MODEL ARG256 is a 10 valve (including rectifier and tuning indicator) automatic radiogram designed for reception of FM signals on the VHF band and AM signals on the Long, Medium, and Short wavebands.

Waveband selection is made by a five position switch, which includes one position for gram.

Internal aerials are fitted for both AM (except on SW) and FM reception. For AM, a rotatable Ferrite rod, controlled by a knob on the receiver front, is used, whilst for FM a folded dipole is provided on the inside of the cabinet.

Sockets are provided for an 80 ohms external aerial for FM, or any conventional type for AM.

When using an 80 ohms external FM aerial, the internal 300 ohm FM aerial should be disconnected.

Push-pull output is employed to feed twin loud-speakers, a 12 in. dual cone, together with a 6½ in. high frequency unit, to give a smooth overall response throughout the audio frequency range.

The inclusion of an electronic tuning indicator, together with fly-wheel tuning, ensures rapid and precise selection of any programme required.

In the tone control circuits, separate bass and treble controls are provided. A five position treble filter switch gives a cut from 6 Kc/s. upwards or a basic treble lift starting at either 9 Kc/s., 6 Kc/s., or 3 Kc/s.

Sockets are also provided at the rear of the receiver, offering an AF output suitable for application to most types of tape recorder.

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

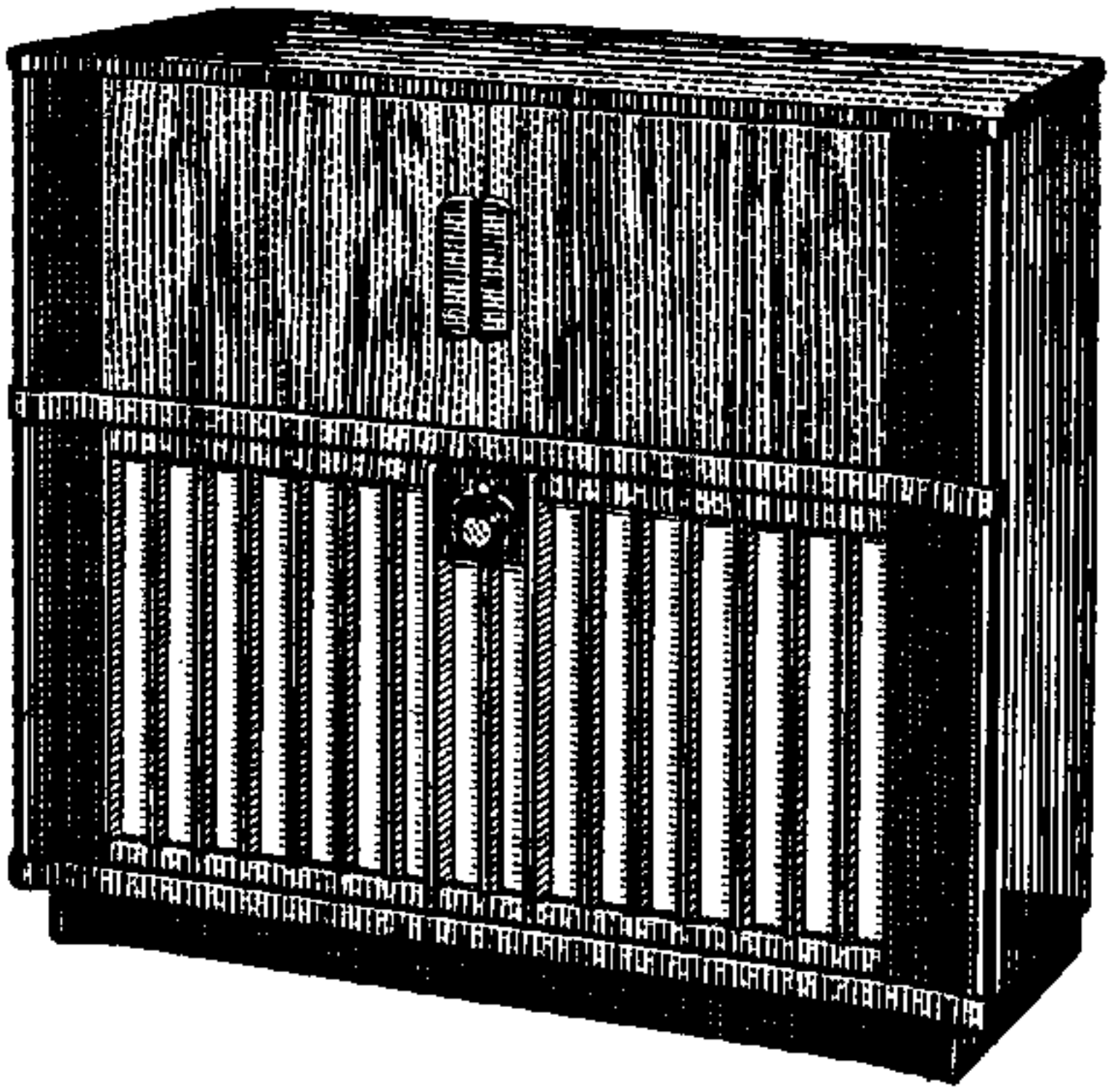
MAINS CONSUMPTION : On radio, 108 watts (including pilot lamps) ; on gram, 135 watts (including gram motor and lamp).

PILOT LAMPS : PL1 Pygmy lamp 230 volts, 15 watts B.C.
PL2 Pilot lamp 6.5 volts, 300 mA. M.E.S.
PL3 Pygmy lamp 230 volts, 15 watts B.C.

CONTROLS : Front of receiver—

Left (upper) TREBLE	Right (upper) TUNING
Left (centre) BASS	Right (centre) WAVEBAND
Left (lower) FILTER	Right (lower) AM AERIAL

Centre of Cabinet VOLUME—ON/OFF



VALVES		BASE	
V1	ECC85	B9A	VHF Amplifier, and self oscillating mixer.
V2	ECH81	B9A	VHF 1st IF Amplifier or AM Frequency Changer.
V3	EF85	B9A	VHF 2nd IF Amplifier or AM 1st IF Amplifier.
V4	EB91	B7G	Ratio Detector (FM).
OA79	Crystal diode		Detector (AM).
V5	ECC83	B9A	AF pre-Amplifier (radio). AF pre-Amplifier (gram).
V6	ECC83	B9A	AF Amplifier and Phase Splitter.
V7, V8	EL84	B9A	Push/pull Output.
V9	GZ30	Octal	HT Rectifier.
V10	EM80	B9A	Electronic Tuning Indicator.

WAVEBAND COVERAGE :

VHF	87.5-100 Mc/s.	(Band 2).
SW	6.0-18.9 Mc/s.	15.9-50 metres.
MW	525-1650 Kc/s.	182-571.5 metres.
LW	150-290 Kc/s.	1034.5-2000 metres.

LOUD-SPEAKER IMPEDANCE :

Internal 12 in. 15 ohms at 400 c/s.
Internal 6½ in. 3 ohms at 400 c/s.

An extension loud-speaker should be of 3 ohms impedance, and connected to the sockets provided at the rear.
A switch, adjacent to these sockets, selects the internal and/or external loud-speakers as required.

RECORD CHANGER : A Garrard Model RC90 or RC98 automatic record changer is fitted, which will handle up to 10 records of the same size, standard or long-playing. It also includes a variable speed control to permit precise adjustments.
Provision is made for manual operation to permit individual playing of rare or non-standard records.

OUTPUT : 10 watts (approx.).

