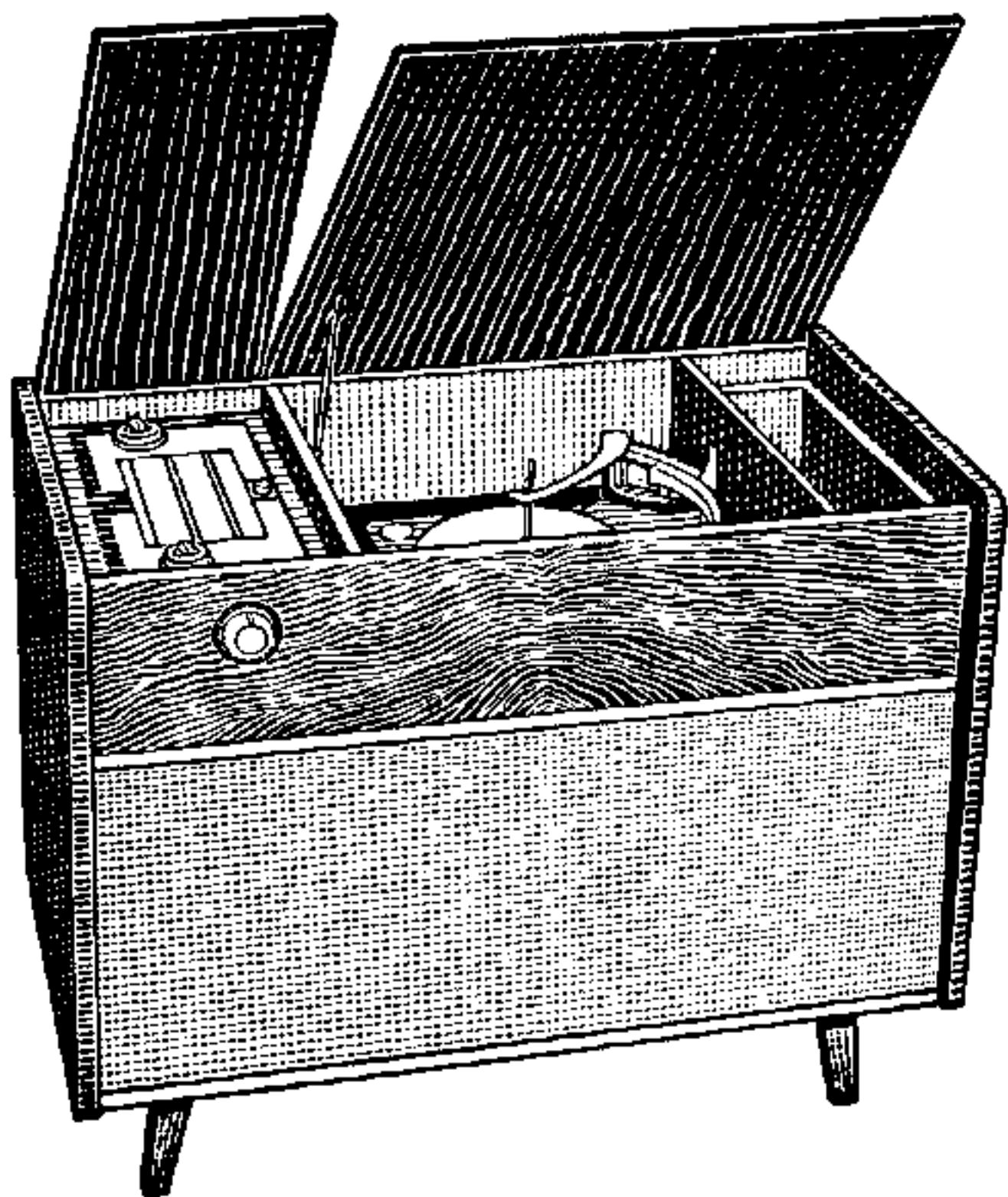
The AERIAL DIRECTION control (for A.M. reception only) is to the right of the scale centre.

A MUTING CONTROL for the internal loud-speakers is fitted on the rear cover.

VALVES : All valves are Mullard, with B9A base connections.

V1	F.M. R.F. and Frequency Changer	ECC85
V2	L.W. & M.W. Frequency Changer & F.M. I.F. Amplifier	ECH81
V3	I.F. Amplifier	EF89
V4	Demodulator A.G.C. diode and AF Amplifier	EABC80
V5.6	A.F. Amplifier, Phase Splitter & Push-Pull Output	ECL82
V7	Electronic Tuning Indicator	EM84

METAL RECTIFIER : Westinghouse ECI.



LOUD-SPEAKERS : The main speaker, a 10" x 6" elliptical unit, is loaded by a special tuned acoustic chamber and is supplemented by a 5" diameter high frequency unit. The impedance of the main unit is nominally 3 ohms at 400 c/s, and the high frequency unit 3 ohms at 3000 c/s.

INTERMEDIATE FREQUENCY : A.M. 470 Kc/s. F.M. 10.7 Mc/s.

CIRCUIT DESCRIPTION

F.M.: A Twin triode is employed in conventional grounded grid R.F. amplifier and triode mixer circuits which are inductively tuned by L3 and L4.

Two I.F. stages, incorporating V2 and V3, feed the ratio detector comprising V4A and associated components.

A.G.C. is derived from the D.C. potential, developed across R26, C52, which varies in direct relation to the input signal amplitude and is applied to V3 suppressor grid as additional bias.

The output from the ratio detector is taken via SW1D, R23 and C50 to the grid of V4B, the first A.F. amplifier.

A.M.: On Long or Medium waves the H.T. is disconnected from V1 by SW2A and V2 operates as a normal triode heptode frequency changer. I.F. amplification is by V3, whilst V4B diode operates as demodulator and A.G.C. rectifier.

The A.F. output is coupled by SW1D to the first Volume control, R19, which is incorporated to avoid overloading V4B triode when very strong Long or Medium wave signals are being received.

GRAM : The output from the pick-up (stereo or single channel) is fed to the co-axial socket via R52 and also via R21 to SW1D, which couples the signal to V4B triode grid via R23.

A.F. CIRCUITS : In V4B circuit the network R27,R23 provides a small negative feedback voltage into the triode grid of the valve. C49 compensates for stray capacities and capacity due to Miller effect on the grid of V4B.

