Replacing Sheet issued on December 3, 1955.

"TRADER" SERVICE SHEET

1227

EKCO A.M./

3-band Table Rece

Appearance of the Ekco U243.

EMPLOYING internal A.M. and F.M. aerials, the Ekco U243 is a 5-valve (plus rectifier and cathode ray tuning indicator) A.M./F.M. table receiver, designed for operation from A.C. or D.C. mains of 200-250 V, 40-100 c/s in the case of A.C. Total mains consumption is 60 watts. The waveband ranges are: A.M., 192-550m, 983-2,027m; F.M., 87-100 Mc/s.

Release date and original price: April, 1955, £19 16*s* 2*d*.

CIRCUIT DESCRIPTION

A.M. aerial input via the common impedance of C16 to aerial tuning coils L10 (M.W.) and L11 (L.W.) which are connected in series with F.M. I.F. transformer secondary L9 in the input circuit of the frequency changer (V2, Mullard UCH81). This method of connection dispenses with A.M./F.M. change-over switches in this part of the circuit.

Section **b** of **V2** operates as mixer, and section **a** as oscillator. Oscillator anode coils **L14** (M.W.) and **L15** (L.W.) are tuned by **C29**. Parallel trimming by **C28** (M.W.) and **C26, C27, C28** (L.W.); series tracking by **C24** (M.W.) and **C25** (L.W.). Reaction coupling from grid circuit via **L12** (M.W.) and **L13** (L.W.).

V3 (Mullard UF85) is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings **C32, L18, L19, C33** and **C40, L23, L24, C41.**

A.M. Intermediate frequency 470 kc/s.

Diode section **c** of triple diode triode valve **(V4, Mullard UABC80)** functions as A.M. signal detector, and the audio frequency component in its rectified output is developed across **R15, R16.** I.F. filtering by **C43, R14** and the capacitance of the leads to chassis. The A.F. signal developed across **R15, R16** is passed via **S13,** which closes on the A.M. bands, volume control **R19,** and **C50** to grid of triode section **d** of **V4,** which operates as **A.F.** amplifier.

D.C. potential developed across **R16** is fed back as bias to **V2b** and **V3,** giving automatic gain control.

Resistance-capacitance coupling by **R21, C52** and **R23** between **V4d** and pentode output valve **V5 (Mullard UL41).** Tone correction by **C54, R28, C56** in **V5** anode circuit and by negative feedback via **R24** between **V5** anode and **V4d** anode. **C48,** in conjunction with a three-position screw-type adjustment, provides three different levels of tone correction. In the A.M./F.M. position, **C48** is shunted directly across **R19** and gives treble cut in all positions of the waveband control, while in the A.M. or F.M. positions **C48** is brought into operation only when the receiver is switched to A.M. or F.M. respectively.

Provision is made for the connection of an external low impedance speaker. A speaker muting switch **S16** is provided to silence the internal speaker.

Filament voltage for the tuning indicator **(T.I., Mullard DM70)** is obtained from the voltage dropped across **R27** in **V5** cathode circuit. The grid circuit of the tuning indicator is connected via **S14** to the D.C. load **R17** for F.M. operation, or via **S15** to the A.M. A.G.C. line for A.M. operation.

H.T. current is supplied by half-wave I.H.C. rectifying valve **(V6, Mullard UY41).** H.T. smoothing by choke **L26** and electrolytic capacitors **C57, C58.** The valve filaments, together with ballast resistor **R29, R30, R31,** are connected in series across the mains input. **R32** protects **V6** from current surges. Mains R.F. filtering by **C62.**

Operation on F.M.

