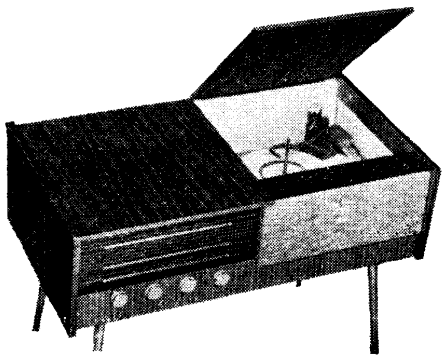
"TRADER" SERVICE SHEET

1553

PHILCO 84

An A.M./F.M. Radiogram for A.C. Mains operation



Appearance of the Philco 84

INCORPORATING a B.S.R. type UA14 record changer, the Philco 84 is an A.M./F.M. radiogram designed for A.C. mains operation. Waveband ranges are 188-550m (M.W.), 1,100-1,920m (L.W.) and 82-101 Mc/s (F.M.). A printed circuit panel is employed for the main receiver wiring and a separate tuner unit houses the F.M. V.H.F. section.

The chassis is fitted with an internal ferrite rod aerial for A.M. reception and is provided with sockets for the connection of an external F.M. aerial. Sockets are also provided for the connection of an external A.M. aerial and earth, and an external loudspeaker. Capacitive tuning is used on all wavebands.

Release date and original price: June, 1961, £35 14s. *Purchase tax extra.*

VALVE ANALYSIS

Valve voltages given in the table (col. 3) are those derived from the manufacturers' information. They were measured with a 20,000Ω/V meter, chassis being the negative connection in every case. The receiver was operating from A.C. mains of 230V with the mains adjustment set at the 230-250V tapping.

CIRCUIT DESCRIPTION

Operation on A.M.

Aerial coils **L8** and **L9** are mounted on a ferrite rod to form an internal aerial. For M.W. reception, **S2** is closed to short-circuit **L9,** and **L8** is tuned by **C23** and **C24.** For L.W. reception, **L8** and **L9** are connected in series and **S3** is closed to connect the additional tuning capacitor **C26** across the coils.

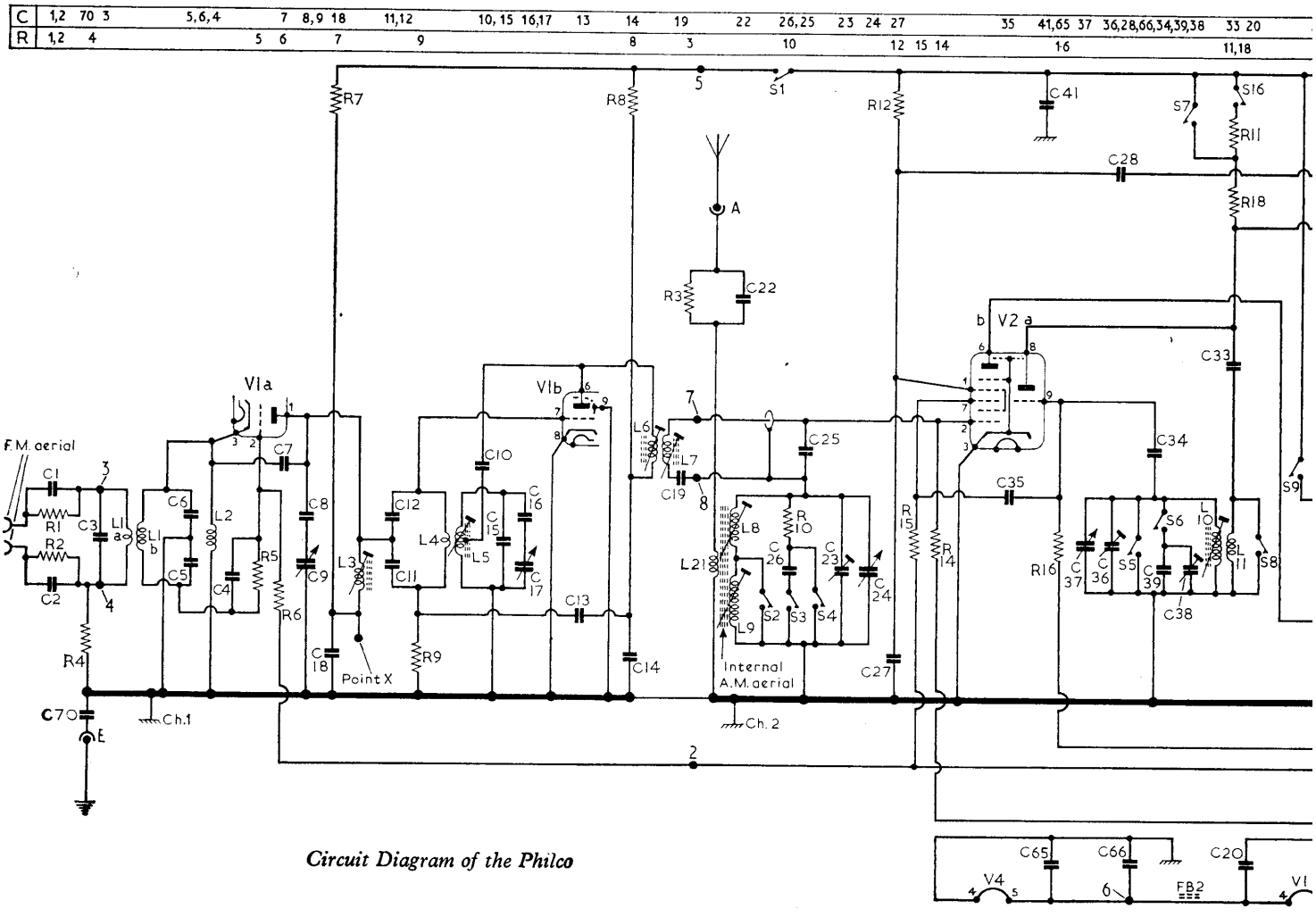
Signals from an external aerial are coupled via **R3, C22** and **L21** to the ferrite rod.