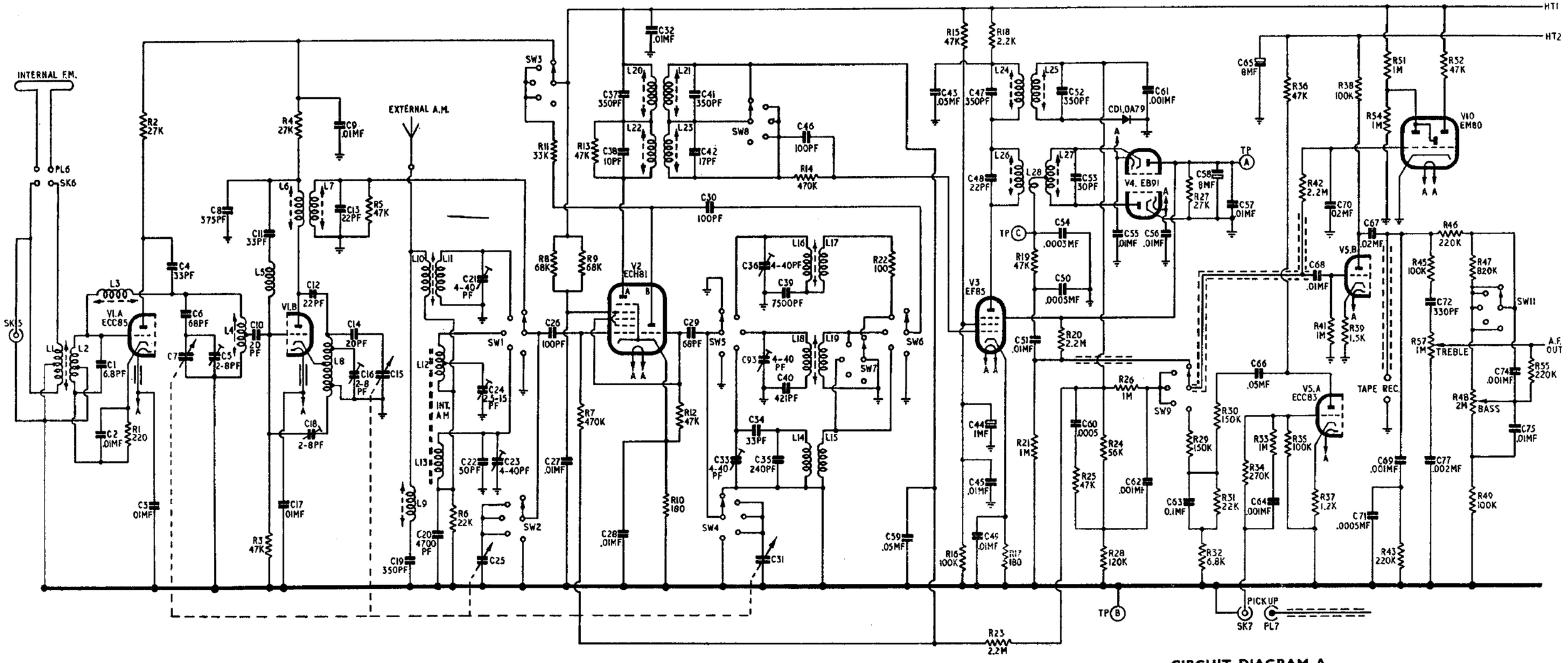
INTERMEDIATE FREQUENCY :

FM 10.7 Mc/s. AM 460 Kc/s.

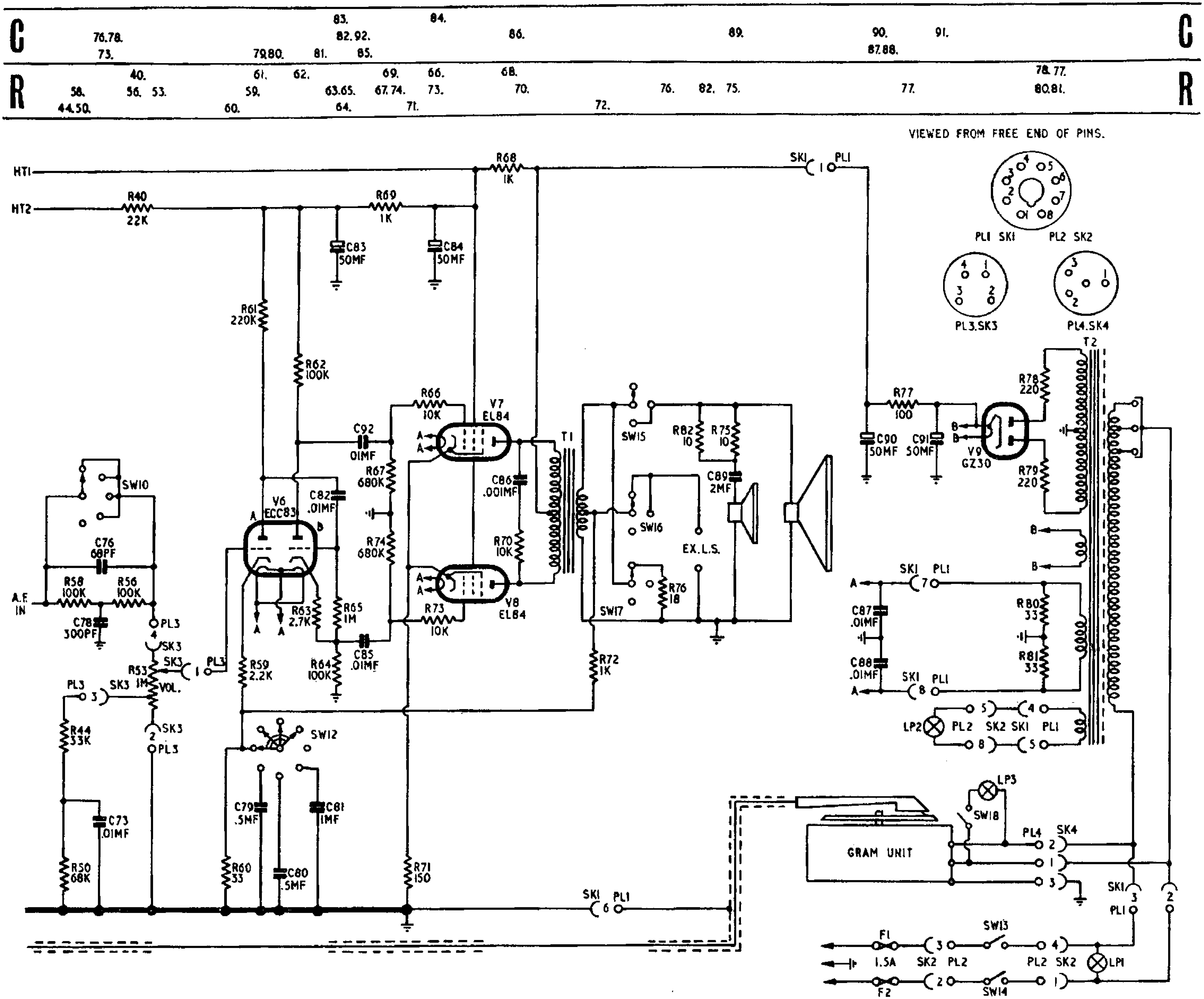
CIRCUIT DETAILS

FM OPERATION

RF AND MIXER STAGES : FM signals from the dipole are fed to the aerial coils L1.L2 and then to the control grid of V1.A operating as a neutralized RF triode. L3 and C4 connected between the anode and grid of V1.A neutralize the valve to prevent instability or oscillatory radiation.
The amplified signal appearing at the anode of V1.A is fed via C4, a tapped coil L4 and C10 to the grid of a self-oscillating triode V1.B. The RF section of the tuning capacitor, C7, its padding capacitor C6 and trimmer C5 are shunted across the valve V1.A.
A parallel fed Hartley circuit is employed in V1.B stage, the oscillator output frequency being higher than that of the incoming signal.
C15 and C16 are the oscillator tuning capacitor, and its trimmer respectively.
In order to increase the gain of V1.B, a part of the resultant IF signal appearing at the anode is fed back via C11 to the grid circuit. The choke L5 prevents RF leakage from grid to earth but allows IF to pass.



CIRCUIT DIAGRAM A



CIRCUIT DIAGRAM B

IF STAGES : The IF signal at the anode of V1.B is fed via the first IF transformer L6.L7 and switch SW1 to grid 1 of the heptode V2.A which operates as an IF amplifier on FM. The triode section of this valve, V2.B, is rendered inoperative by the switch SW3 open-circuiting the HT to its anode. From the heptode anode the amplified IF signal is passed via a further IF transformer L22.L23 to the grid of V3 for amplification. L22 primary winding is in series with the AM primary L20 but SW8 short circuits the AM secondary L21 on FM.

This prevents IF signals at 460 Kc/s. passing to the detector stage. On high signal inputs a voltage, built up across R14, is passed to the control grid of V3 and is additive to the fixed bias on the valve, which therefore makes the grid more negative with respect to the cathode, to result in a limiting action on signals above a pre-determined level. The amplified output from V3 is therefore more constant.