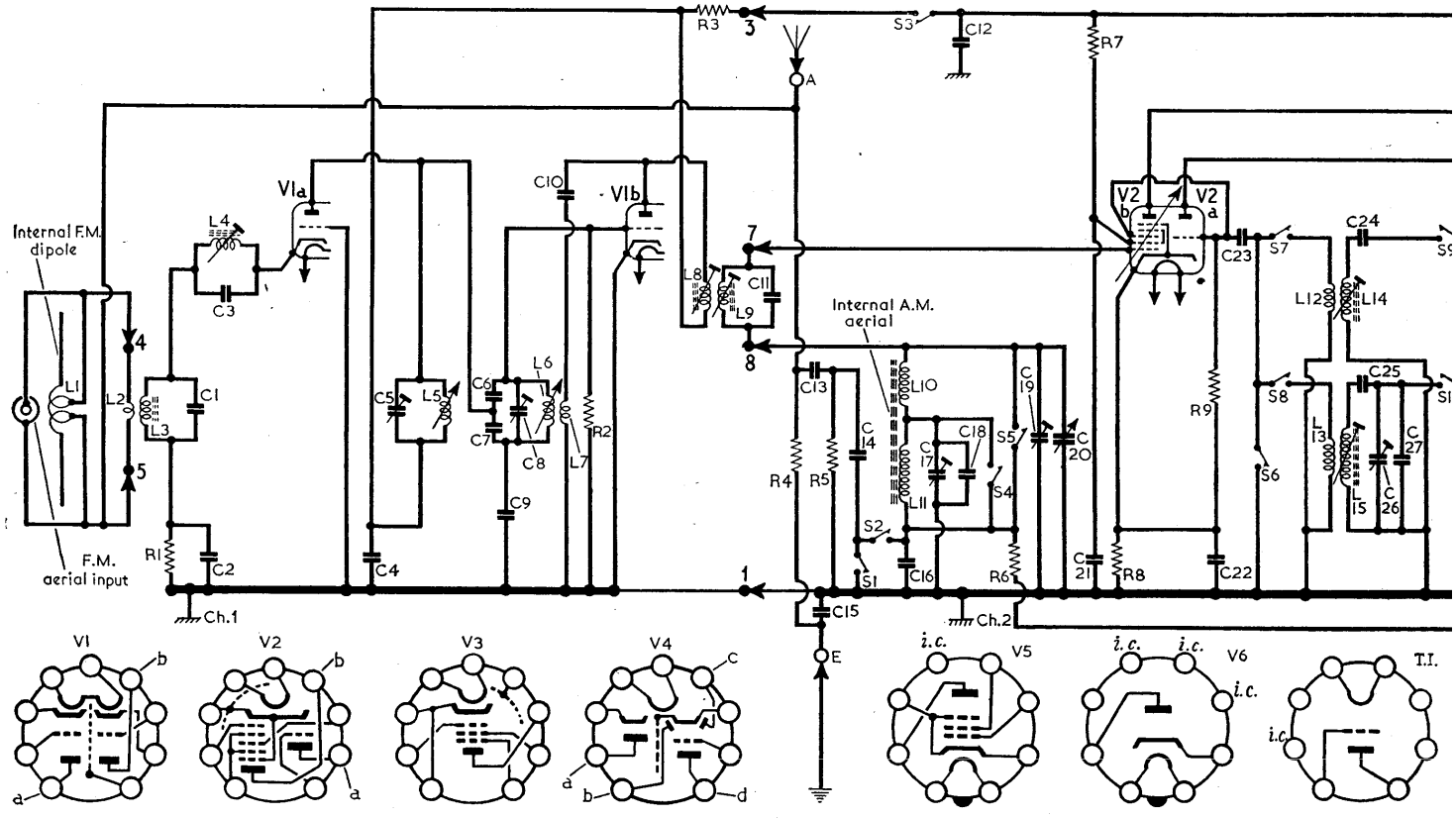
Co-axial 75 Ω F.M. aerial input via coupling transformer **L2, L3** to R.F. amplifier, section **a** of **V1 (Mullard UCC85).** I.F. rejection by **L4, C5.**

Section **b** of **V1** operates as oscillator/mixer valve with tuned oscillator grid circuit **L6, C6, C7, C8.** Reaction coupling from anode via **C10, L7.** Oscillator radiation is reduced by means of a bridge neutralizing circuit, formed by **C6, C7, C9,** and the inter-electrode capacitances of **V1b,** which prevents coupling between the oscillator and R.F. circuits. Oscillator tuning is by means of the ganged cores of **L5, L6** which are cam-driven from the spindle of the tuning gang **C20, C29.**

V2b and **V3** form the two-valve F.M. intermediate frequency amplifier, which is coupled by tuned transformers **L8, L9, C11; C30, L16, L17, C31;** and discriminator transformer **C38, L20, L21, L22, C39** to diode sections **a** and **b** of **V4** connected in a ratio detector discriminator circuit.

F.M. intermediate frequency 10.7 Mc/s.

The A.F. output of the ratio detector is developed across **C42** and passed via **R19** and **C50** to **V4d** grid. Limiting is performed by the



M./F.M. RECEIVER U243

ble Receiver for Operation from A.C. or D.C. Mains

"fly-wheel" effect of D.C. reservoir **C45**. Potential developed across D.C. load **R17** is fed back as A.G.C. bias to **V3** suppressor grid.