Triode-heptode valve **V2** operates as frequency changer, the output of oscillator section **a** being coupled via **C35** to the injector grid of mixer section **b. V2a** grid resistor

Valve Table

Valve		Anode (V)	Screen (V)	Cathode (V)
V1 UCC85	‡	—	—	
V2a UCH81	*	97	—	—
	†	42	—	—
V2b UCH81	*	187	74	—
	†	146	75	—
V3 UF89	*	182	72	—
	†	173	65	—
V4d UABC80	*	90	—	—
	†	85	—	—
V5 UL84	*	190	190	14·1
	†	180	178	12·8
V6 UY85	*	‡	—	247·0
	†	‡	—	242·0

‡*No reading quoted.*
**Receiver switched to A.M.*
†*Receiver switched to F.M.*



Circuit Diagram of the Philco

R16 is connected to chassis by A.M. switch **S10.** Oscillator grid coil **L10** is tuned by **C36** and **C37** on M.W. and, in addition, by **C38** and **C39** on L.W. Reaction coupling from **V2a** anode via **C33** and **L11.**

Variable-mu valve **V3** operates as intermediate frequency amplifier with tuned A.M. transformer couplings **C31, L14, L15, C32,** and **C43, L16, L17, C44,** to A.M. diode detector **V4c.** The primary winding, **L12,** of the second F.M. intermediate frequency transformer is short-circuited by **S9.**

A.M. intermediate frequency 470 Kc/s

The audio frequency component in the rectified output of **V4c** is passed via I.F. filter circuit **R28, C52,** and A.M. switch **S13,** to **R32,** which operates as a combined diode load and volume control. The D.C. component of the rectified signal developed across **R32** is fed back as A.G.C. bias to **V2b** and **V3** via decoupling circuit **R27, C72.**

V4d operates as an A.F. amplifier, its output being resistance-capacitance coupled by **R29, C57** and **R34** to the control grid of pentode output valve **V5.** Tone correction by **C60,** and tone control by **R35, C58** in the anode circuit of **V5.**

H.T. current is supplied by half-wave rectifying valve **V6.** Smoothing by **C62, R37, C61,** section **a** of output transformer **T1, R36** and **C60.**

Operation on F.M.

