"TRADER" SERVICE SHEET

1416

EKCO U319

A.M./F.M. Table Receiver

THE Ekco U319 is a five-valve (plus rectifier) A.M./F.M. receiver designed to operate from A.C. or D.C. mains of 200-250V, 50-100 c/s in the case of A.C. Mains consumption is 57W (A.M.) and 62.4W (F.M.) It employs an internal aerial for F.M. reception and a ferrite rod aerial for A.M. Sockets are provided for the connection of external aerials, a gramophone pickup and an external speaker. The ranges covered are 86-100 Mc/s (F.M.), 187-550m (M.W.) and 1,200-2,000m (L.W.).

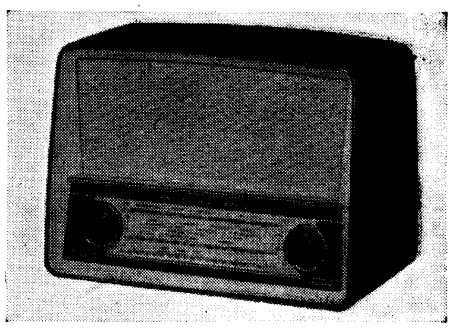
Release date and original price: June 1957, £15 2*s* 1*d*. *Purchase tax extra.*

CIRCUIT DESCRIPTION

For A.M. operation on M.W., the aerial tuned circuit is formed by **L8, C18** and **C19,** while for L.W. reception **L8** and **L9** are connected in series and are tuned by **C17, C18** and **C19. L8** and **L9** are mounted on a rotatable ferrite rod to form an internal aerial. The external aerial is coupled via **C13, C14** and bottom-coupling capacitor **C15.**

For A.M. operation, **V2** operates as a triode-heptode frequency changer. Oscillator grid coil **L10** is tuned by **C22, C23** and **C24** for M.W., and additionally by **C25** on L.W. Series tracking by **C26** on both bands. Reaction coupling by **C27, L11.**

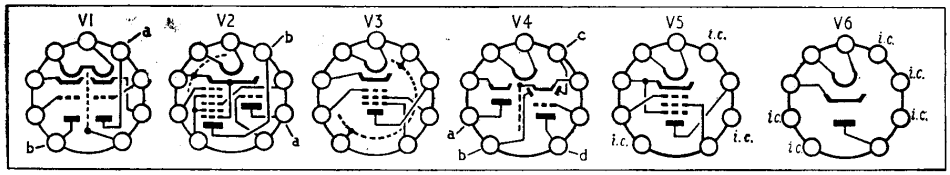
Variable-mu pentode valve **V3** operates as intermediate frequency amplifier with tuned A.M. transformer couplings **L14, L15; L19, L20.** The primary winding of the second F.M. transformer **L12, L13,** which is connected in series with **L14,** is short-circuited by **S10** for A.M. operation.