COMPONENTS AND VALUES

	RESISTORS	Values	Locations
R1	V1a G.B.	220Ω	F3
R2	V1b C.G	100kΩ	F3
R3	H.T. feed	4·7kΩ	F3
R4	A.M. aerial shunts	1MΩ	A2
R5		10kΩ	A2
R6	A.G.C. decoup. ...	1MΩ	G3
R7	V2b S.G. decoup....	10kΩ	G4
R8	V2 G.B.	180Ω	G4
R9	V2a C.G.	47kΩ	G4
R10	H.T. feed	68kΩ	G4
R11	V3 S.G. feed ...	82kΩ	F4
R12	H.T. feed	2·2kΩ	F4
R13	Part de-emphasis...	39kΩ	F4
R14	I.F. stopper ...	100kΩ	E4
R15	A.M. detector load	470kΩ	B1
R16		470kΩ	F4
R17	D.C. load	33kΩ	E4
R18	T.I. decoupling ...	2·2MΩ	E3
R19	Volume control ...	1MΩ	D3
R20	V4d C.G.	10MΩ	E4
R21	V4d anode load ...	220kΩ	E4
R22	T.I. H.T. feed ...	470kΩ	D3
R23	V5 C.G.	680kΩ	E4
R24	Neg. feed-back ...	1·8MΩ	E4
R25	H.T. feed	10kΩ	E4
R26	V5 G.B.	180Ω	E4
R27		82Ω	E4
R28	Tone correction ...	22kΩ	D4
R29	Heater ballast ...	370Ω	C2
R30		200Ω	C2
R31		200Ω	C2
R32	V6 surge limiter ...	200Ω	C2

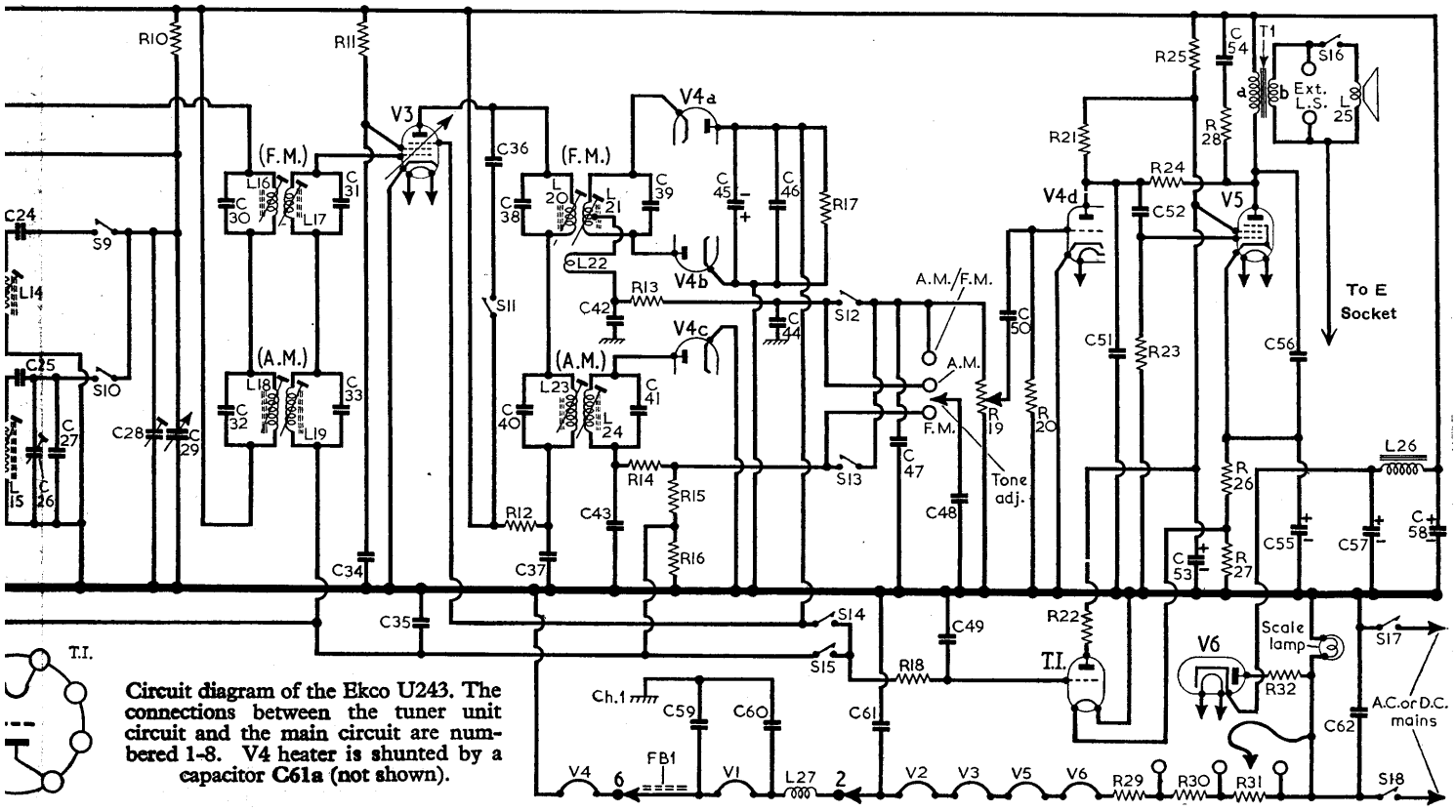
	CAPACITORS	Values	Locations
C1	F.M. aerial tun.	12pF	F3
C2	V1a cath. by-pass	0·001μF	F3
C3	F.M. I.F. filter	20pF	G3
C4	H.T. by-pass ...	500pF	F3
C5	F.M. R.F. trim.	30pF	F3
C6	F.M. osc. trimmers	6pF	F3
C7		6pF	F3
C8		30pF	G3
C9		12pF	G3
C10	F.M. osc. coup. ...	22pF	G3
C11	1st. F.M. I.F.T. tuning	22pF	A1
C12*	H.T. by-pass ...	0·011μF	F4
C13	A.M. aerial coupling	1,800pF	A2
C14		0·01μF	A2
C15	Earth isolator ...	1,800pF	A2