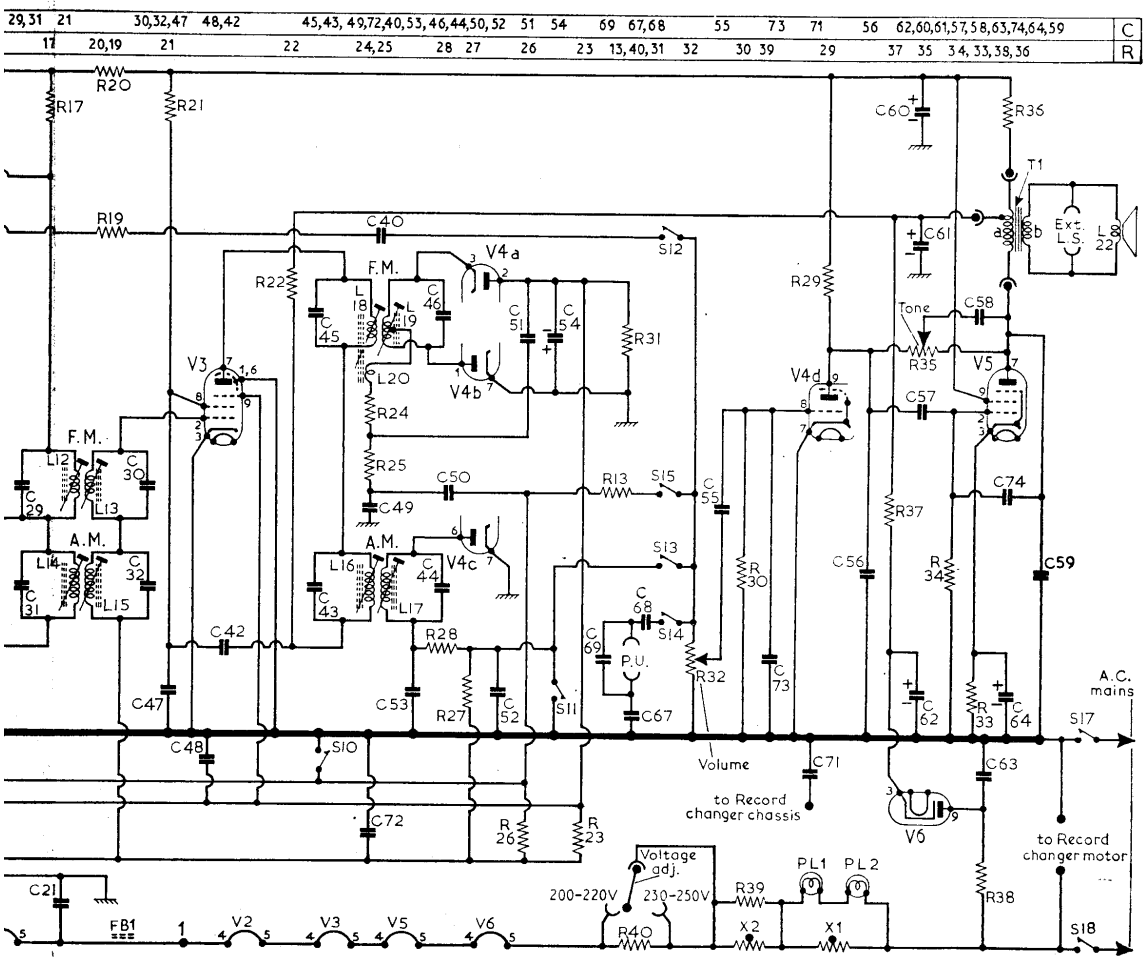
Balanced aerial input is coupled via **L1a, L1b** to a conventional F.M. tuner employing an earthed-grid R.F. amplifier **V1a** and self-oscillating mixer **V1b.** The R.F. and oscillator circuits are capacitance tuned by **C9** and **C17.**

V2b and **V3** form a two-valve F.M. intermediate frequency amplifier which is connected by tuned transformers **L6, L7, C19, C25; C29, L12, L13, C30;** and discriminator transformer **C45, L18, L19, L20, C24,** to diode sections **a** and **b** of **V4,** which operate in a radio detector circuit.