RATIO DETECTOR : The 3rd IF transformer consists of three windings L26.L27 and L28. To the centre tap of L27, L28 applies a signal voltage that is in constant phase relationship with the voltage in the primary L26.

The voltage, across L27 which is derived from the coupling to L26, is 90 degrees out of phase with that across L26, when the FM signal is at the mean frequency, and the sum total of signal voltages at the ends of L27 are equal and opposite. If this is applied to the opposed diodes of V4, it produces a constant output.

When the signal voltage in L26 deviates above or below the mean frequency, the phase in L27 changes relative to the degree of deviation. The total voltage $\frac{1}{2}L27 \pm L28$ applied to one diode will, therefore, increase while the voltage to the other will decrease similarly.

The resultant output from the diodes will vary in direct sympathy with the deviation of the FM signal, i.e., in accordance with the audio content.

The reservoir action of the capacitor C58 across the diodes assists in removing any AM content in the output.

A stabilising voltage is fed from the negative side of R27 to the suppressor grid (pin 9) of V3 for A.G.C.

AF AND OUTPUT STAGES : AF output from the ratio detector is developed across C54 and is taken via R19, C50, the de-emphasis network and C51, SW9, C68, to V5.B grid.

At high audio frequencies the capacitor C50 presents a low impedance to give a potentiometer effect, which attenuates the high frequencies.

At low audio frequencies, however, the capacitor has a high impedance with a negligible effect upon the signal. Thus the amplitude of the high audio frequencies is returned to the correct level, i.e. de-emphasised to restore the normal characteristics of the AF signal. The signal appearing at the anode of V5.B is fed via C67, the tone controls, filter switch and volume control, to the grid of V6.A AF amplifier. After amplification it is fed from the anode to the grid of the phase-splitter V6.B from which anti-phase signals are taken off at the anode and cathode, respectively. Two EL84 valves, V7.V8 in push pull, provide the final AF amplification stage, to feed the two internal loud-speakers via the output transformer T1. Negative feed back is provided by the speaker transformer secondary, fed back to the cathode of the AF amplifier V6 via R72.

TONE CONTROLS, PICK UP, AND TAPE RECORDER CIRCUITS

Separate treble and bass controls R57, R48 are used in the tone control circuit.

R57 in conjunction with R45.C72 and C77 make up a top lift circuit. By moving R57 slider towards the earthy end of its traverse (anti-clockwise) the amplitude of the treble frequencies decreases. In the reverse direction (clockwise) the upper frequencies are increased.

The bass control R48 together with R49.R55.C75.C74 form the bass lift circuit, which increases the bass as the resistance is increased between SW11 and earth. Maximum bass is obtained at the fully clockwise position of the control.

A pre-amplifier for the pick-up input is a triode V5.A which amplifies the output from the high fidelity crystal head, before passing the AF via SW9 to the grid of V5.B.

The two networks, consisting of R33.C64.R34 in the grid of V5.A, and R29.R30.R31.R32.C63.C66 in the anode, are for pick-up compensation.

To enable the use of a tape recorder, sockets have been provided to give an audio output from the anode of the first AF amplifier.

TUNING INDICATOR : To facilitate accurate station adjustment, an electronic tuning indicator V10 is incorporated.
V10 is negatively driven, so that internal fluorescence increases with a corresponding increase in the signal input level. A steady DC potential is applied to the anodes via R51.R52.R54 from the HT line.

POWER SUPPLIES : The mains transformer T2 has three primary tappings. The anodes of the full wave rectifier V9 are connected to the HT secondary winding through the two surge limiting resistors R78.R79, the DC output being smoothed by C90.R77.C91. Heater supplies are taken from a separate winding, which has two resistors R80.R81 with their centre point earthed, connected in series across the winding to balance out the hum. The two capacitors C87.C88 also across the winding provide VHF decoupling, the centre tap again being earthed.

AM OPERATION

RF MIXER STAGE : AM signals from the aerial pass to the control grid (heptode section) of V2 via SW1 and C26. L9.C19 form an effective IF rejector circuit.

The AM section of the main tuning capacitor C25 is shunted across one of the three tuned circuits as determined by the setting of the selector switch SW2.

In the local oscillator section of V2 are three individually tuned HF transformers, covering the LW, MW, and SW bands. The secondary of each transformer is selected by the switch SW5 for connection to the triode grid.

Primary windings are selected by the switch SW6 and connected to the triode anode. SW7 is used to earth the primary winding of the range following the waveband in use.

The oscillator section of the main tuning capacitor is shunted across each grid coil by the switch SW4.

NOTE.—On AM operation V1 is inoperative, the HT feed being open circuited by the switch SW3.

INTERMEDIATE FREQUENCY STAGES : The oscillator and incoming signals combine to form an IF signal at the anode of V2 and is fed via the 1st IF transformer L20.L21 and SW8 to the grid of V3, operating as an IF amplifier.

As on FM operation, L20 primary is in series with L22, but the FM secondary L23 is short-circuited by the switch SW8 when on AM operation.

The amplified IF signal at the anode of V3 is passed via a further IF transformer L24.L25 to the crystal diode CD1 for demodulation.

The DC voltage developed across R24 and R28 is fed back as A.G.C. via R23, to V3 and V2 control grids.

AF AND OUTPUT STAGES : The rectified AF output from the diode CD1 is fed via the AF amplifier V5.B and the tone controls to the output stage for final amplification.
The output and power supply circuits are common to both AM and FM operation, previously described under FM operation.

ALIGNMENT (1)

PROCEDURE FOR FM BAND using FM/AM signal generator and an output meter or low range AC voltmeter. The output meter should be connected across the loud-speaker tags leaving the LS in circuit.

IF 10.7 Mc/s.

SWITCH TO FM and tune receiver to 87.5 Mc/s. Inject a 10.7 Mc/s. ±25 Kc/s. deviation with 400 c/s. tone via a 150 pf capacitor between the 2nd IF secondary L23 and chassis. Tune L26.L27 for maximum response.

Switch generator to AM 30% mod and tune L27 for the sharpest minimum response.
Switch generator back to FM. Check bandwidth for 6dB loss in output with ±5 Kc/s. deviation. It should be approximately ±100 Kc/s.

Increase generator deviation to ±25 Kc/s. and inject signal to 1st IF secondary L7.

Tune L22 and L23 for maximum response. Check bandwidth for 6dB loss with ±5 Kc/s.deviation and retune for symmetry if necessary. Inject signal to the junction of L4.C10 and tune L7.L6 for maximum response.

NOTE.—The IF signal level at L4.C10 will be approximately half that injected into L7.

Check bandwidth as before.

RF. 87-100 Mc/s.

(a) Tune receiver to 90 Mc/s. and inject a signal at the same frequency, ±25 Kc/s. deviation, to the VHF aerial input socket. Tune L8 for maximum response, on the first peak from fully in position, and check for image at 111.4 Mc/s.

(b) Tune receiver to 98 Mc/s. and inject a signal at the same frequency. Adjust C16 for maximum response, on first peak from minimum capacity of trimmer.

Check for image at 119.4 Mc/s. and calibration at 90 Mc/s.

(c) Tune receiver to 90 Mc/s. and inject a signal at the same frequency.

Tune L4 for maximum response, retuning receiver if necessary.

Adjust C7 for maximum response at 98 Mc/s. retuning receiver if necessary. Check at 90 Mc/s.

(d) Tune receiver to 94 Mc/s. and inject a signal at the same frequency. Tune L2 for maximum response.

(e) Disconnect R2 (27K) from the HT and connect it to chassis. Tune L3 for minimum response at 94 Mc/s. Reconnect R2 to the HT supply.

(f) Connect a valve voltmeter of high sensitivity between the centre tap of L4 and chassis, and tune C18 for minimum oscillator voltage at this point.

(g) Repeat (a) and (b) for accurate calibration and (c) for maximum response.

ALIGNMENT (2)

PROCEDURE FOR FM BAND USING AN AM SOURCE

IF. Switch to the FM band and tune receiver to 87.5 Mc/s. Connect a high sensitivity voltmeter (20,000 ohms/volt) across C58, and connect points (a) and (b) of the test jig meter also across C58. Connect point (c) of the test jig to the junction of L28 and C54. C58 (8 mfd) is located above chassis adjacent to V5, V7, whilst C54 (.0003 mf) is below chassis adjacent to V4. The test jig is shown on page 6, but the meter should be 50 microamps.