Continued next col.

*Two capacitors, 0·01μF + 0·001μF, in parallel.

Dealers are reminded that if the component numbers given in the component tables are used when ordering replacements, it is advisable to mention the fact on the order, as these numbers may differ from those used in the manufacturers' circuit.

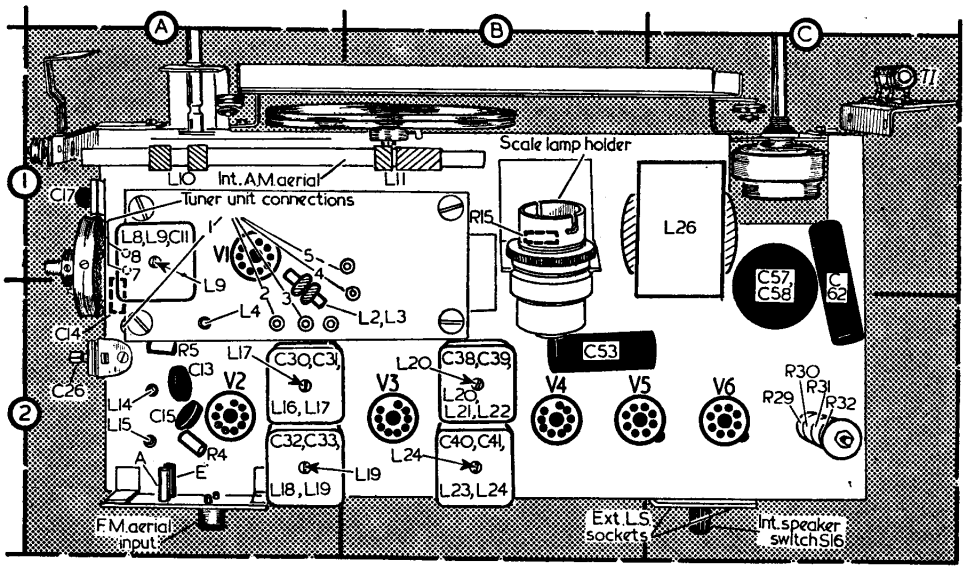
	CAPACITORS (*Continued*)	Values	Locations
C16	A.M. aerial coup.	2,500pF	G3
C17	L.W. aerial trim	40pF	A1
C18		50pF	G3
C19	M.W. aerial trim	—	F3
C20	Aerial tuning ...	—	F3
C21	V2b S.G. decoup.	0·01μF	G4
C22	V2 cath. by-pass	0·04μF	G4
C23	V2a C.G.... ...	68pF	G4
C24	M.W. osc. tracker	470pF	G4
C25	L.W. osc. tracker	200pF	G4
C26	L.W. osc. trimmers	40pF	A2
C27		82pF	G4
C28	Osc. trimmer ...	—	F3
C29	A.M. osc. tuning	—	F3
C30	2nd F.M. I.F.T. tuning	22pF	A2
C31		17pF	A2
C32	1st A.M. I.F.T. tuning	100pF	A2
C33		100pF	A2
C34	V3 S.G. decoup.	0·01μF	F4
C35	A.G.C. decoup. ...	0·04μF	F4
C36	A.M. I.F.T. tun.	30pF	F4
C37	H.T. decoup. ...	0·01μF	F4
C38	3rd F.M. I.F.T. tuning	22pF	B2
C39		30pF	B2
C40	2nd A.M. I.F.T. tuning	350pF	B2
C41		350pF	B2
C42	A.F. load ...	100pF	E4
C43	I.F. by-pass ...	100pF	E4
C44	Part de-emphasis	0·001μF	F3
C45	D.C. reservoir ...	12μF	E4
C46	I.F. by-passes ...	100pF	E4
C47		100pF	F3
C48	Tone correction	0·002μF	F4
C49	T.I. decoupling ...	0·01μF	D3
C50	A.F. coupling ...	0·01μF	D3
C51	I.F. by-pass ...	100pF	E4
C52	A.F. coupling ...	0·01μF	E4
C53	H.T. smoothing	8μF	B2
C54	Tone correction	0·02μF	D4
C55	V5 cath. by-pass	50μF	E4
C56	Tone correction	0·001μF	E4
C57	H.T. smoothing	50μF	C1
C58		50μF	C1
C59	Heater by-pass capacitors ...	0·001μF	F3
C60		0·001μF	F3
C61		0·01μF	G4
C61a		0·01μF	E4
C62	Mains R.F. by-pass	0·1μF	C1