F.M. intermediate frequency 10.7 Mc/s

The audio frequency output of the ratio detector is developed across **C49** and fed via **C50** and **R16** to the grid of **V2a,** which for F.M. operation functions as an A.F. amplifier. The output of **V2a** is developed across the anode load comprising **R11, R18,** and is coupled via **R19, C40,** and F.M. switch **S12,** to volume control **R32. C33** operates as an R.F. bypass, A.M. oscillator reaction coil **L11** being short-circuited by **S8.**

(*Continued overleaf col.* 1)



Resistors

R1	1·8MΩ	A2
R2	1·8MΩ	A2
R3	1·8MΩ	B2
R4	68Ω	A2
R5	680kΩ	F4
R6	1·5MΩ	F4
R7	2·2kΩ	F4
R8	6·8kΩ	F4
R9	680kΩ	F3
R10	100Ω	B1
R11	22kΩ	B1
R12	22kΩ	B2
R13	2·2MΩ	B1
R14	1MΩ	B2
R15	68kΩ	B2
R16	47kΩ	B1
R17	2·7kΩ	C2
R18	15kΩ	B2
R19	220kΩ	B2
R20	470Ω	C2
R21	47kΩ	C2
R22	3·3kΩ	C2
R23	2·7MΩ	B1
R24	220Ω	C1
R25	100kΩ	B2
R26	4·7MΩ	C1
R27	1MΩ	C1
R28	100kΩ	C1
R29	120kΩ	D1
R30	10MΩ	D1
R31	27kΩ	D1
R32	1MΩ	C1
R33	270Ω	D2
R34	680kΩ	D1
R35	1MΩ	D1
R36	680Ω	D2
R37	500Ω	D2
R38	100Ω	D1
R39	2·2kΩ	D2
R40	250Ω	D2

Capacitors

C1	470pF	A2
C2	470pF	A2
C3	47pF	F4
C4	220pF	F4
C5	15pF	F4
C6	47pF	F4
C7	7pF	F4
C8	47pF	E4
C9	—	B1
C10	18·5pF	F3
C11	5pF	E3
C12	5pF	E3
C13	12pF	E3
C14	88pF	E3
C15	11·5pF	F3
C16	50pF	F3
C17	—	B2
C18	1,500pF	E4
C19	40pF	E3
C20	1,000pF	E3
C21	1,000pF	E3
C22	100pF	B2
C23	40pF	B2
C24	—	B2
C25	30pF	B2
C26	96pF	B1
C27	3,900pF	B2
C28	5,000pF	B2
C29	12pF	B2
C30	12pF	B2
C31	220pF	B2
C32	220pF	B2
C33	220pF	B2
C34	56pF	B2
C35	220pF	B2
C36	40pF	B1
C37	—	B1
C38	30pF	C1
C39	265pF	B1
C40	5,000pF	B1
C41	5,000pF	C2
C42	0·01μF	C2
C43	220pF	C2
C44	220pF	C2
C45	15pF	C2
C46	56pF	C2
C47	6,000pF	C2
C48	5,000pF	C1
C49	500pF	C1
C50	0·02μF	C1
C51	300pF	C1
C52	100pF	C1
C53	100pF	C2
C54	4μF	C1
C55	0·02μF	C1
C56	220pF	D1
C57	3,900pF	D1
C58	500pF	D1
C59	1,000pF	D2
C60	32μF	C2
C61	40μF	C2
C62	40μF	C2
C63	0·02μF	D1
C64	10μF	D2
C65	5,000pF	B2
C66	1,000pF	A2
C67	0·02μF	—
C68	0·01μF	—
C69	1,000pF	—
C70	0·02μF	B2
C71	0·02μF	—
C72	0·04μF	C1
C73	100pF	C1
C74	7pF	D2

Coils*

L1a	—	F4
L1b	—	F4
L2	—	F4
L3	—	A1
L4	—	F3
L5	—	A2
L6	—	E3
L7	—	E3
L8	—	C2
L9	6·0	D2
L10	3·0	B1
L11	—	B1
L12	—	B2
L13	—	B2
L14	6·5	C2
L15	6·5	C2
L16	6·5	C2
L17	6·5	C2
L18	—	C2
L19	—	C2
L20	—	C2
L21	1·25	D2
L22	—	†