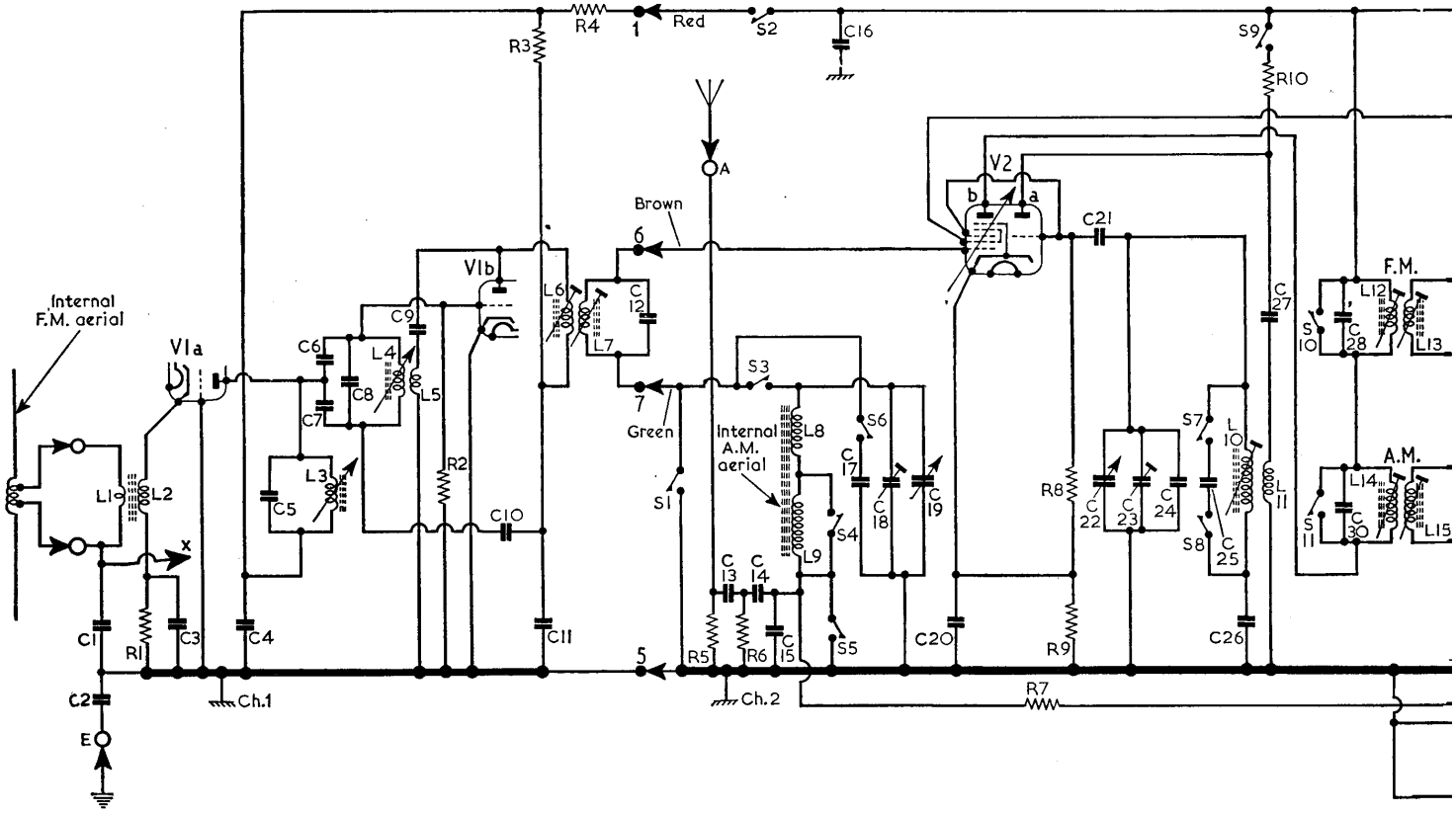


Appearance of the Ekco U319.

A.M. intermediate frequency 470 Kc/s.

Diode section **c** of triple-diode-triode valve **V4** operates as A.M. detector, the rectified audio output being filtered by **R15, C42,** and developed across the diode load **R15, R18;** the A.F. signal is then passed via **S13, C47,** volume control **R21** and **C48** to A.F. amplifier valve **V4d.** Provision is made for the connection of a gramophone pickup across volume control **R21** via **R20, S14, C47** and mains isolating capacitor **C46.**





Circuit diagram of the Ekco U319, and above it the valve base diagrams, drawn as seen from the free ends of the pins. The dotted lines assoc values and circuitry which may be found in some receivers are referre

The D.C. potential developed across **R18** is fed back via decoupling circuits to **V2b** and **V3**, giving automatic gain control.

Resistance-capacitance coupling by **R23, R24, C50** and tone control **R25** between the anode of **V4d** and pentode output valve **V5**. Tone correction by negative feedback via tertiary winding **c** on output transformer **T1**.

H.T. current is supplied by half-wave rectifying valve **V6**. Smoothing by **C54, R28, C55, R29** and **C56**.

Operation On F.M.

F.M. aerial input is coupled via transformer **L1, L2** to the earthed-grid R.F. amplifier valve **V1a**, which together with self-oscillating frequency changer **V1b** operate in a conventional permeability tuned F.M. tuner circuit.