Circuit diagram of the Ekco U243. The connections between the tuner unit circuit and the main circuit are numbered 1-8. V4 heater is shunted by a capacitor **C61a** (not shown).

1227 EKCO U243

Supplement to Wireless & Electrical Trader, 14 *January* 1956



Plan illustration of the chassis, showing the majority of the tuner unit connections in A1 and A2. Connection 6 is shown in the underside illustration (location E4). A.M. internal aerial coils L10 and L11 in locations A1, B1 are mounted on a length of ferrite rod.

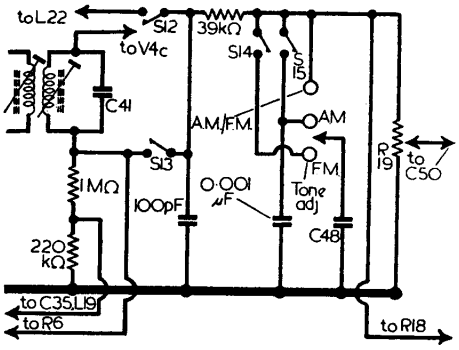
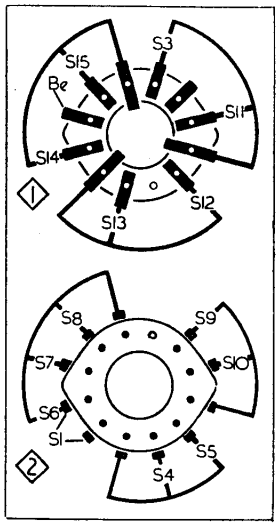


Diagram showing circuit differences as they appear in the A.M. and F.M. detector circuits of early versions of the receiver.

OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	Int. F.M. dipole ...	—	—
L2, L3	F.M. aerial coup. coils	—	A1
L4	F.M. I.F. rejector ...	—	G3
L5	F.M. R.F. coil ...	—	F3
L6, L7	F.M. osc. coils ...	—	G3
L8	1st F.M. I.F.T. Pri.	—	A1
L9	1st F.M. I.F.T. Sec.	—	A1
L10	Int. A.M. aerial coils	1·0	A1
L11		7·5	B1
L12	A.M. osc. reaction coils	2·5	G4
L13		3·0	G4
L14	A.M. osc. tuning coils	2·5	G4
L15		7·0	G4
L16	2nd F.M. I.F.T. Pri.	—	A2
L17	2nd F.M. I.F.T. Sec.	—	A2
L18	1st A.M. I.F.T. Pri.	10·0	A2
L19	1st A.M. I.F.T. Sec.	10·0	A2
L20	3rd F.M. I.F.T. Pri.	—	B2
L21	3rd F.M. I.F.T. Sec.	—	B2
L22	3rd F.M. I.F.T. Tert	—	B2
L23	2nd A.M. I.F.T. Pri.	6·0	B2
L24	2nd A.M. I.F.T. Sec.	6·0	B2
L25	Speech coil ...	2·5	—
L26	H.T. Smoothing choke	350·0	C1
L27	Heater R.F. choke	—	F3
T1	O.P. trans. a ...	400·0	E3
	O.P. trans. b ...	—	
S1-S15	Waveband switches	—	G3
S16	Int. L.S. switch ...	—	D4
S17, S18	Mains sw., g'd R19	—	D3