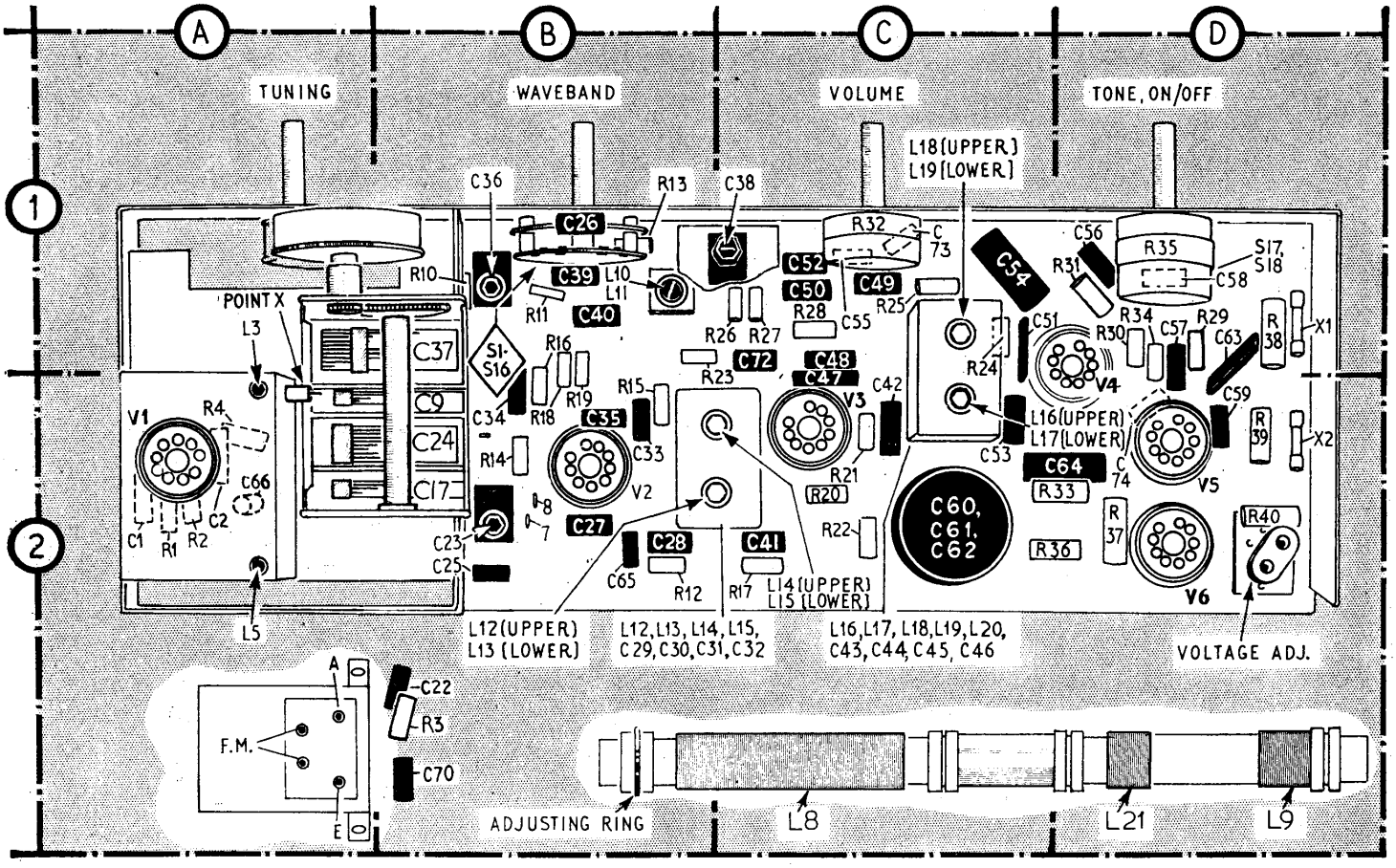
Transformers*

T1 a	400·0	†
T1 b	—	†

Miscellaneous

X1	V1010	D1
X2	V1010	D2
FB1	—	E4
FB2	—	F4
S1—S16	—	B1
S17, S18	—	D1
PL1, PL2	12V 0·1A	—

**Approximate D.C. resistance in ohms.*
†Mounted on loudspeaker.



Plan view of chassis. Components shown dotted in the V.H.F./F.M. tuner unit are mounted below the terminal block. Adjustment to **L6**/**L7** *is not shown, but it is made through a hole in the tuner unit casing in the diagonally opposite corner to* **L3**