Inject a 10.7 Mc/s. CW signal between the 2nd IF secondary L23 and chassis via a 150 pf capacitor.

Tune L26 and L27 for maximum response on the voltmeter. Retune L27 for minimum response on the test meter.

Disconnect test jig meter from the receiver. Tune L22.L23.L7.L6 and L1 as described in the main alignment instructions using a 10.7 Mc/s. signal without modulation, and the voltmeter as an output meter.

RF. The procedure given in the previous RF instructions should be followed using a voltmeter across C58 (8 mfd) as an output meter and with an AM source.

ALIGNMENT (3)

PROCEDURE FOR AM BANDS

IF. 460 Kc/s.

SWITCH TO MW and fully mesh the tuning capacitor (control fully clockwise).

Inject a 460 Kc/s. signal (modulated 30% 400 c/s.) across C25. Connect a 47K damping resistor across L24 and tune L25 for maximum response.

Transfer the damping resistor to L21 and tune L24 for maximum response. Connect the resistor across L24 and tune L21 for maximum response.

Transfer resistor to L21 and tune L20 for maximum response. Check for overall symmetry and bandwidth.

Inject 460 Kc/s. signal into the aerial socket and tune L9 for minimum response.

RF.

(a) **SWITCH TO LW** and tune receiver to 275 Kc/s.

Inject a signal at the same frequency into the aerial socket. Adjust C33 and C23 for maximum response. Check calibration and tracking at 150 Kc/s., 200 Kc/s., and 250 Kc/s.

Tune receiver to 150 Kc/s. and inject a signal at the same frequency. Adjust L13 for maximum response.

(b) **SWITCH TO MW** and tune receiver to 1300 Kc/s.

Inject a signal at the same frequency to the aerial socket. Adjust C93 for maximum response.

Tune receiver to 600 Kc/s. and inject a signal at the same frequency. Tune L18 for maximum response. Check calibration at 1300 Kc/s. and readjust C93 if necessary.

Tune receiver to 1300 Kc/s. and inject a signal at the same frequency. Adjust C24 for maximum response. Check calibration and tracking at 800 Kc/s.

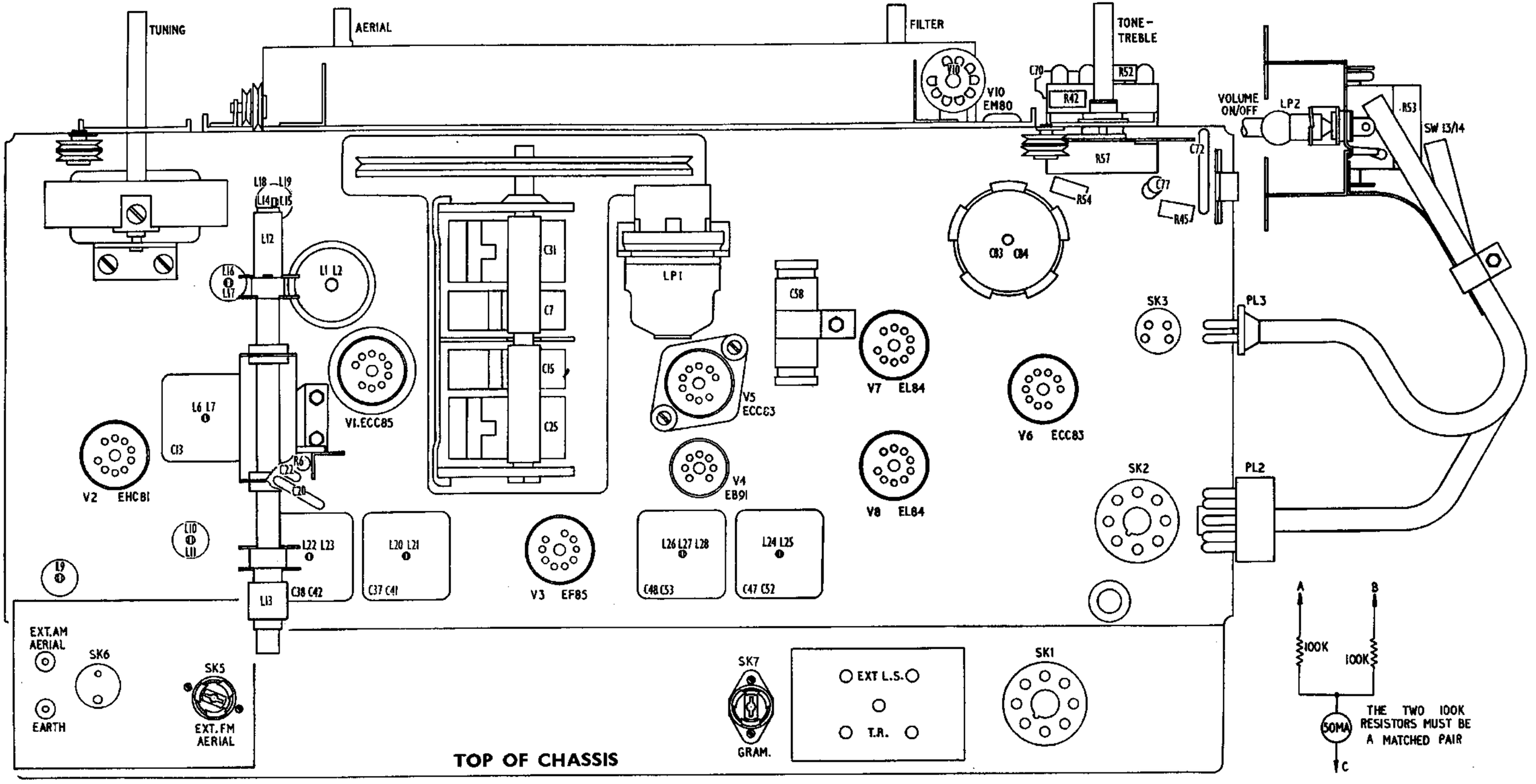
Tune receiver to 600 Kc/s. and inject a signal at the same frequency. Adjust L12 on the ferrite rod for maximum response.

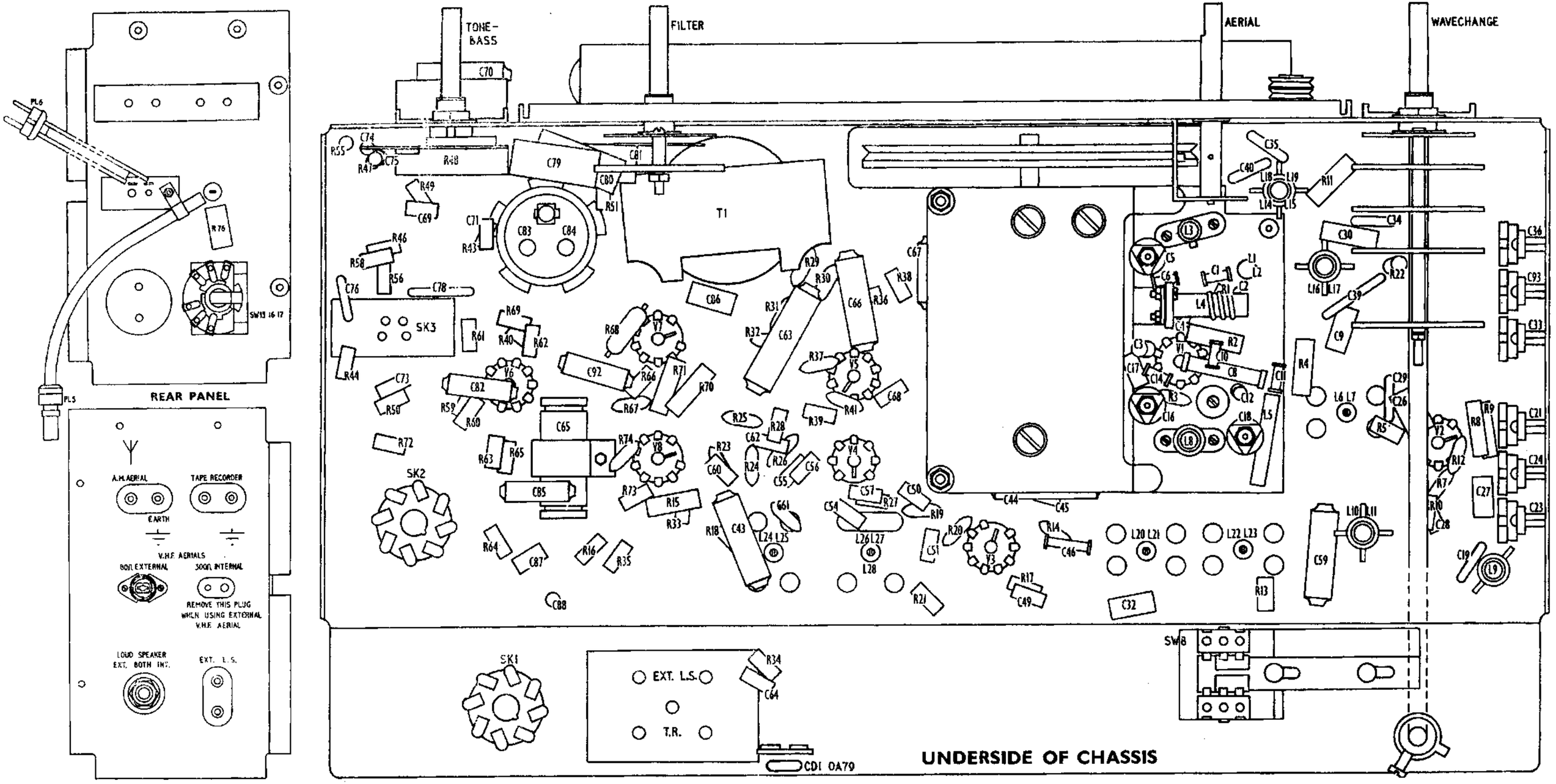
(c) **SWITCH TO SW** and tune receiver to 7.0 Mc/s.