Local oscillator radiation via the R.F. and aerial circuits is minimized by the bridge neutralizing circuit formed by **C6, C7, C8, C10, C11** and the input capacitance of **V1b**; the amplified output of **V1a** being connected to the point of minimum oscillator voltage at the junction of **C6, C7**.

For F.M. operation, the A.M. local oscillator **V2a** is muted by disconnecting the H.T. supply to its anode via **S9**, while the heptode section **b**, together with pentode R.F. amplifier **V3**, now forms an F.M. I.F. amplifier with transformer couplings **L6, L7; L12, L13;** and discriminator transformer **L16, L17** and **L18**. The primary winding of the first A.M. I.F. transformer is short-circuited via **S11**, while further A.M. muting is performed by **S1** and **S3**.

F.M. intermediate frequency 10.7Mc/s.

Diode sections **a** and **b** or **V4** are employed in a conventional ratio detector circuit. A.F. output is developed across **C37** and fed via de-emphasis circuit **R14, C43** and **S12, C47** to volume control **R21**. From **R21** the audio signal follows the same route as described for A.M. operation. The negative voltage developed across the D.C. load circuit **C45, R19** is fed back as A.G.C. bias to the suppressor grid of **V3**.

CIRCUIT ALIGNMENT

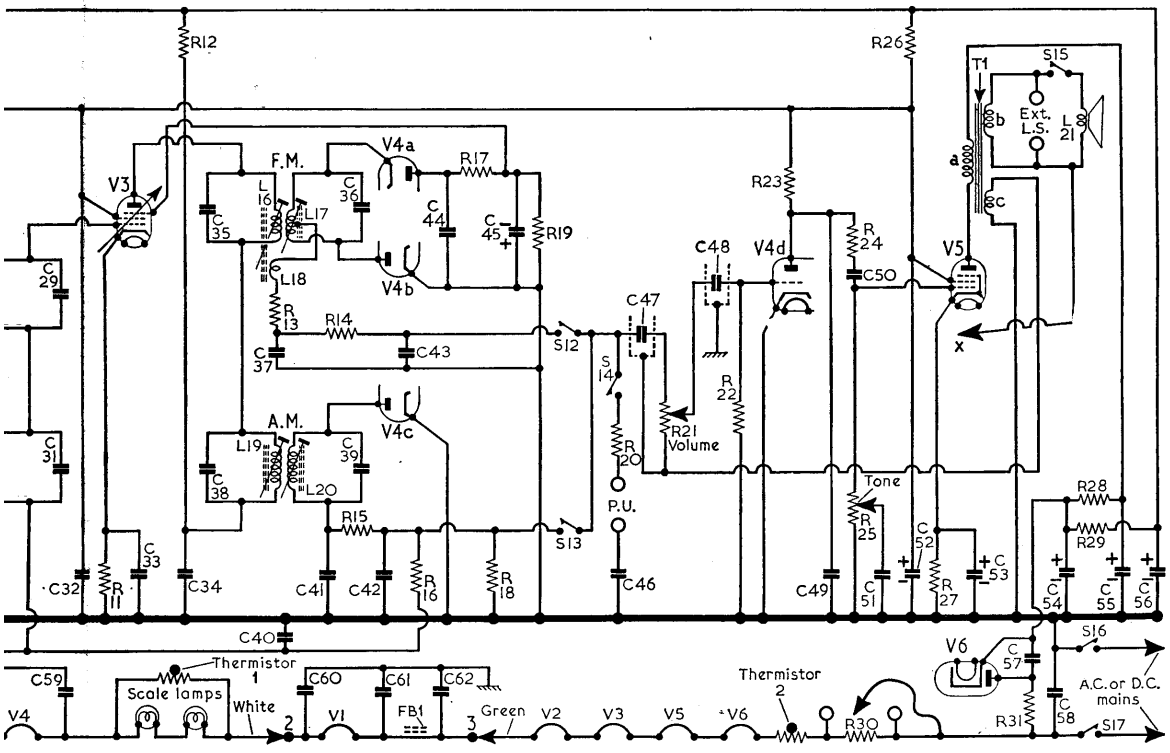
Equipment Required.—An A.M./F.M. signal generator, modulated 30 per cent at 400c/s for A.M., and deviated by ±25kc/s for F.M.; an A.C. voltmeter for use as audio output meter; a 0—50μA meter for use as D.C. output meter; two matched 220kΩ resistors; a 0.001μF capa-