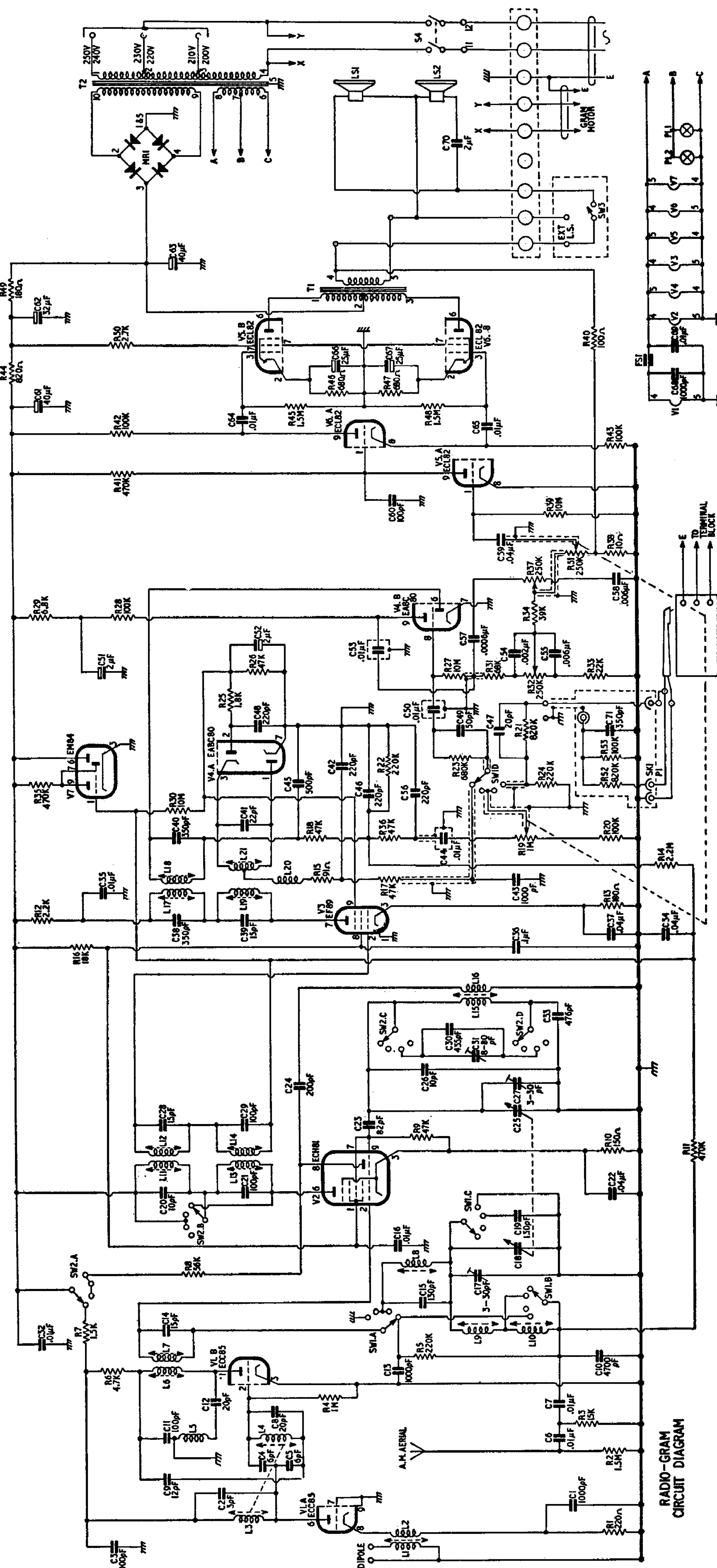
The tone control network incorporates R32, the Bass control, and R37, the Treble control. Both controls attenuate signals within their respective frequency range as the slider is moved towards the earthy end. With both tone controls set to their mechanical mid-position the response is approximately flat.

The main Volume control, R51, feeds the signal to the A.F. amplifier V5A. This is followed by a conventional phase splitter and push-pull output circuit.

Independent biasing of the output valves ensures that slight variations of characteristics of valve replacements will not unduly change the overall characteristic of the circuit. The design of the output transformer, incorporating a special 'sandwich' construction, provides an exceptionally good feedback characteristic and output efficiency.

The dual loud-speaker system is specially loaded and designed to give a level response over the very wide frequency range of 30 c/s to 16 Kc/s.

C 3.	2.	9.	4.	5.	11.	8.	12.	32.	14.	20.	21.	23.	28.	29.	24.	30.	33.	34.	35.	36.	37.	34.	43.	45.	42.	48.	46.	47.	71.	49.	50.	54.	53.	57.	58.	59.	60.	61.	64.	61.	66.	62.	63.	70.																																																																										
R 1.	1.	13.	VI.A.	14.	LS.	16.	VI.B.	17.	SW1.A.	SW2.A.	18.	SW1.C.	19.	LI0.	SW1.B.	2.	3.	4.	6.	7.	8.	15.	17.	18.	16.	19.	22.	25.	27.	26.	31.	30.	33.	36.	37.	34.	43.	45.	42.	48.	46.	47.	50.	54.	53.	57.	58.	59.	60.	61.	64.	61.	66.	62.	63.	70.																																																														
M 1.	LI. L2.	LI. L3.	VI.A.	LI. L4.	VI.B.	SW1.A.	SW2.A.	LI0.	SW1.B.	LI1.	LI2.	SW1.C.	LI3.	LI4.	LI5.	LI6.	SW2.C.	SW2.D.	LI5.	LI6.	LI7.	LI8.	VI.A.	SW1.D.	LI9.	LI10.	LI11.	LI12.	LI13.	LI14.	LI15.	LI16.	LI17.	LI18.	VI.A.	SW1.A.	LI19.	LI20.	LI21.	LI22.	LI23.	LI24.	LI25.	LI26.	LI27.	LI28.	LI29.	LI30.	LI31.	LI32.	LI33.	LI34.	LI35.	LI36.	LI37.	LI38.	LI39.	LI40.	LI41.	LI42.	LI43.	LI44.	LI45.	LI46.	LI47.	LI48.	LI49.	LI50.	LI51.	LI52.	LI53.	LI54.	LI55.	LI56.	LI57.	LI58.	LI59.	LI60.	LI61.	LI62.	LI63.	LI64.	LI65.	LI66.	LI67.	LI68.	LI69.	LI70.	LI71.	LI72.	LI73.	LI74.	LI75.	LI76.	LI77.	LI78.	LI79.	LI80.	LI81.	LI82.	LI83.	LI84.	LI85.	LI86.	LI87.	LI88.	LI89.	LI90.	LI91.	LI92.	LI93.	LI94.	LI95.	LI96.	LI97.	LI98.	LI99.	LI100.



RADIO-GRAM
CIRCUIT DIAGRAM

DISMANTLING, MECHANICAL AND ACOUSTIC ADJUSTMENTS

CHASSIS REMOVAL : Disconnect from the mains supply and remove the screws securing the back cover. The leads connecting to the back cover are long enough to enable the cover to be moved to one side for normal servicing purposes but may be disconnected from the terminal block if desired.

Disconnect the flying leads from the rear flange of the chassis and the mains leads from the terminal block inside the cabinet. Pull off all the control knobs, then carefully lift out the styling strip each side of the scale. To facilitate releasing these styling strips a blunt instrument, such as a rod or pencil, may be pushed up inside the rear of the cabinet. Remove four screws and brackets securing the scale, which can be lifted out after easing the end styling strips.