Inject a signal at the same frequency to the aerial socket and tune L16 for maximum response on first peak approaching from the core fully out position.

Tune receiver to 16 Mc/s. and inject a signal at the same frequency. Adjust C36 for maximum response on first peak approaching from minimum capacity of the trimmer.

Check at 7.0 Mc/s., retuning L16 if necessary. Check also for images at 7.0 and 16 Mc/s.


TUNING
AERIAL
FILTER
TONE – TREBLE
VOLUME ON/OFF
LP2
SW 13/14
R53
R52
R42
C79
R57
C72
C77
R54
R45
V10 EM80
C83 C84
SK3
PL3
L18 – L19
L14 L15
L12
L16
L17
L1 L2
C31
C7
C15
C25
LP1
C38
V5 ECC83
V7 EL84
V6 ECC83
V1. ECC85
L6 L7
C13
R6
C22
C20
V2 EHC81
V4 EB91
V8 EL84
SK2
PL2
L10
L11
L9
L22 L23
L20 L21
L26 L27 L28
L24 L25
C38 C42
C37 C41
C48 C53
C47 C52
L13
V3 EF85
EXT. AM AERIAL
SK6
EARTH
SK5
EXT. FM AERIAL
SK7
GRAM.
EXT L.S.
T.R.
SK1
A
B
100K
100K
50MA
C
THE TWO 100K RESISTORS MUST BE A MATCHED PAIR
TOP OF CHASSIS


TONE-
BASS
FILTER
AERIAL
WAVECHANGE
PL6
PL5
REAR PANEL
A.M. AERIAL
TAPE RECORDER
EARTH
V.H.F. AERIALS
80Ω EXTERNAL
300Ω INTERNAL
REMOVE THIS PLUG
WHEN USING EXTERNAL
V.H.F. AERIAL
LOUD SPEAKER
EXT. BOTH INT.
EXT. L.S.
SW13 16 17
SK1
SK2
SK3
EXT. L.S.
T.R.
T1
SW8
CDI 0A79
UNDERSIDE OF CHASSIS

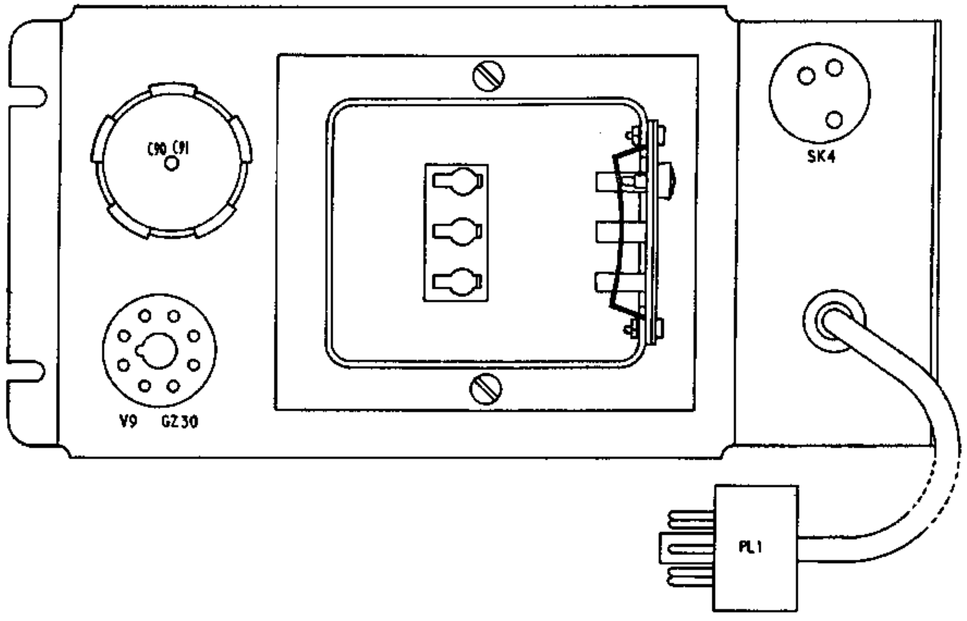
Tune receiver to 7.0 Mc/s. and inject a signal at the same frequency.
Tune L11 for maximum response.
Adjust C21 for maximum response at 16 Mc/s. and check at 7.0 Mc/s., retuning L11 if necessary.
Check for calibration and tracking at 12 and 17.55 Mc/s., the latter mark being 6.61 in. from the datum line.

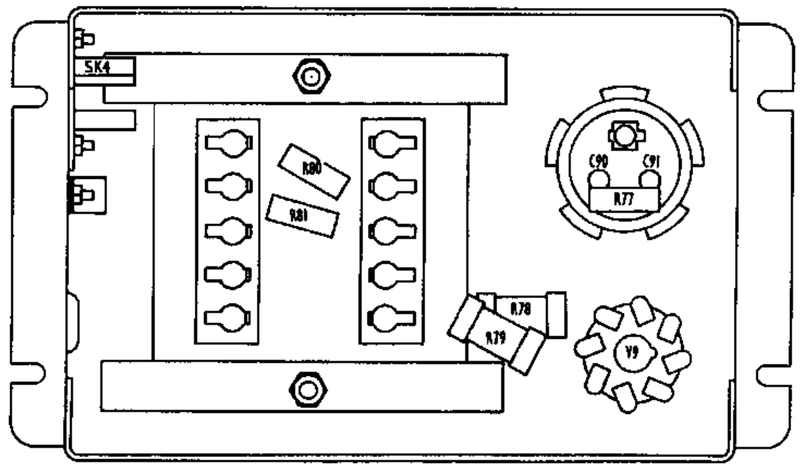
CHASSIS REMOVAL.

First remove the two back covers, the top left hand cover from the radio compartment and the bottom right hand cover behind the loud-speaker.
Remove the volume control knob and the escutcheon plate. This exposes two wood screws which should also be removed.
Release the plugs PL3 and PL2 located on the top of the chassis at the rear right hand corner (looking from the back), and finally withdraw the volume control complete with leads and plugs through the front of the cabinet.
Remove all the remaining control knobs, then remove the eight screws from the front of the cabinet securing the front panel and scale, and withdraw same.
Finally, remove all plugs and sockets at the rear, together with the four chassis securing bolts, then withdraw the chassis assembly through the front of the cabinet.
To remove the small power unit chassis, release the 3-way plug and the four securing bolts.