(*Continued overleaf, col.* 1)

Resistors		
R1	220Ω	J5
R2	1MΩ	J5
R3	4·7kΩ	D2
R4	1·5kΩ	D2
R5	1·5MΩ	B1
R6	3·3kΩ	C2
R7	470kΩ	C2
R8	47kΩ	H4
R9	150Ω	H4
R10	33kΩ	H4
R11	180Ω	G4
R12	2·2kΩ	G4
R13	82Ω	G4
R14	47kΩ	G4
R15	47kΩ	G4
R16	2·2MΩ	G4
R17	470Ω	G4
R18	220kΩ	G4
R19	33kΩ	G4
R20	560kΩ	H3
R21	820kΩ	E3
R22	10MΩ	F4
R23	220kΩ	G4
R24	47kΩ	F4
R25	820kΩ	E3
R26	8·2kΩ	B4
R27	180Ω	F4
R28	330Ω	F4
R29	820Ω	B4
R30	300Ω	A1
R31	100Ω	A1
Capacitors		
C1	1,800pF	D1
C2	0·01μF	B1
C3	0·001μF	J5
C4	0·001μF	J5
C5	3pF	J5
C6	6pF	J5
C7	6pF	J5
C8	20pF	J5
C9	20pF	J5
C10	12pF	J5
C11	100pF	J5
C12	15pF	J5
C13	470pF	C2
C14	0·01μF	C2
C15	4,700pF	C2
C16	0·01μF	G4

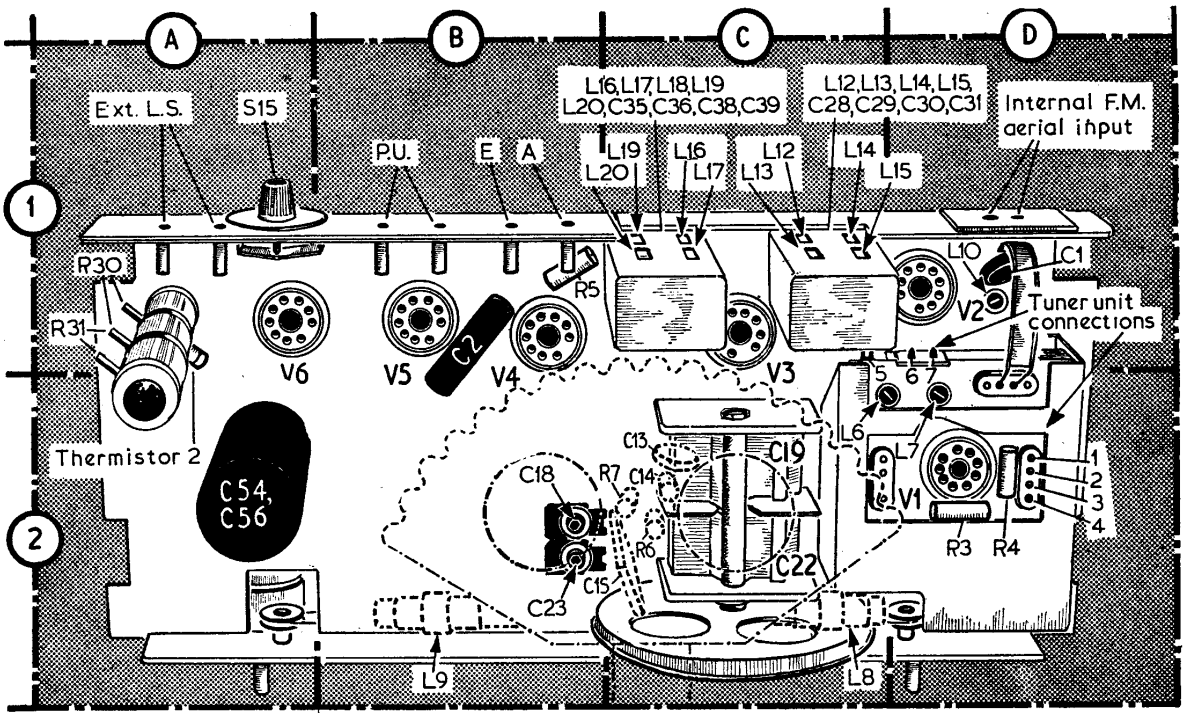
If the component numbers in these tables are used when ordering spare parts, dealers are requested to mention the fact on the order, as these numbers may differ from those used in the manufacturers' service manual.