Release four 2BA nuts, then withdraw the chassis upwards through the cabinet top, taking care not to damage VI, by slightly tilting the chassis sideways whilst lifting.

DRIVE CORD REPLACEMENT : Two drive cords are employed, one for the F.M. Tuning and the other for the pointer and tuning gang.

POINTER DRIVE : Slightly more than 56" of nylon drive cord will be required. Tie a small loop in one end and attach this loop to the drive spring, which should be temporarily anchored on the right hand end of the scale backing plate. The diagram on page 6 gives the layout of the drive. The slot in the centre flange of the drive pulley should be approximately 45 degrees to the left of upright when the gang is fully meshed.

The terms left and right in the above description are dependent upon the top of the chassis being viewed from the rear.

F.M. UNIT DRIVE : Replacement of this drive necessitates the complete removal of the F.M. tuner unit and should not be undertaken unless facilities are available to re-align the F.M. circuits.

A length of nylon cord, approximately 10 inches, is required together with a securing nipple. The correct replacements are available from the Service Dept.

To proceed, disconnect the leads and bonding braid from the F.M. unit, remove four screws from beneath the chassis, securing the bracket to the chassis grommets. Remove four screws securing the unit to the bracket and withdraw the unit. The cover on the underside of the unit should now be removed (four 6BA cheese head screws). Make a half inch loop in one end of the cord and seal the knot with adhesive then, holding the cord taut, make a mark $6\frac{1}{4}$ " from the end of the loop. Press the tuner carriage forward against the tension of the spring and thread the free end of the cord through the central hole in the carriage bracket and insulated panel. The eyelet should now be threaded on to the cord so that the shank faces the front of the unit. Tie a small knot at the $6\frac{1}{4}$ " mark, seal with adhesive, then pull the cord so that the knot is slightly embedded into the eyelet and the shank of the latter passes through the hole in the insulated panel. Release the carriage and ensure that it is free to travel to the full extent of the guides. Apply a trace of light grease if necessary. Replace the cover and re-assemble the unit on to the receiver chassis. Pass the looped cord round the small pulley and then one turn anticlockwise round the gang spindle and secure to the grub screw on the collar with the gang fully meshed.

Carry out final adjustments and alignment as detailed on page 5.

LOUD-SPEAKER REPLACEMENT : To gain access to the loud-speakers it will be necessary to remove the acoustic chamber. This is secured to the base of the cabinet by four nuts accessible from beneath the cabinet. When re-assembling, make sure that the felt pads on the front edges of the acoustic chamber are intact and that the chamber is pressed firmly against the cabinet front, whilst the securing nuts are tightened.

Correct phasing of the loud-speakers should be observed. Replacement units are obtainable from the Service Dept., suitably marked to facilitate connecting in the correct phase.

The tuning of the acoustic chamber will require checking after replacing the main loud-speaker.

TUNING THE ACOUSTIC CHAMBER : The instruments are correctly adjusted prior to despatch and should normally require no further adjustment unless the main loud-speaker is replaced. Should adjustment be required, however, proceed as follows :-

A simple R.G. test set will be required, the circuit of which is given on page 6. Unscrew the loud-speaker muting switch knob on the rear of the cabinet and insert the test set in the circuit as indicated in the diagram.

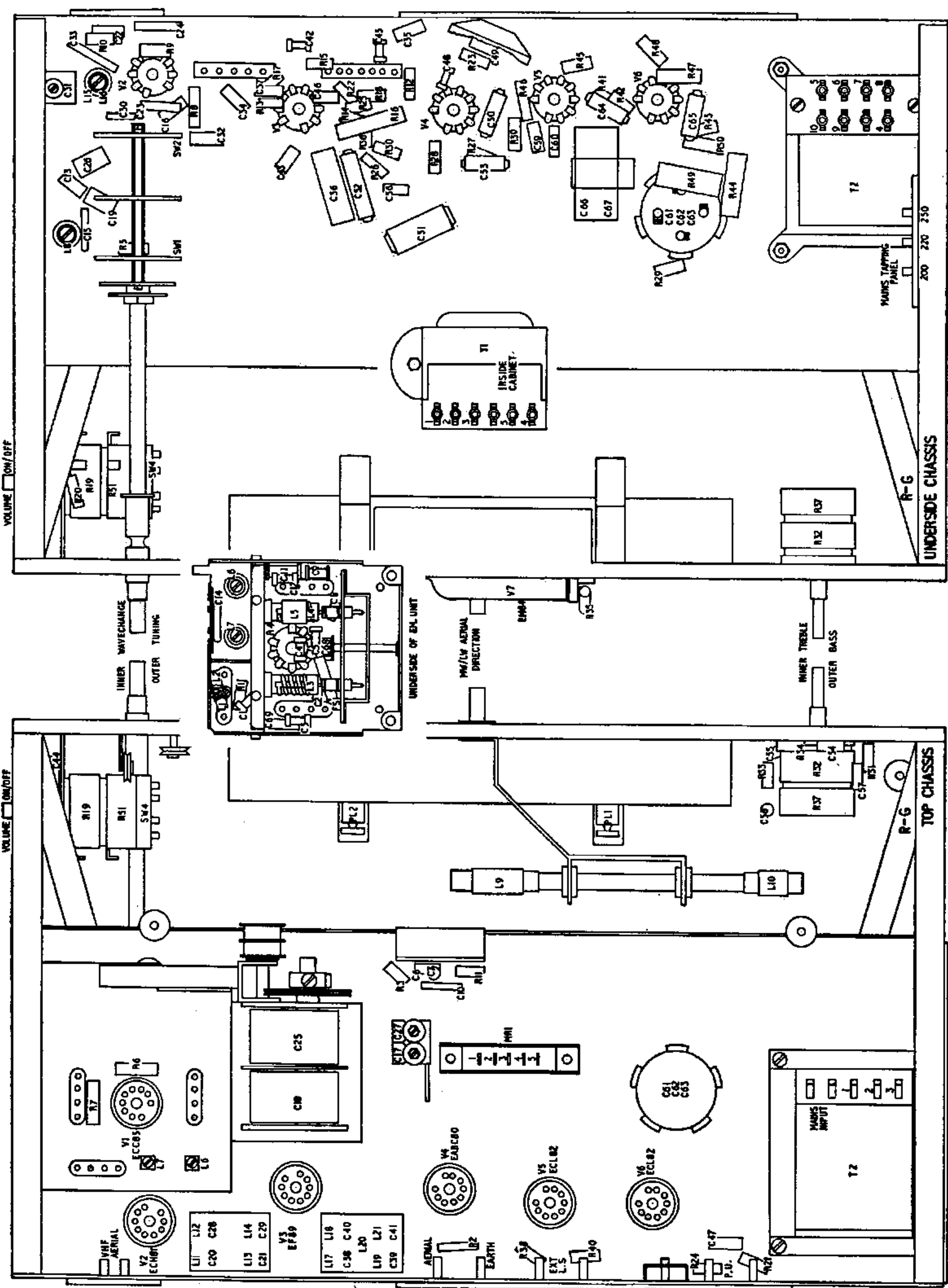
A B.F.O. will also be required, with the output connected to SK1 (with P1 disconnected). Switch the receiver to Gram and allow the valves to warm up. Adjust the Bass, Treble and Volume controls to approximately the mid-position.