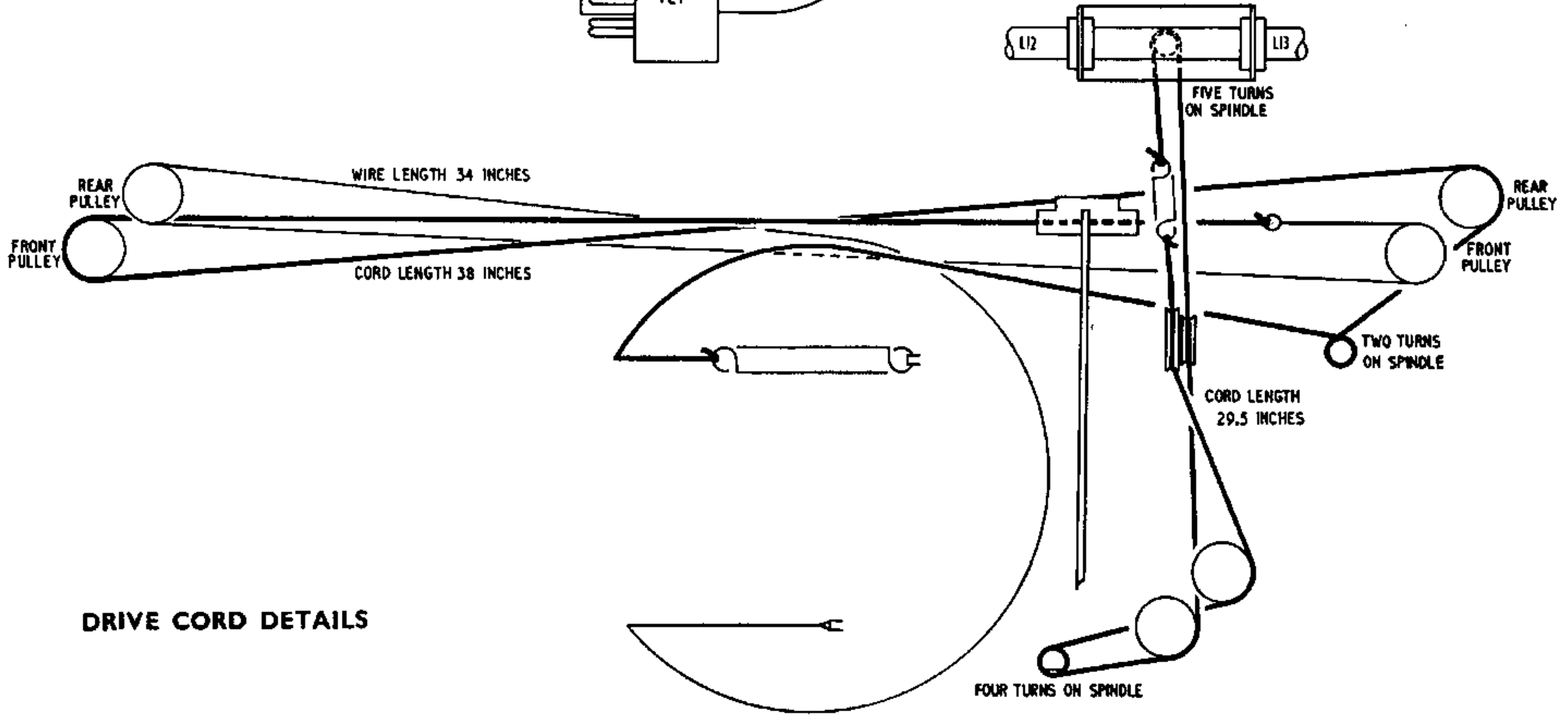
GRAM UNIT REMOVAL : To remove record changer unit disconnect mains supply plug from the power unit, and the pick-up lead co-axial plug from the main chassis.
Unscrew the three securing bolts that hold the gram unit to the motor board, and lift the gram unit out through the back of the cabinet.

DRIVE CORD DETAILS : The diagram gives full instructions for fitting a replacement cord. Before using new cord it should be stretched to prevent slack drive developing in later use.





POWER UNIT



DRIVE CORD DETAILS

SERVICE NOTES

COMPONENT REPLACEMENT : Care should be taken to ensure that leads are not displaced when replacing faulty parts especially in the circuits associated with V1.

It is also important to ensure that when replacing parts directly concerned with the F.M. circuit, they have the same value and operating characteristics as the original components.

VALVE REPLACEMENT : The ECH81 and EF85 valves may generally be replaced without realignment of associated circuits, as can the ECC85 in areas where the signal strength is reasonably strong. When replacing the EB91 a listening check should be made to ensure that the noise rejection is not impaired.

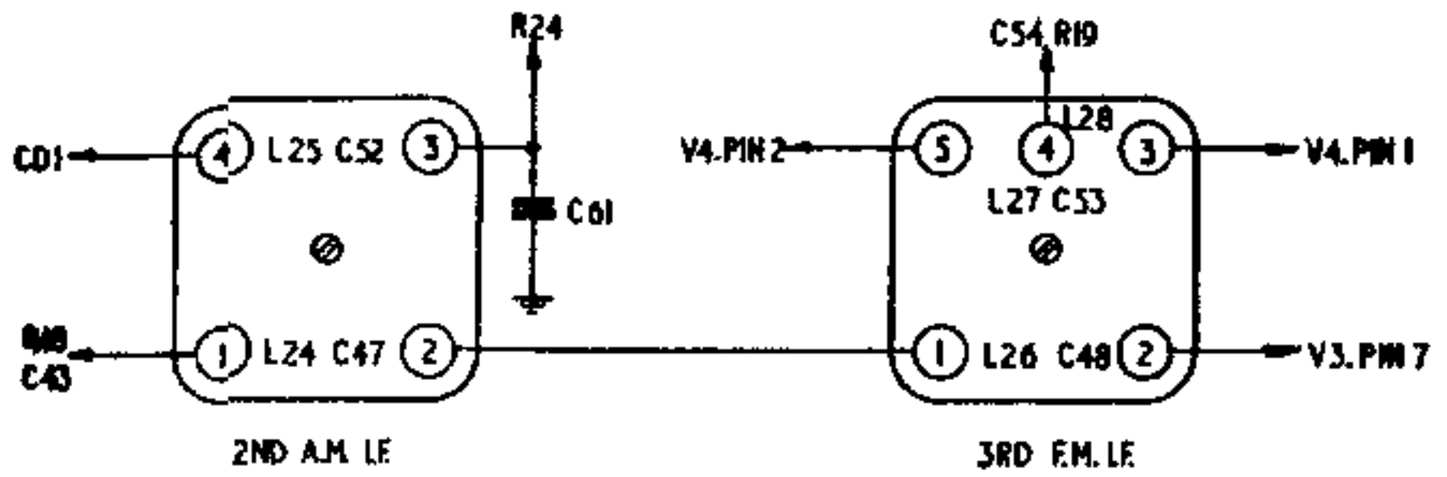
VOLTAGE AND CURRENT DATA

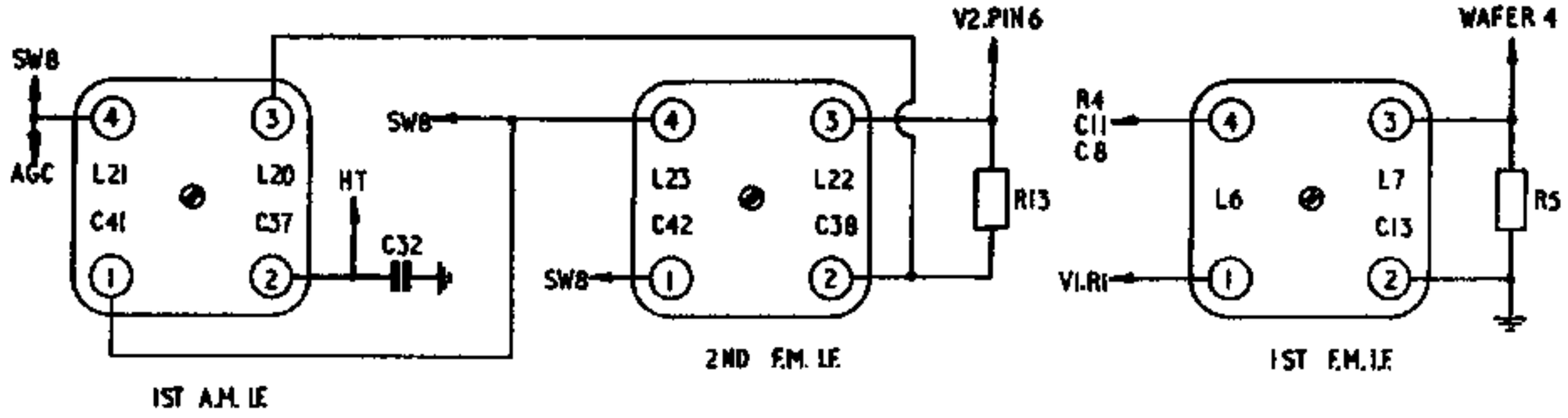
Valve	Type	Anode		Screen		Cathode		Heaters
		V	mA	V	mA	V	mA	V
V1.A V1.B	ECC85	118 130	4.0 5.0	– –	– –	0.9 –	4.0 5.0	6.3
V2.A V2.B	ECH81	255 106	1.8 4.7	100 –	4.9 –	2.12 2.12	11.5 11.5	6.3
V3	EF85	236	10	117	2.0	2.35	12	6.3
V4	EB91	–	–	–	–	–	–	6.3
V5.A V5.B	ECC83	167 140	1.0 0.8	– –	– –	1.3 1.25	1.0 0.8	6.3
V6.A V6.B	ECC83	150 205	0.5 0.6	– –	– –	1.23 54	0.5 0.6	6.3
V7 V8	EL84	292 292	28 28	260 260	3 3	9.3 9.3	31 31	6.3
V9	GZ30	300 0 300	–	–	–	300	90	5.0
V10	EM80	30	0.2	Target 260	3	–	3.2	6.3