C17	150pF	H4
C18	30pF	B2
C19	—	C2
C20	0·04μF	H4
C21	82pF	H4
C22	30pF	C2
C23	—	B2
C24	10pF	H4
C25	470pF	H4
C26	495pF	H4
C27	200pF	H4
C28	10pF	C1
C29	15pF	C1
C30	100pF	C1
C31	100pF	C1
C32	0·01μF	G4
C33	0·04μF	G4
C34	0·01μF	F4
C35	15pF	C1
C36	22pF	C1
C37	220pF	G4
C38	350pF	C1
C39	350pF	C1
C40	0·04μF	G4
C41	220pF	G4
C42	220pF	G4
C43	500pF	G4
C44	0·01μF	F4
C45	4μF	G4
C46	0·02μF	F4
C47	0·01μF	E3
C48	0·01μF	G4
C49	220pF	F4
C50	0·01μF	F4
C51	0·003μF	E3
C52	8μF	E4
C53	50μF	F4
C54	50μF	A2
C55	8μF	F3
C56	50/F	A2
C57	470pF	F4
C58	0·01μF	E3
C59	0·03μF	F4
C60	0·001μF	J5
C61	0·001μF	J5
C62	0·01μF	J5
Coils*		
L1	—	J5
L2	—	J5
L3	—	J5
L4	—	J5
L5	—	J5
L6	—	C2
L7	—	D2
L8	2·0	C2
L9	8·0	B2
L10	2·0	H4
L11	1·0	H4
L12	—	C1
L13	—	C1
L14	10·0	C1
L15	10·0	C1
L16	—	C1
L17	—	C1
L18	—	C1
L19	6·0	C1
L20	6·0	C1
L21	3·0	—
Miscellaneous*		
T1 a	335·0	F3
T1 b	—	
T1 c	—	
Thermistor 1	VA1010[1]	F4
Thermistor 2	VA1009[1]	A1
FB1	—	J5
S1-S14	—	H3
S15	—	A1
S16, S17	—	E3



sociated with **C47** *and* **C48** *indicate that the metal cases of these capacitors are connected as shown. Variations in component rred to under "Modifications" in column 6 overleaf.*

**Approximate D.C. resistance in ohms.*
[1]Mullard.



Plan view of the chassis. The A.M. internal aerial assembly is shown dotted so as not to obscure the components mounted beneath it on the chassis deck. The F.M. tuner unit connections are numbered to correspond with those shown in the circuit diagram overleaf. When an external F.M. aerial is used it is connected in place of the internal aerial plug.

Circuit Alignment—*continued*

citor; a 0.1μF capacitor; and a non-metallic trimming tool.

Check that with the gang at maximum capacitance the F.M. tuner carriage is $\frac{1}{32}$ inch from its fully open position, and adjust it if necessary by rotating the tuning drive drum on the tuning gang shaft; also check that with the gang at maximum capacitance the cursor coincides with the datum line at the right-hand end of the L.W. tuning scale.

A.M. Alignment

1.—Connect the audio output meter to the external speaker sockets. Connect signal generator to the control grid of **V2b** (pin 2) via the 0.1μF capacitor.

2.—Switch the receiver to M.W. and tune it to 550m. Turn volume control to maximum. Feed in a modulated 470kc/s signal and adjust the cores of **L.20, L19, L15** and **L14** (location reference C1) in that order for maximum output.

3.—Tune receiver to 500m. Transfer signal generator output to the A.M. aerial socket. Feed in a 600kc/s signal and adjust **L10** (D1) for maximum output, then slide the former of **L8** (C2) along the ferrite rod for maximum output.