With the test set switched to 'L', sweep the B.F.O. through the lower frequency range. Two major peaks will be observed on the voltmeter reading, one between 40—60 c/s and the other between 80—120 c/s. Select the upper of these two frequencies then switch the test set to 'R' and adjust the B.F.O. output to give a reading of 0.5V on the test set voltmeter. Switch to 'L' and note the voltmeter reading. This reading multiplied by ten gives the impedance in ohms of the loud-speaker at the selected frequency. Select the lower frequency to produce a major peak on the voltmeter then repeat the above procedure to find the impedance of the loud-speaker at this lower selected frequency. Should the two impedance measurements differ by more than 1 ohm, slacken the screws securing the tuning vent cover at the rear of the chamber and adjust the cover until a position is reached giving the required result. It may be necessary to take several sets of readings before the desired result is achieved. Remove the test set.

CIRCUIT ALIGNMENT

INSTRUMENTS REQUIRED : A standard AM/FM signal generator and A.F. output meter will be required, together with a 0-50 μ A meter and two matched 220K resistors or a sweep generator and oscilloscope.

I.F. (F.M.) : Two methods are given, (a) Visual, using a sweep generator and oscilloscope and, (b) Meter, using the standard signal generator, μ A meter and two matched 220K resistors.



(a) Visual Method : Disconnect the earthed (positive) side of C52. Tune the receiver to the low frequency end of the F.M. band and connect the oscilloscope across R26.

Inject the sweep input to V3 (pin 2) and tune L19 for peak response. Reconnect C52 and transfer the oscilloscope leads to the junction of R15,C42. Tune L21 for the best 'S' waveform, readjusting L19 if necessary.

If the alignment equipment has the facility to super-impose A.M. on the F.M. signal, the adjustment of L21 should be made for best compromise between A.M. rejection at 10.7 Mc/s and 'S' waveform whilst L19 is adjusted for 'S' waveform only. Transfer the sweep input to the junction of R6,R7 (4.7K and 1.5K). As this point is live to H.T. potential the generator should be connected via a 0.1 μ F capacitor. Disconnect C52 and transfer the oscilloscope leads across R26. Tune L12,L11,L7 and L6 in that order for maximum output at 10.7 Mc/s.

The curve should be substantially flat over ± 75 Kc/s and within -2 dB for ± 100 Kc/s.

(b) Meter Method : Connect the output meter across the loud-speaker leads and adjust the volume control for maximum output. Connect the 220K resistors in series across R26 then connect the μ A meter between the junction of the 220K resistors and chassis. Tune the receiver to the low frequency end of the F.M. band.

Input to V3 (pin 2), tune L19 at 10.7 Mc/s for peak reading on the μ A meter.

Disconnect the μ A meter lead from chassis and connect this lead to the junction R15,C42, then tune L21 for minimum reading. This should be tunable from a maximum in one direction to a maximum in the other direction.

Connect the μ A meter between the junction of the 220K resistors and chassis and the generator input to V2 (pin 2). Tune L12 and L11 for peak reading on the meter. Re-tune L19 if necessary. Transfer the input to the junction of R6,R7 via a suitable isolating capacitor.

Tune L6 and L7 for maximum μ A meter reading at 10.7 Mc/s. Disconnect the μ A meter and test resistors.

I.F. (A.M.) : Switch to M.W. and tune the receiver to 545 Metres. Connect the output meter across the loud-speaker leads. Input at 470 Kc/s A.M. 30% to V2 (pin 2). Adjust L18,L17,L14 and L13 in that order for maximum symmetrical output.

Input to SW1.C slider contact, adjust L8 core for minimum output.

R.F. ALIGNMENT : To facilitate tuning the receiver to the correct positions when the chassis is out of the cabinet and the scale removed, the following measurements are given for the pointer from the centre of the Treble/Bass control spindle for the datum and various test frequencies.

Spindle to datum 1.75"	Datum to 91 Mc/s mark	2.906"
Datum to 500 Metres 1.343"	Datum to 200 Metres	7.015"
Datum to 430 Metres 2.606"	Datum to 1400 Metres	4.890"

R.F. (F.M.) : Check that with the gang fully open the tuner carriage is $\frac{1}{16}$ " from fully open. Adjust if necessary by rotating the drive collar on the gang shaft ; also check that the pointer coincides with the datum mark on the scale with the gang fully open, adjust if necessary by sliding the pointer along the drive cord.

Tune the receiver to the 91 Mc/s mark on the scale and inject an F.M. signal of that frequency to the aerial input. Adjust L4 for calibration and L3 for maximum output.

R.F. (A.M.) : Connect the signal generator output to the aeria and earth sockets and switch to M.W.

Tune to 500 metres and adjust L15 for maximum output, then tune to 200 metres and adjust C27 for maximum output.

Adjust C17 at 200 metres and L9 at 430 metres.

Switch to L.W. align C31 then adjust L10 for maximum output at 1400 metres.

NOTE : The adjustment of L9 and L10 is carried out by sliding the coils along the Ferrite rod until a point of maximum output is reached. The coils should be sealed on the Ferrite rod after completion of alignment.

D.C. RESISTANCE OF WINDINGS :

Winding	Ohms
L8	16
L9	0.5
L10	8
L13,14	13 each coil
L15	2.8
L16	1
L17	6.8
L18	6.8
T1 Pri	165 + 205
T2 Pri	31
H.T. Sec.	81

Other windings less than 0.5 ohms.