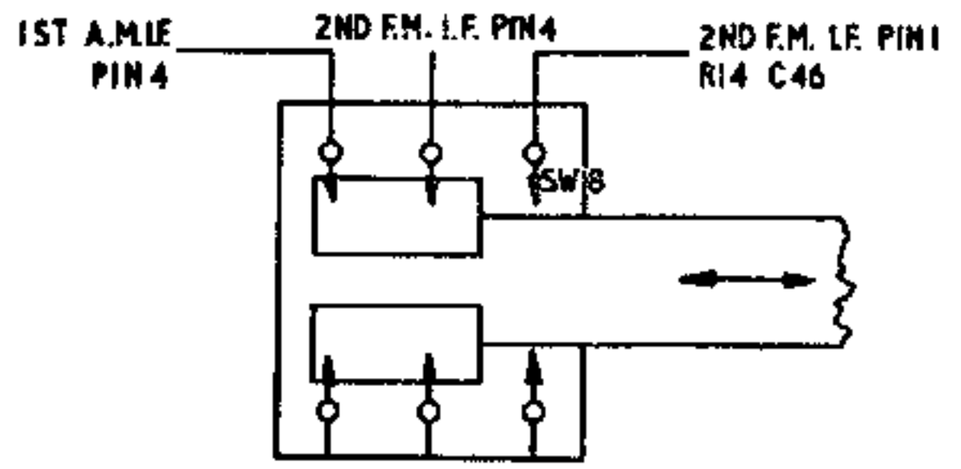
DC RESISTANCE OF WINDINGS

Circuit Ref	Coil	Ohms	Part No.
L1	VHF Aer. Pri.	*	DP23745
L2	VHF Aer. Sec.	*	DP23934
L3	VHF Neutralising	*	DP23933
L4	VHF Intervalve	*	DP106007
L5	VHF Choke	1	DP22983
L6	1st FM IF Pri.	*	DP22780
L7	1st FM IF Sec.	*	DP22780
L8	VHF Osc. Coil	*	DP22783
L9	AM IF Rej.	5.0	DP23459
L10	SW Aer. Pri	2.9	DP23457
L11	SW Aer. Sec.	*	DP23457
L12	MW Aer.	2.0	DP23442
L13	LW Aer.	3.5	DP23442
L14	LW Osc. Sec.	5.5	DP23443
L15	LW Osc. Pri.	3.5	DP23443
L16	SW Osc. Sec.	*	DP23456
L17	SW Osc. Pri.	*	DP23456
L18	MW Osc. Sec.	3.2	DP23443
L19	MW Osc. Pri.	*	DP23443
L20	1st AM IF Pri.	12	DP22779
L21	1st AM IF Sec.	10.5	DP22779
L22	2nd FM IF Pri.	*	DP23445
L23	2nd FM IF Sec.	*	DP23445
L24	2nd AM IF Pri.	12	DP22779
L25	2nd AM IF Sec.	10.5	DP22779
L26	3rd FM IF Pri.	*	DP22782
L27	3rd FM IF Sec.	*	DP22782
L28	3rd FM IF Ter.	*	DP22782
T1	Pri.	148+190	SA5482
T1	Sec.	1.2	
T2	Pri.	19.0	
T2	Sec. HT	84+90	SA5481
T2	Sec. LT	*	

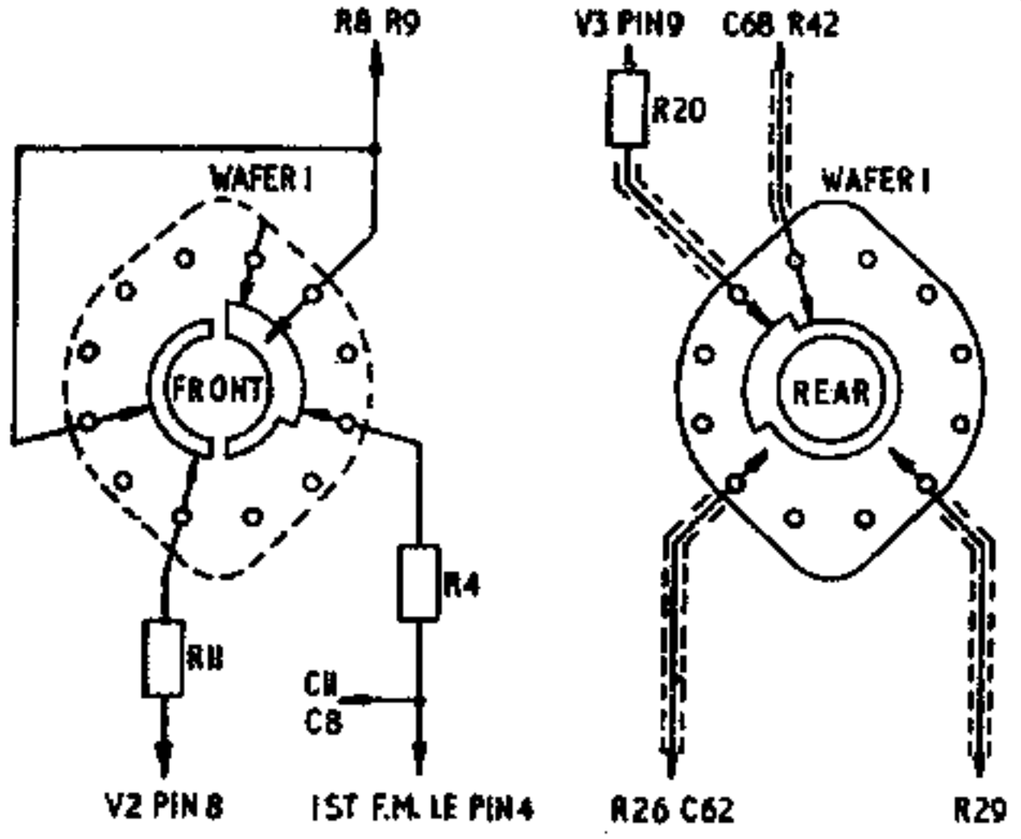
*Less than 1 ohm.