4.—Tune receiver to 225m. Feed in a 1,333kc/s signal and adjust **C23** (B2) and **C18** (B2) for maximum output.

5.—Switch receiver to L.W. and tune it to 1,400m. Feed in a 214.3kc/s signal and slide the former of **L9** (B2) along the ferrite rod for maximum output. Disconnect the signal generator and audio output meter.

F.M. Alignment

1.—Connect the two matched 220KΩ resistors in series across **R19** (G4). Connect the 50μA D.C. output meter between the junction of the two 220kΩ resistors and chassis. Connect the F.M. signal generator to the control grid (pin 2) of **V3.**

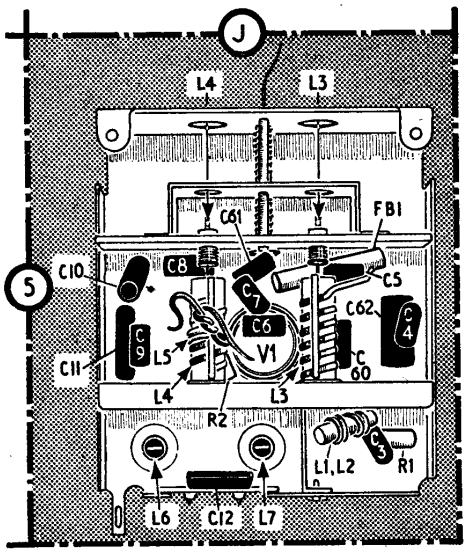
2.—Switch the receiver to F.M. and tune it to the low-frequency end of the scale. Turn volume and tone controls fully clockwise. Feed in a 10.7Mc/s signal, deviated by ±25kc/s, and adjust **L16** (C1) for maximum output.

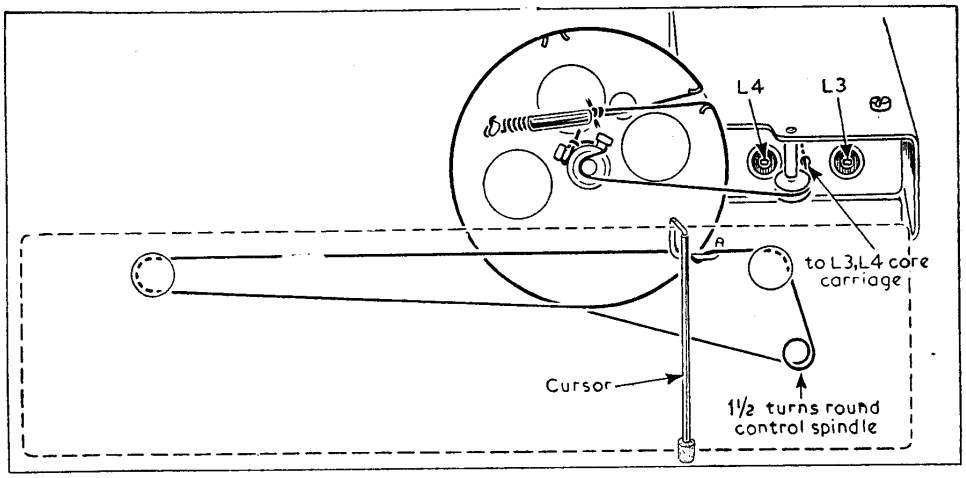
3.—Transfer the earthy lead of the D.C. output meter from chassis to the junction of **R14, C37** (G4). Feed in a 10.7Mc/s signal and adjust **L17** (C1) for *minimum* output. The correct tuning point for **L17** is the zero position between a negative and positive peak.

4.—Re-connect the D.C. output meter as described in operation 1. Transfer signal generator to the control grid (pin 2) of **V2b.** Feed in a 10.7Mc/s signal and adjust **L12** (C1) and **L13** (C1) for maximum output.

5.—Transfer the signal generator output to the junction of **R3, R4** (D2) via the 0.001μF capacitor in its live lead. Feed in a 10.7Mc/s signal and adjust **L6** (D2) and **L7** (D2) for maximum output.