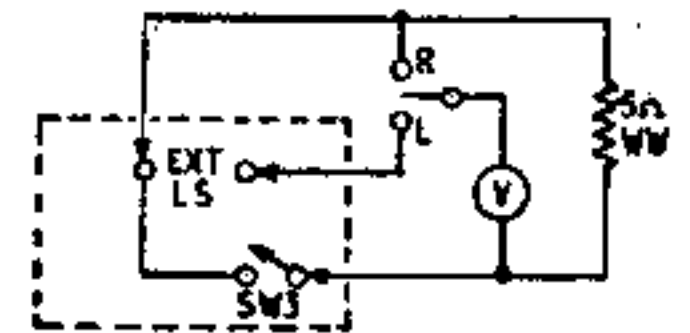
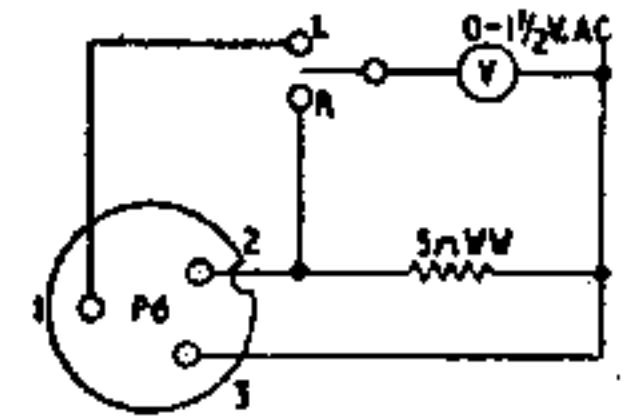
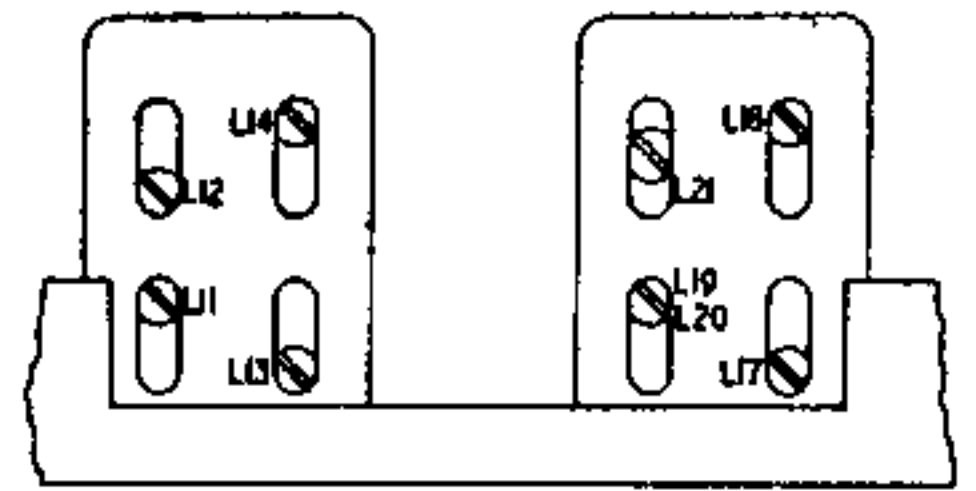
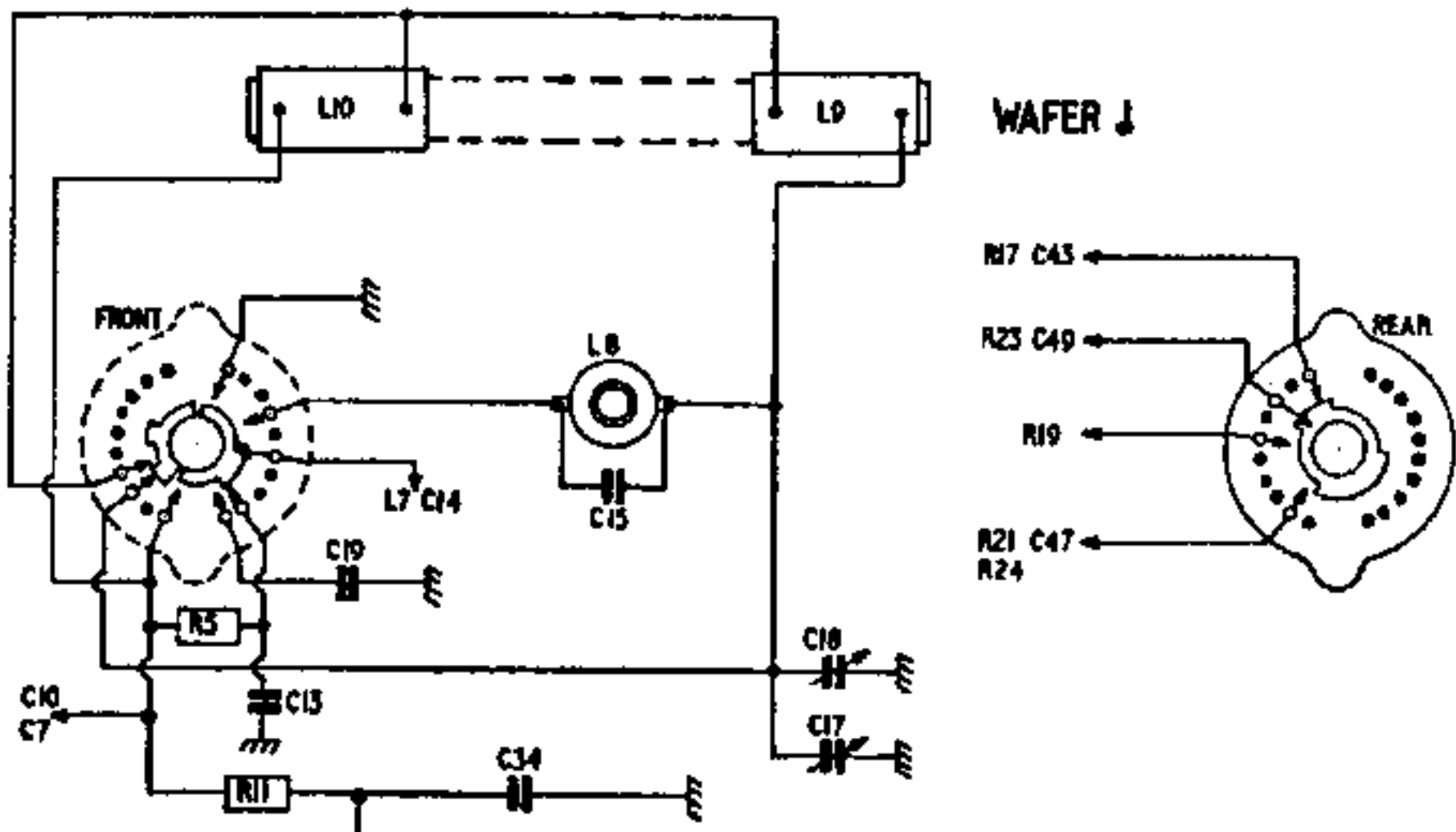
VOLTAGE AND CURRENT DATA :

The following readings were taken on a receiver tuned to 1 Mc/s A.M. or 94 Mc/s F.M., no signal input and Volume control adjusted for minimum output. Voltages are to chassis and taken with a meter of 20,000 ohms per volt sensitivity.