Circuit description—*continued*

V2b and **V3** are grid current biased by connecting **R27** to chassis via F.M. switch **S11.** The negative voltage developed across stabilizing capacitor **C54** is fed back as A.G.C. bias to the grid of **V1a,** the injector grid of **V2b,** and the suppressor grid of **V3.** A fraction of this voltage is also fed to the control grids of **V2b** and **V3.**

Operation on Gram

S12, S13 and **S15** are open disconnecting the ratio detector outputs from the audio stage and the pickup is switched into circuit via **C68** by **S14. C67** isolates the pickup from the "live" chassis.

CIRCUIT ALIGNMENT

Equipment Required.—An A.M. signal generator, modulated 30 per cent at 400c/s; an F.M. signal generator, deviated by ±25kc/s; an output meter; a 0.1μF capacitor and a 400pF capacitor; and two trimming tools, a hexagonal type and a non-metallic screwdriver type.

The chassis should be connected to the mains via an isolating transformer. Where this is not available ensure that the chassis is connected to the neutral side of the mains. No earth connection, either direct or through earthed equipment, should be made to the receiver. Connect the signal generator to the receiver via an isolating capacitor in its live output lead.

To facilitate accurate tuning of the receiver to the alignment frequencies, calibration markers are provided along the top edge of the scale backing plate. Reading from left to right these indicate the following positions: 1,400kc/s (M.W.), 220kc/s (L.W.), 91Mc/s (F.M.), 580kc/s (M.W.) and "set cursor."

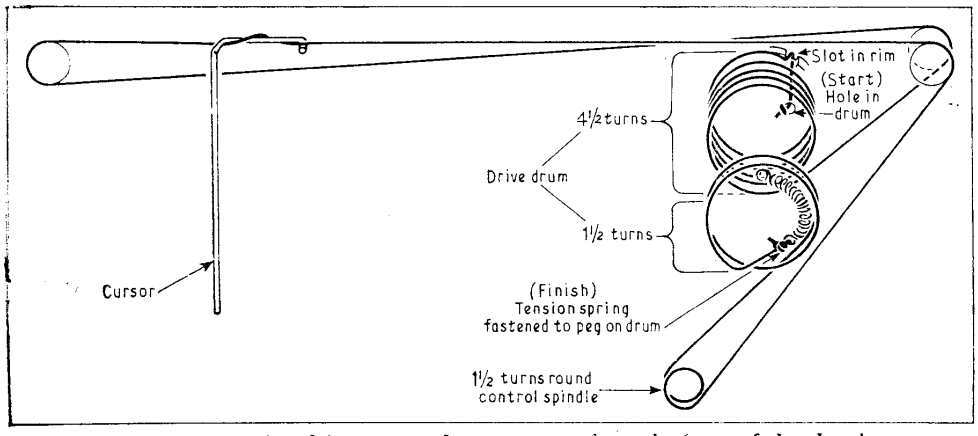


Diagram of the tuning drive system drawn as seen from the front of the chassis

Adjust the signal generator to maintain an output of 100mW during alignment.

A.M. ALIGNMENT

1.—Connect the output meter across the speaker. Connect the A.M. signal generator between chassis and the control grid of **V2b** (tags **7** and **8,** location reference B2) via the 0.1μF capacitor in its live output lead. Switch the receiver to M.W. Turn the tuning gang to minimum capacitance and the volume control to its maximum clockwise position.

2.—Feed in a modulated 470kc/s signal and adjust the cores of **L17, L16** (location reference C2) and **L15, L14** (location reference C2) for maximum output.

3.—With the tuning gang at maximum capacitance check that the cursor coincides with the extreme right-hand (set cursor) calibration marker.