Switch Table and Diagrams

Switches	L.W.	M.W.	F.M.
S1	—	—	C
S2	C	C	—
S3	—	—	C
S4	—	C	—
S5	—	—	C
S6	—	—	C
S7	—	C	—
S8	C	—	—
S9	—	C	—
S10	C	—	—
S11	C	C	—
S12	—	—	C
S13	C	C	—
S14	—	—	C
S15	C	C	—



Diagrams of the waveband switch units, as seen in the direction indicated by the numbered arrows in the underchassis illustration.

GENERAL NOTES

Switches.—S1-S15 are the waveband and A.M./F.M. change-over switches, ganged in two rotary units beneath the chassis. These units are identified in the underchassis illustration, where the numbered arrows indicate the direction in which they are viewed in the diagrams of the units in column 2. The associated switch table below the diagrams gives the switch operations for the three control settings starting with the control in its fully anti-clockwise position. A dash indicates open, and **C**, closed.

S16 is the internal speaker muting switch, mounted between the external speaker sockets in location C2.

S17, S18, are the Q.M.B. mains switches ganged with the volume control **R19.**

Scale Lamp.—This is a 230-250 V, 15 W pygmy lamp with a bayonet cap base.

Modifications.—Differences between the sample receiver on which this *Service Sheet* was prepared and earlier models are as follows.

A 20pF capacitor was connected between the lower end of **L2** and chassis. **C12** was an 0.01μF capacitor. **R28, C54** were not fitted. An 0.001μF capacitor was connected in series between **R24** and the junction of **R28** and **V5** anode. **R22** was 220 kΩ.

In the A.M. detector and F.M. discriminator circuits there were many differences which can be seen in the diagram of the original section of the circuit above. These differences are mainly centred round switches **S14, S15,** which are employed here in the 3-position tone adjustment circuit. In later circuits, as seen in the diagram overleaf, these switches are used to connect the tuning indicator grid circuit either to the discriminator D.C. load or to the A.M. A.G.C. line.

Drive Cord Replacement.—About 36 inches of good quality flax fishing line, plaited and waxed, is required for a new gang drive, and about 20 inches of 7-strand steel wire is required for a new waveband indicator drive.

The gang drive drum should be turned to maximum capacitance and the drive cord should be run as shown in the sketch at the foot of column 5. The waveband indicator drive should be run as shown in the sketch at the foot of column 6.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our sample receiver when it was operating from A.C. mains of 230 V. The receiver, except where otherwise indicated, was tuned to the high wavelength end of M.W., and there was no signal input.

Voltages were measured with an Avo Electronic Test Meter, and as this instrument has a high internal resistance, allowance should be made for the current drawn by other types of meter. Chassis was the negative connection in every case.

Valve	Anode V	Anode mA	Screen V	Screen mA	Cath. V
V1 UCC85* a	135	4·5	—	—	1·3
V1 UCC85* b	135	4·0	—	—	—
V2 UCH81 a	48	2·2	—	—	2·8
V2 UCH81 b	195	5·5	130	7·4	2·8
V3 UF85	175	7·4	50	2·5	—
V4 UABC80 a-c	—	—	—	—	—
V4 UABC80 d	60	0·4	—	—	—
V5 UL41	180	37·0	130	10·0	8·0
V6 UY41	150†	—	—	—	215·0‡
T.I. DM70	90	—	—	—	—

*Switched to F.M. †A.C. reading, each anode. ‡ Cathode current 67mA.

DISMANTLING

Removing Chassis.—Remove volume and tuning control knobs (grub screws) from front of cabinet, and waveband knob (grub screw) from side of cabinet;

remove plastics runners from base of cabinet (four wood screws), and unscrew four chassis bolts thus revealed;