H.T. across C63	280V AM and Gram	275V FM
H.T. across C62	273V AM and Gram	265V FM
H.T. across C61	250V AM and Gram	230V FM
H.T. Consumption	80 mA AM and Gram	91.5 FM
L.T. Voltage	6.2V A.C. Heaters	5.55V A.C. Pilot lamps

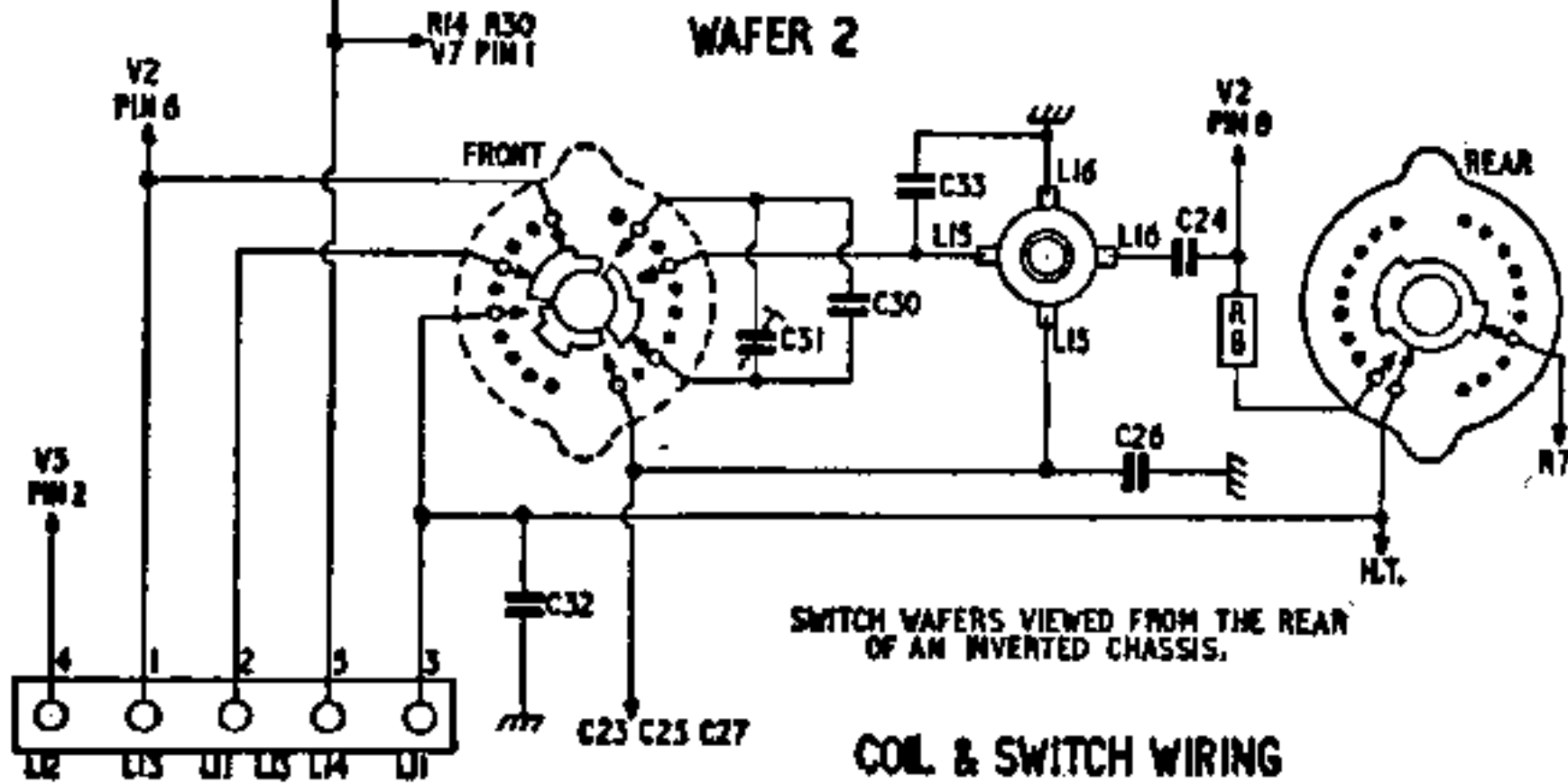
VALVE VOLTAGES AND CURRENTS :

Valve	Anode			Screen			Cathode		
	Pin	V	mA	Pin	V	mA	Pin	V	mA
V1A F.M. only	6	208	8.8	—	—	—	8	1.95	8.8
V1B F.M. only	1	185	5.0	—	—	—	3	0	—
V2 H(F.M.)	6	230	7.0	1	108	4.3	3	1.75	11.3
V2 H(A.M.)	6	250	2.7	1	101	6.0	3	1.86	12.0
V2T A.M. only	8	70	3.3	—	—	—	—	—	—
V3 (F.M.)	7	210	7.6	8	108	2.9	3	1.9	10.5
V3(A.M.)	7	233	7.1	8	101	2.6	3	1.75	9.7
V4B (F.M.)	9	107	1.1	—	—	—	7	0	—
V4B (A.M.)	9	113	1.2	—	—	—	7	0	—
V5A (F.M.)	9	58	0.36	—	—	—	8	0	—
V5A (A.M.)	9	60	0.4	—	—	—	8	0	—
V5B (F.M.)	6	270	21.5	7	242	4.0	2	18.7	26.0
V5B (A.M.)	6	278	22.0	7	250	4.2	2	19.5	27.0
V6A (F.M.)	9	167	0.6	—	—	—	8	60	0.6
V6A (A.M.)	9	185	0.62	—	—	—	8	62	0.62
V6B (F.M.)	6	270	21.5	7	242	4.0	2	18.7	26.0
V6B (A.M.)	6	278	22.0	7	250	4.2	2	19.5	27.0