4.—Loosely couple the signal generator to the ferrite rod aerial via a loop of insulated wire. Tune the receiver to the calibration dot at 580kc/s. Feed in a 580kc/s signal and adjust the core of **L10** (B1) for maximum output. Then slide the adjusting ring adjacent to **L8** along the ferrite rod for maximum output.

5.—Tune the receiver to the calibration marker at 1,400kc/s. Feed in a 1,400kc/s signal and adjust **C36** (B1) and **C23** (B2) for maximum output.

6.—Switch the receiver to L.W. and tune to the calibration marker at 220kc/s. Feed in a 220kc/s signal, adjust **C38** and slide the former of **L9** (D2) along the ferrite rod for maximum output.

F.M. ALIGNMENT

1.—Connect the output meter across the speaker and the F.M. signal generator to **V2b** control grid (tags **7** and **8,** location

reference B2) via the 400pF capacitor in its live output lead. Switch the receiver to F.M. and allow it to warm up for at least ten minutes. Set the volume control 90 deg. back from its fully clockwise position and set the tone control to the maximum treble position.

2.—Feed in a 10.7 Mc/s signal, deviated by ±25kc/s and adjust the cores of **L18, L19** (location reference C1), and **L13, L12** (location reference B2) for maximum output. Remove the F.M. signal generator.

3.—Connect the A.M. signal generator to tags **7** and **8**. Feed in a modulated 10.7Mc/s signal and adjust the core of **L19** (C1) for *minimum* output. Disconnect the A.M. generator.

4.—Reconnect the F.M. signal generator to tags **7** and **8** and check that the level of F.M. output has been retained. If maximum A.M. rejection does not coincide with maximum F.M. output, **L19** should be adjusted for maximum A.M. rejection at the expense of a slight reduction in F.M. output.

5.—Unscrew the core of **L7** (location reference E3) so that it protrudes from the former by approximately ⅜in. Transfer the F.M. signal generator to test point **X** on the tuner unit (location reference A2). Feed in a 10.7Mc/s signal and adjust the cores of **L6** and **L7** (location reference A2) for maximum output.

6.—Rotate the tuning gang to set the cursor at the 91Mc/s calibration marker. Connect the signal generator to the F.M. aerial sockets and feed in a 91Mc/s signal. Tune in this signal by adjusting **L5** (F3). If two peaks can be obtained, the one with the core nearer **L4** at the top end of the former is correct.

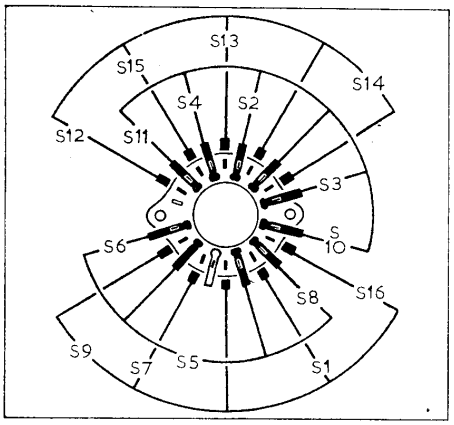
7.—Adjust **L3** (E4) for maximum audio output with the core towards the bottom end of the coil former. Check the calibration over the range.