6.—Transfer the signal generator to the





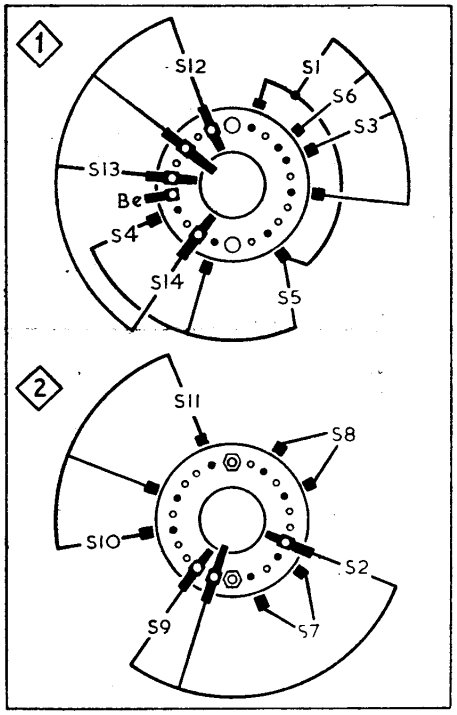
Above: *Sketch of the tuning drive system, drawn as seen when viewed from the front of the chassis with the gang at maximum capacitance.* Left: *Underside view of the F.M. tuner unit.*

F.M. aerial sockets. Tune the receiver to 91Mc/s. Feed in an unmodulated 91Mc/s signal and adjust **L4** (J5) and **L3** (J5) for maximum output. Check calibration at 87Mc/s, 94Mc/s and 99Mc/s. If large errors occur check that the carriage of F.M. tuner unit is travelling its full course without sticking.

7.—The oscillator frequency should be *below* the signal frequency, and a check should be made to ensure that it is correctly adjusted to be so. This can be done by tuning the receiver to 100Mc/s and feeding in a signal at the image frequency of 78.6Mc/s, when an output signal should be indicated on the output meter.

GENERAL NOTES

Switches.—S1-S14 are the waveband and radio/gram switches which are ganged in two rotary units beneath the main chassis. These units are identified in our under-chassis illustration, where the numbers **1** and **2** in diamond surrounds show the direction in which they are viewed in the switch diagrams below.

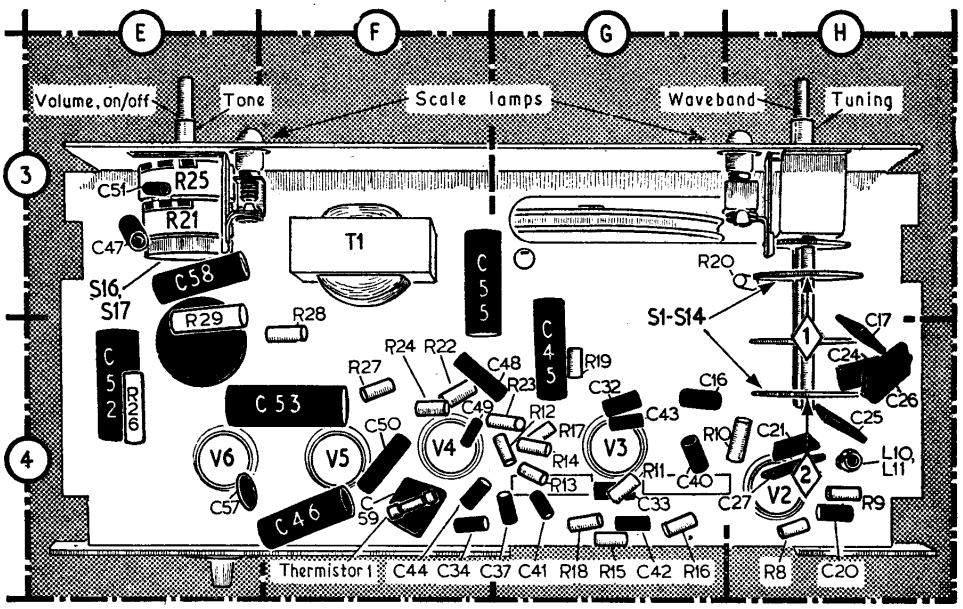


The table in this column shows the switch positions for the four control settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and **C**, closed.