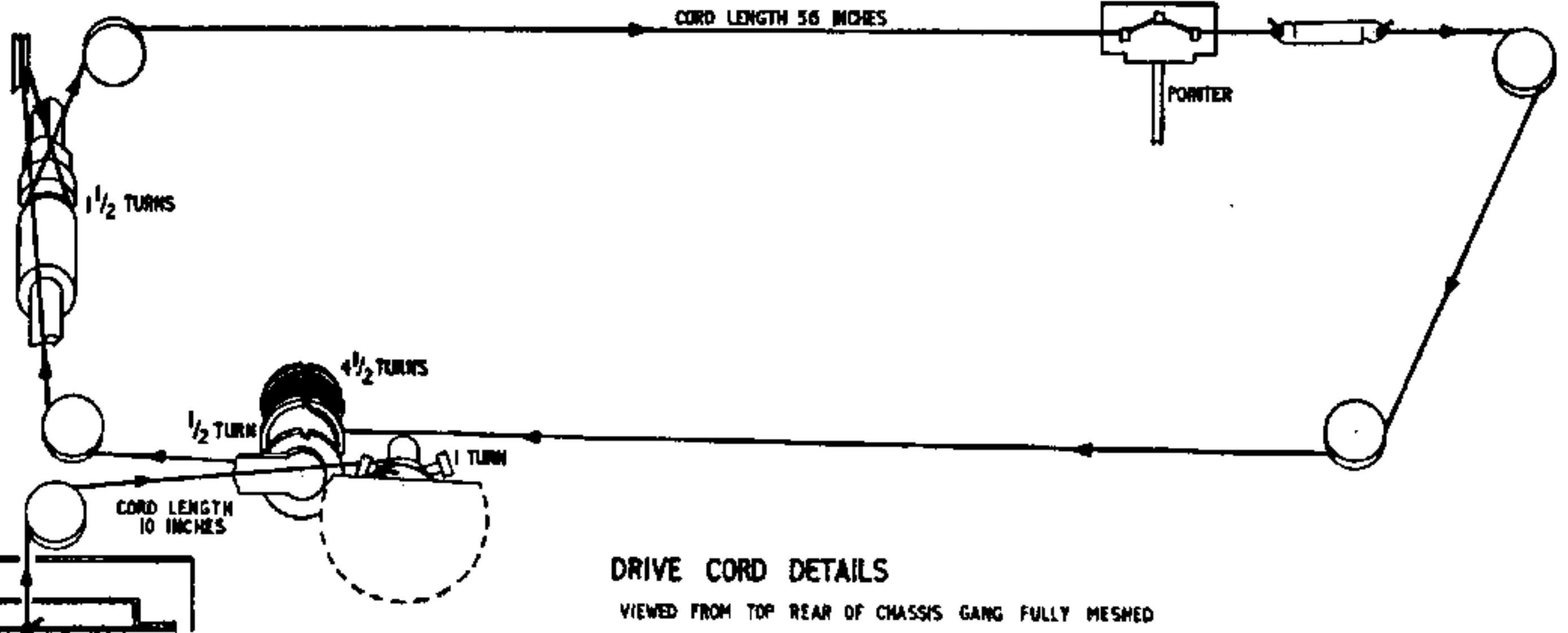


SWITCH WAFERS VIEWED FROM THE REAR OF AN INVERTED CHASSIS.

COIL & SWITCH WIRING



CORD LENGTH 56 INCHES



MODEL SU334 is an amplifier specially designed to operate in conjunction with Model ARG334 in a stereo installation. The cabinet is finished in walnut veneers to match the cabinet of the Radio-gramophone.

A tuned acoustic chamber provides loading for the main loud-speaker.

MAINS SUPPLY : 200-250V A.C. 50 c/s.

MAINS CONSUMPTION : 41W.

PILOT LAMP : 6.5V 0.3A.

VALVES : V1—EF86, V2,3—ECL82.

RECTIFIER : Westinghouse ECI.

LOUD-SPEAKERS : One 10" x 6" main and two 4" dia. high frequency units. The notes concerning loud-speaker impedances and phasing on pages 1 and 3 are also applicable to this unit.

CONTROLS : left TREBLE, centre BASS, right VOLUME. The ON/OFF switch is at the top of the control panel.

CHASSIS REMOVAL : Disconnect from the mains supply then remove the rear cover. Remove the control knobs, then release four nuts securing the chassis to the side of the cabinet. The chassis can now be withdrawn to the extent of the loud-speaker and mains transformer leads. To remove further, disconnect the loudspeaker leads from the output transformer, then remove four screws and nuts securing the mains transformer to the base of the cabinet. The chassis and transformer can now be withdrawn together.

Care should be taken when re-fitting that all the covers are correctly fitted.

VOLTAGE AND CURRENT DATA : The following measurements were taken on a unit connected to a 245V 50 c/s supply, with the mains transformer set to the 240/250V tap. Voltmeter sensitivity 20,000 ohms per volt. Voltages are with respect to chassis, unless otherwise stated.

H.T. across C16	245V	H.T. across C15	219V
H.T. across C14	198V	H.T. consumption	72 mA
Pilot Lamp supply	5.4V A.C.	L.T. for valves	6.3V A.C.

VALVE VOLTAGES AND CURRENTS :

Valve	Anode			Screen			Cathode		
	Pin	V	mA	Pin	V	mA	Pin	V	mA
V1	6	58	0.82	1	58	0.15	3	12	0.97
V2A	9	57	0.3	—	—	—	8	0.03	0.3
V2B	6	238	30	7	219	5.8	2	17	25.8
V3A	9	139	0.59	—	—	—	8	59	0.59
V3B	6	238	30	7	219	5.8	2	17	35.8

D.C. RESISTANCE OF WINDINGS :

T1 Primary 165 + 205 ohms.

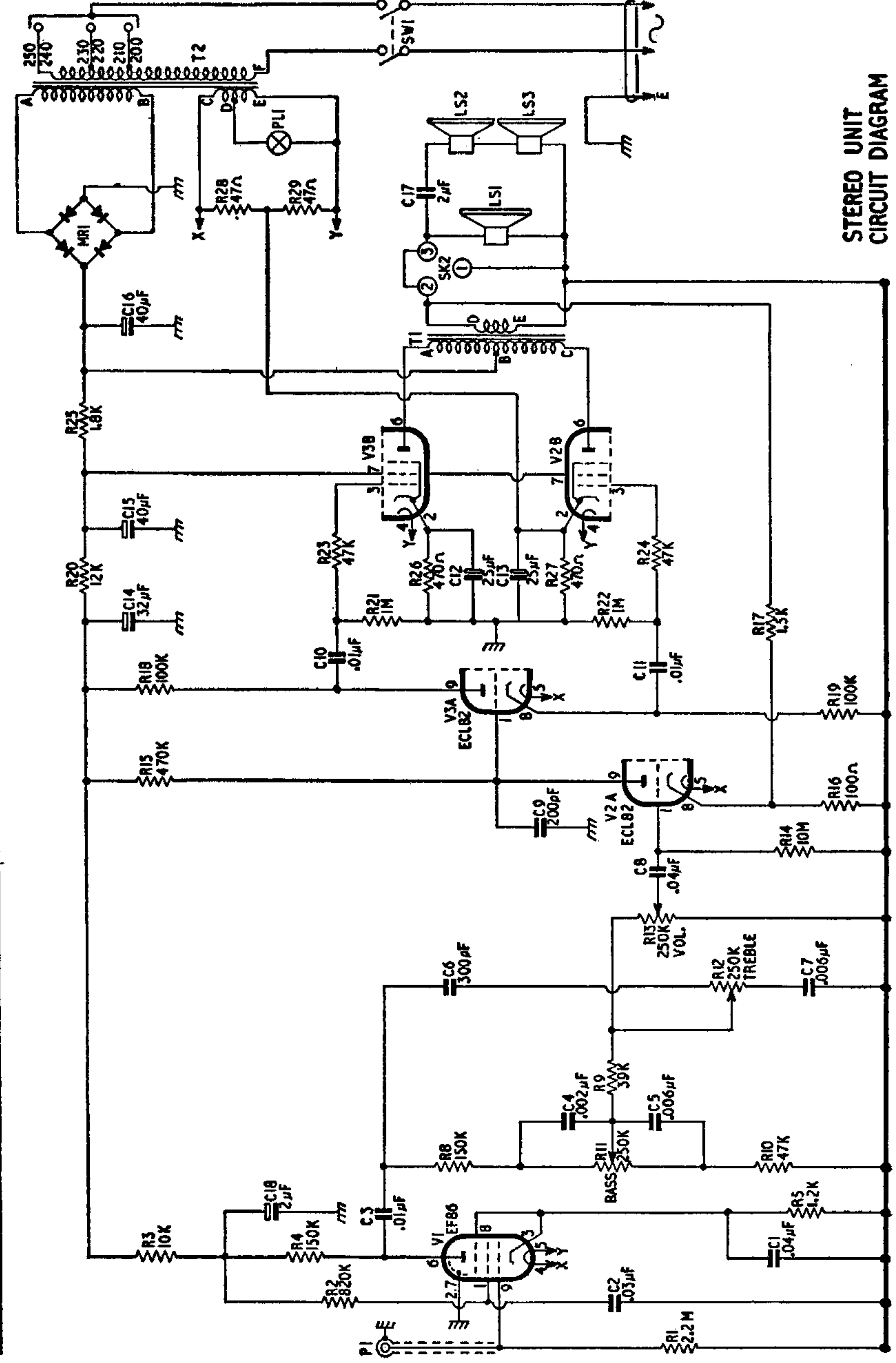
T2 Primary 65 ohms tapped at 60 ohms and 54 ohms.