DISMANTLING

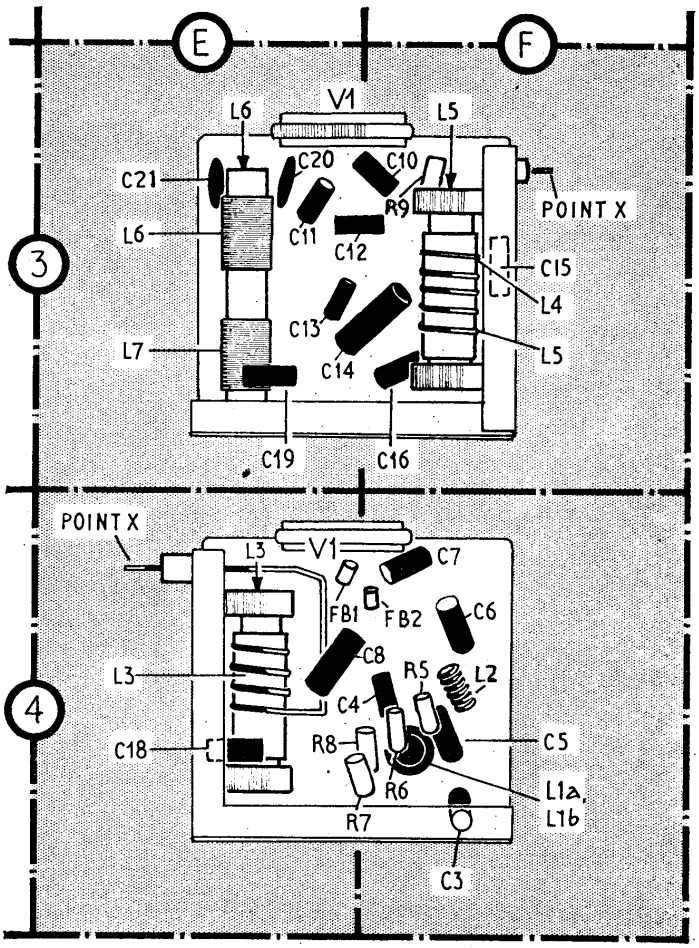
Access to the chassis for minor servicing operations can be gained by removing both back and bottom covers.

Switch Table

Switches	Gram	L.W.	M.W.	F.M.
1	—	—	—	C
2	—	—	C	C
3	C	C	—	—
4	—	—	—	C
5	—	—	—	C
6	C	C	—	—
7	—	C	C	—
8	—	—	—	C
9	—	C	C	—
10	C	C	C	—
11	—	—	—	C
12	—	—	—	C
13	—	C	C	—
14	C	—	—	—
15	—	C	C	C
16	—	—	—	C



Left : Diagram of the waveband switch unit drawn as seen when looking from the rear of an upright chassis



Two sketches of the V.H.F./F.M. tuner unit. The top one is the view from the rear; below is the view from the front

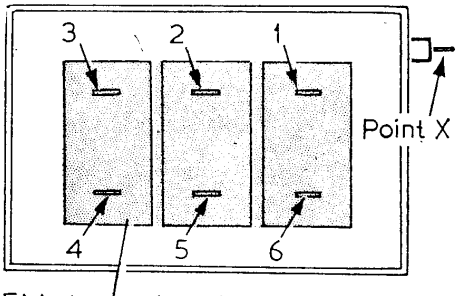
To remove the chassis entirely from its cabinet, proceed as follows:

Detach the aerial input and external loudspeaker panels by removing securing screws.

Remove screws securing the output transformer and terminal block to the floor of the cabinet.

Disconnect the leads to the external loudspeaker parel from the terminal block and disconnect also the mains leads to the gram motor switch from the terminal block located on the underside of the motor board.

Unplug the pick-up input leads from the tag panel on the underside of the auto-mechanism baseplate.



Above : V.H.F./F.M. tuner terminal block viewed from above

Pull off the front control knobs. If these are difficult to remove take a piece of stout cord round the knob boss and use it as a puller.

Captive bolts with 4 B.A. nuts and washers secure the chassis to the front of the cabinet.

Remove the nuts with a long box spanner and withdraw the chassis through the rear aperture.

GENERAL NOTES

Switches.—S1-S16 are the waveband and A.M./F.M. change-over switches ganged in a single rotary unit and shown in our illustration of the chassis in location reference B2. A detailed diagram of the unit is shown in column 4, where the contacts are drawn as seen when viewed in the direction of the arrow in the chassis illustration. The table (col. 4) shows the switch operations for the four controls settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and **C** closed.

Drive Cord Replacement.—Approximately 87in of nylon braided glass yarn is required for a new drive cord. Turn the tuning gang to minimum capacitance (fully open) and thread the cord as shown in the illustration of the completed assembly in col. 1. Begin at the rear of the drive drum, winding 4½ turns in an anti-clockwise direction on the drum and finish with 1½ turns in the same direction on the front of the drive drum anchoring the tension spring to the peg provided. Attach the cursor so that it lines up with the extreme right-hand calibration marker with the tuning gang fully meshed.

Record Changer.—The record changer fitted is B.S.R. Monarch type UA14 with monaural cartridge type TC8M and sapphire styli type TC8G(78) and TC8R(LP).

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