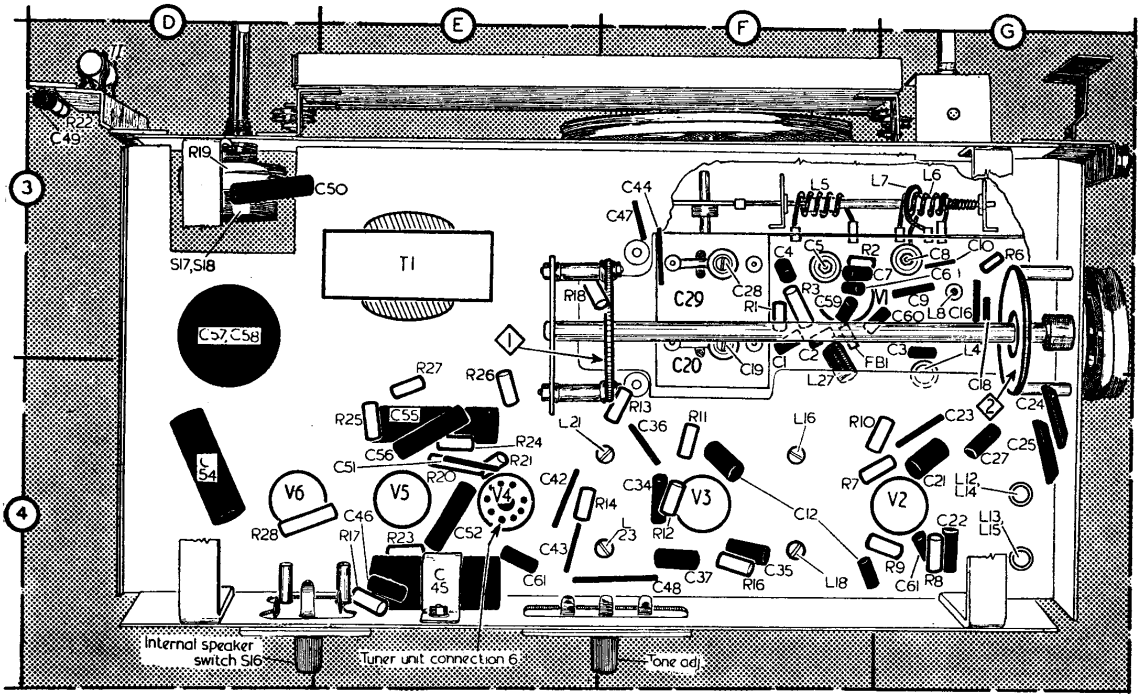
unclip white and pink internal F.M. aerial leads from their terminations on the tuner unit;

unsolder leads from speech coil tags on speaker, and withdraw chassis.

CIRCUIT ALIGNMENT

Remove chassis from cabinet and support it on its ballast resistor end on the bench. Remove tuning scale from cabinet (held by three springs and wood block), and place it in position over the control spindles.

Equipment Required.—An A.M. signal generator covering the range of 140 kc/s to 1.5 Mc/s; an F.M. signal generator covering the F.M. intermediate frequency of 10.7 Mc/s and the frequency range of 86-100 Mc/s, with a deviation of at least ±25 kc/s (if an F.M. signal



Underside illustration of the chassis. The chassis is shown broken in locations F3 and G3 to reveal the F.M. tuning coils L5, L6 and L7. C61 in location E4 is actually C61a.

generator is not available, the instructions given under "F.M. Alignment using A.M. Generator" should be used); an output meter with an internal resistance of 3 Ω; a 0-100 μA D.C. microammeter; two 220 kΩ resistors.

F.M. I.F. Stages.—Switch receiver to F.M. and tune it to 87 Mc/s. Connect output meter across speech coil tags on speaker and disconnect internal F.M. aerial. Connect output of F.M. signal generator, via an 0.01 μF capacitor in each lead, to control grid (pin 2) of **V3** and to chassis.

1.—Feed in a 10.7 Mc/s signal deviated by ±25 kc/s and adjust the core of **L20** (location reference B2) for maximum output.
2.—Connect 220 kΩ resistors in series across **R17**, and connect microammeter between the junction of these resistors and the junction of **C42, R13.** Adjust the core of **L21** (F4) for zero current. Disconnect resistors and microammeter.
3.—Transfer F.M. generator "live" lead, with isolating capacitor, to control grid (pin 2) of **V2.** Adjust the cores of **L17** (A2) and **L16** (F4) for maximum output.
4.—Check that the outputs at 10.6 Mc/s and 10.8 Mc/s are equal. A slight adjustment should be made to the core of **L21** if any inequality exists.
5.—Transfer F.M. signal generator live lead with isolating capacitor, to cathode (pin 8) of **V1a** and chassis. Adjust the cores of **L9** (A1) and **L8** (G3) for maximum output.
6.—Transfer signal generator leads to F.M. aerial socket and adjust the core of **L4** (A2) for minimum output.

A.M. I.F. Stages.—Switch receiver to M.W. and tune receiver to 545 kc/s. Connect output of spot-frequency signal generator, via an 0.01 μF capacitor in each lead, to control grid (pin 2) of **V2** and to chassis.