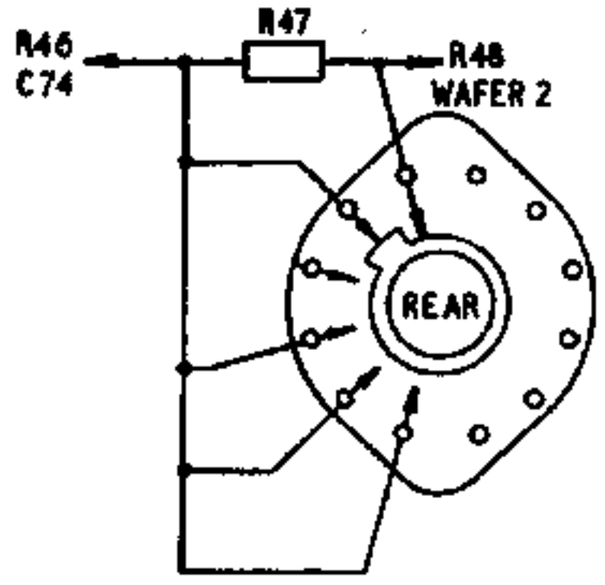


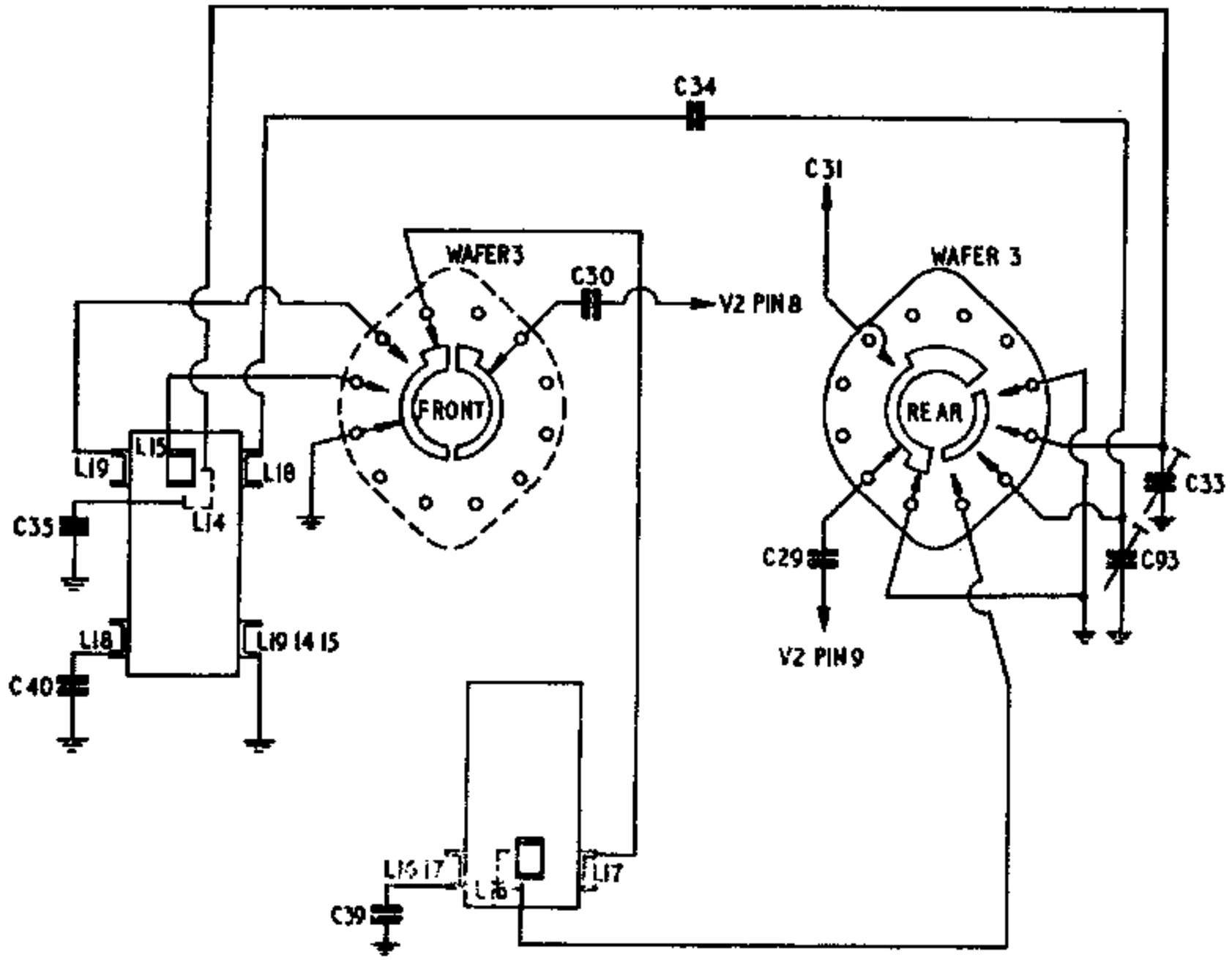


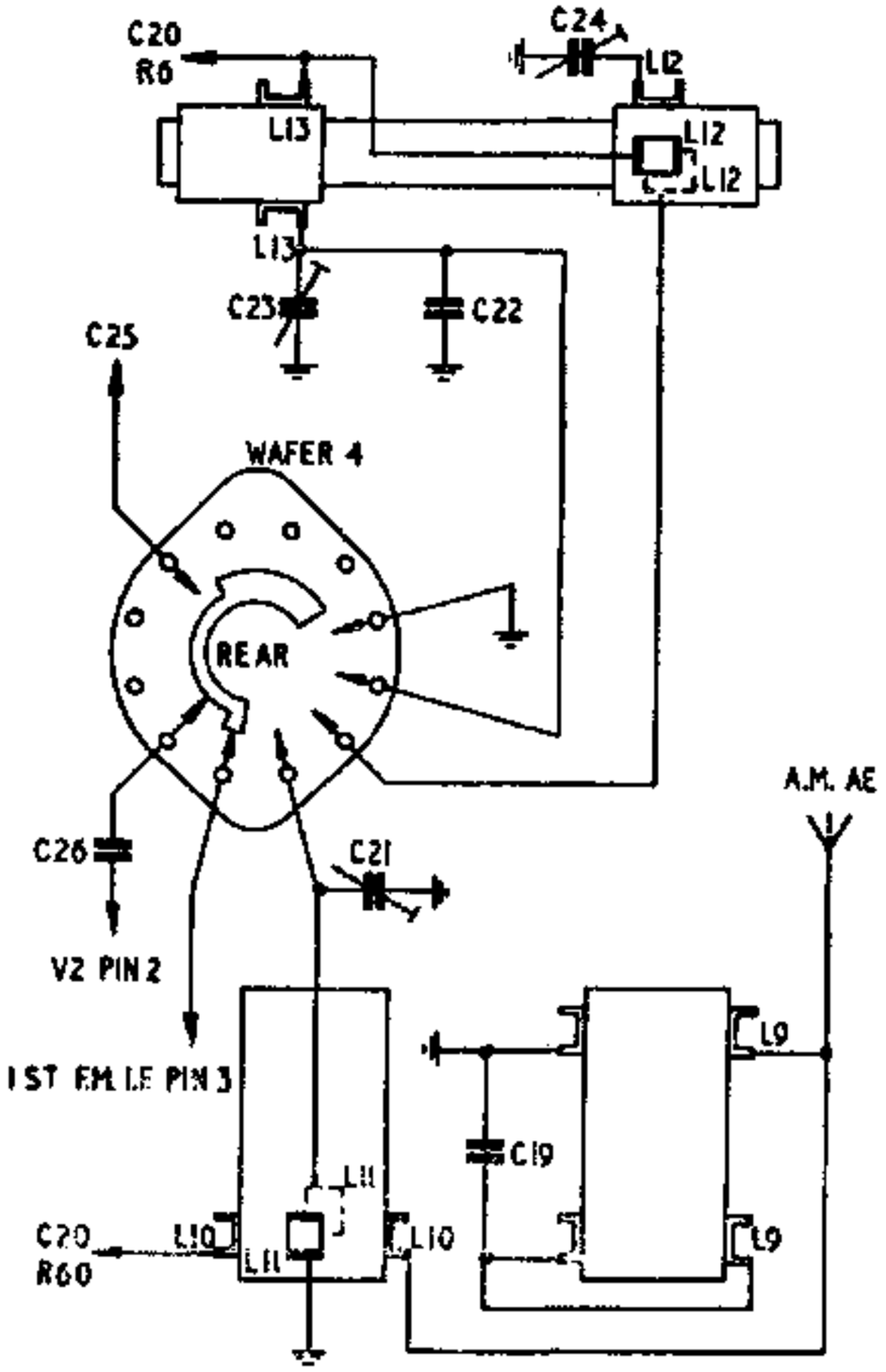


THE LOWER CORE IS THE PRIMARY IN ALL ASSEMBLIES EXCEPT IN THE 3RD F.M. I.F.









SWITCH AND COIL WIRING

ALL WAFERS VIEWED FROM THE REAR WITH CHASSIS INVERTED

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