H.T. Secondary 116 ohms.

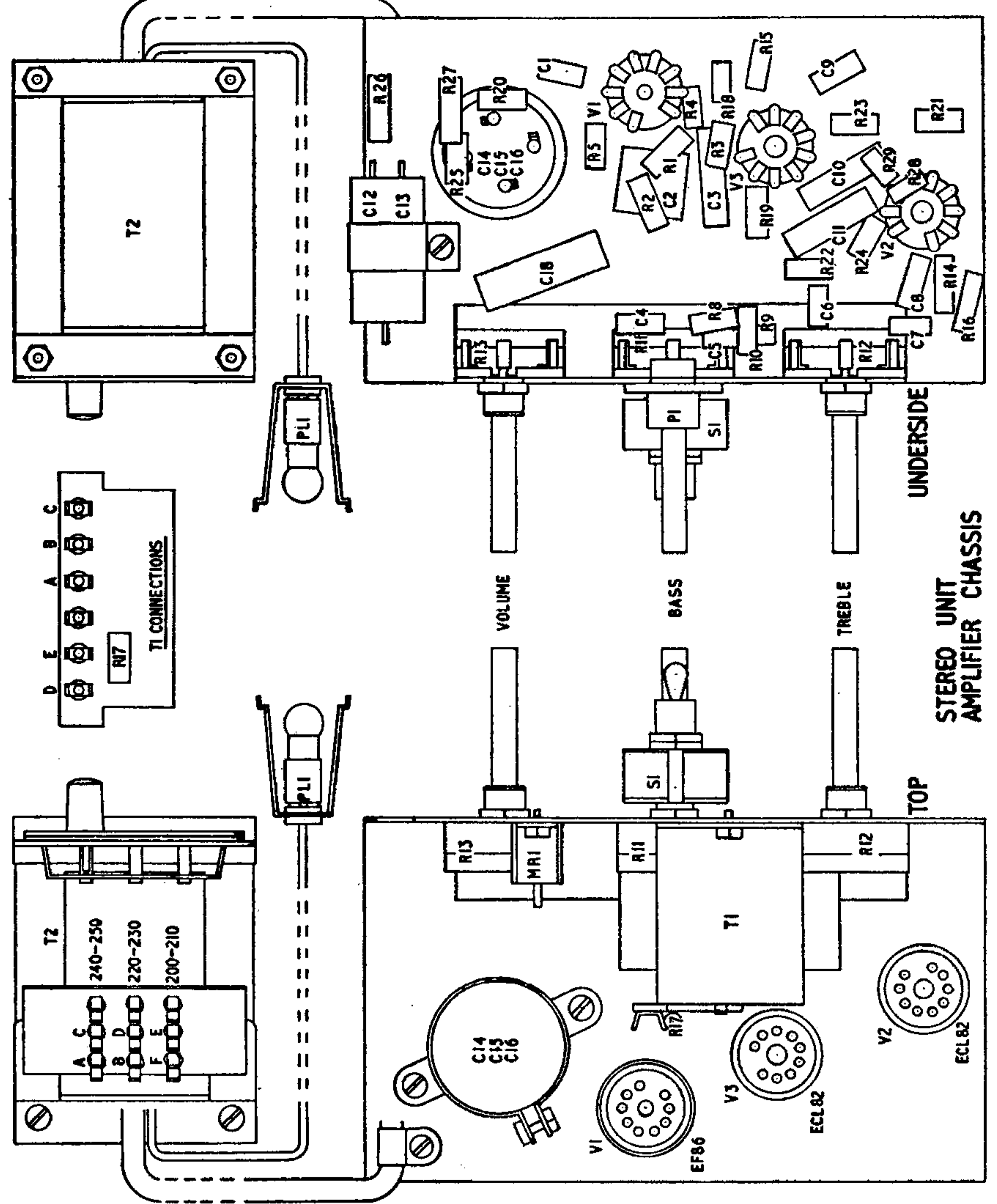
Other windings less than 0.5 ohms.

TUNING THE ACOUSTIC CHAMBER : The notes given on page 3 are also applicable to this unit, excepting that the Stereo Unit test set must be connected to SK2 (with P2 removed). The acoustic chamber vent cover is on the base of the cabinet and the back cover must be fitted securely in position. The instrument must be stood upright on its legs with no obstructions beneath the cabinet.

C	2.	1.	18.3.	4.	5.	6.	7.	8.	9.	10.	14.	12.	15.	16.	17.	18.	28.	29.
R	1.	2.	3.4.	5.	11.10.	12.	13.	14.	15.	18.	21.	20.26.23.	22.17.	27.	24.	25.		



STEREO UNIT CIRCUIT DIAGRAM



STEREO UNIT AMPLIFIER CHASSIS

SERVICE DEPT., E. K. COLE Ltd.,
 Somerton Works, Arterial Road,
 Southend-on-Sea
 'Phone: Southend 42296
 Head Office: Ekco Works, Southd an-Sea

SCOTTISH SERVICE DEPOT:
 17, Cadogan Street,
 Glasgow, C.2
 'Phone: Central 3633/4

NORTHERN SERVICE DEPOT:
 115, Jersey Street,
 Ancoats, Manchester, 4
 'Phone: Callyhurst 401/3

MIDLAND SERVICE DEPOT:
 11, Brook Street,
 Birmingham, 3
 'Phone: Central 2505/6