Cursor Drive Cord.—About 41 inches of nylon cord is required, which should be run as indicated in the sketch (cols. 2, 3) commencing with the tuning gang set to maximum capacitance.

Switch Table

Switches	FM	MW	LW	Gram
1	C	—	—	C
2	C	—	—	—
3	—	C	C	—
4	—	C	—	—
5	—	—	—	C
6	—	—	C	C
7	—	—	C	—
8	—	—	C	—
9	—	C	C	C
10	—	C	C	—
11	C	—	—	—
12	C	—	—	—
13	—	C	C	—
14	—	—	—	C



Underside view of the chassis. Details of the waveband and radio/gram switches **S1-S14** *are shown in the diagrams in col. 4. The wafers in the diagrams are numbered to simplify identification in the illustration. The metal case of* **C47** *is connected to a tag on volume control* **R21**, *while the case of* **C48** *is connected to chassis.*

F.M. Drive Cord.—Replacement of this tuning drive necessitates the complete removal of the F.M. tuner unit, and the F.M. circuits will require re-alignment after the tuning drive cord has been replaced.

To remove the F.M. unit, disconnect the leads and bonding braid, and remove four screws from beneath the tuner chassis. Remove the screening cover (four 6 B.A. cheese-head screws).

A length of nylon cord of approximately 10 inches is required together with a brass eyelet. Make a small loop in one end of the cord and seal the knot with an adhesive. Then, holding the cord taut, make a mark $6\frac{5}{8}$ inches from the looped end of the cord. Press the tuner unit carriage forward against the tension of its spring, and thread the free end of the cord through the central hole in the front of the unit, then through the corresponding holes in the carriage bracket and the 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 $6\frac{5}{8}$ inches mark and seal it with an adhesive, then pull the cord so that this knot is slightly embedded in the eyelet and the shank of the latter enters 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 grease to the guides if necessary. Replace the screening cover and reassemble the tuner unit on to the receiver chassis. Pass the looped cord clockwise round the gang spindle, then pass it round one screw on the collar on the gang spindle and loop it on to the second screw, as shown in the sketch (cols. 2, 3).

Scale Lamps.—These are two 6-8V, 0.12A lamps, with clear tubular bulbs and M.E.S. bases.

MODIFICATIONS

Receivers of earlier production than our sample model, from which this *Service Sheet* was prepared, may have the following variations:

C25 may be 495pF or 510pF; **C26** may be 545pF; **C59** may be 0.04μF; **R18** may be 1MΩ; **R13, R17, R28, C55, C57, C58** and **C60** may be omitted; **C45** may be 8μF.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those derived from the manufacturers' information. Voltages were measured with a Model 8 Avometer, chassis being the negative connection in every case. The receiver was tuned to the low frequency end of the scale with no signal input.

Valve Table

Valve		Anode		Screen		Cath.
		V	mA	V	mA	V
V1a UCC85	*	—	—	—	—	—
	†	190[1]	—	—	—	—
V1b UCC85	*	—	—	—	—	—
	†	165[2]	—	—	—	—
V2a UCH81	*	87	4·3	—	—	2·6
	†	—	—	—	—	—
V2b UCH81	*	239	3·1	125	9.2	2·6
	†	214	9·3	127	6·4	2·4
V3 UF89	*	210	9·3	125	3·8	2·5
	†	190	9·3	127	3.6	2·3
V4d UABC80	*	58	0·26	—	—	—
	†	58	0·27	—	—	—
V5 UL84	*	250	40·5	125	1·5	8·2
	†	240	40·5	127	2·0	8·35
V6 UY85	*	235[3]	95·0[3]	—	—	261·0[4]
	†	233[3]	105·0[3]	—	—	251·0[5]

**Set switched to A.M.*
†Set switched to F.M.
[1]Measured at junction of **R3, R4** (D2).
[2]Measured at junction of **R3, C11** (D2).
[3]A.C. reading.
[4]Cathode current 76 mA.
[5]Cathode current 87 mA.

Printed in England by Cornwall Press Ltd., Paris Garden, London, S.E.1.