7.—Feed in a 30% modulated 470 kc/s signal and adjust the cores of **L24** (B2), **L23** (F4), **L19** (A1) and **L18** (F4) for maximum output.

F.M. R.F. and Oscillator Stages.—Check that with the gang at maximum capacitance the cursor coincides with the calibration marks at the high wavelength end of the M.W. and L.W. bands, and that the F.M. tuning plunger, which is driven by a cam on the gang spindle, projects from its screening can by $\frac{1}{8}$in overall.

8.—Switch receiver to F.M. and tune it to 94 Mc/s. Set **C8** (G3) to maximum capacitance, and adjust **C5** (F3) to mid-capacitance. With F.M. signal generator connected to F.M. aerial socket, feed in a 94 Mc/s signal and adjust **C8** to the first peak obtained on unscrewing the trimmer from maximum capacitance.
9.—Adjust **C5** for maximum output. Readjust **C8** for maximum output.
10.—Check calibration at 98 Mc/s and 90 Mc/s and adjust position of cam on gang shaft if necessary to correct errors. Repeat operation 9.

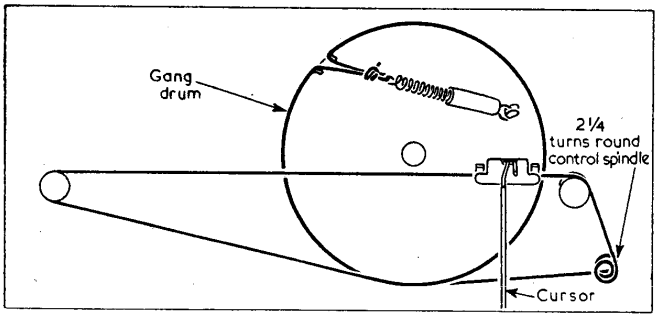
A.M. R.F. and Oscillator Stages.—Connect spot-frequency signal generator, via a standard dummy aerial, to **A** and **E** sockets.

11.—Switch receiver to M.W. and tune it to 500m. Feed in a 500m (600 kc/s) signal and adjust the core of **L14** (A2) for maximum output.
12.—Tune receiver to 214.3m, feed in a 214.3m (1,400 kc/s) signal and adjust **C28** (F3) for maximum output. Repeat this adjustment, and operation 11.
13.—Retune receiver to 500m, feed in a 500m (600 kc/s) signal and adjust the inductance of **L10** (A1) for maximum output by sliding it along the ferrite rod.
14.—Retune receiver to 214.3m, feed in a 214.3m (1,400 kc/s) signal and adjust **C19** (F3) for maximum output. Repeat this adjustment and operation 13.
15.—Switch receiver to L.W. and tune it to 2,000m. Feed in a 2,000m (150 kc/s) signal and adjust the core of **L15 (A2)** for maximum output.
16.—Tune receiver to 1,000m, feed in a 1,000m (300 kc/s) signal and adjust **C26** (A2) for maximum output. Repeat this adjustment and operation 15.
17.—Retune receiver to 2,000m, feed in a 2,000m (150 kc/s) signal and adjust the inductance of **L11** (B1) for maximum output by sliding the coil along the ferrite rod.
18.—Retune receiver to 1,000m, feed in a 1,000m (300 kc/s) signal and adjust **C17** (A1) for maximum output. Repeat this adjustment and operation 17.

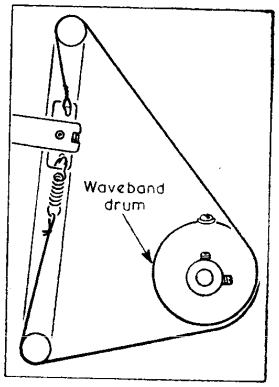
F.M. Alignment Using A.M. Generator.—When using an A.M. signal generator for F.M. alignment an unmodulated signal should be used throughout, and the R.F. and oscillator operations 8-10 should be made for maximum voltage output across **R17,** measured on a high resistance 0-10V D.C. voltmeter.

Sensitivity Figures.—Not more than 70 mV of 10.7 Mc/s signal, deviated by ±25 kc/s, should be required at **V3** control grid to produce an output of 500 mW across **T1** secondary winding. Not more than 5.5 mV of signal at **V2** control grid, and not more than 2 mV of signal at **V1b** cathode should be required to produce a 500 mW output.

Response Curves.—Check that with the signal generator output connected to **V3** control grid and to chassis, the outputs at 10.45 Mc/s and at 10.95 Mc/s are not less than half that at 10.7 Mc/s. Check that with the generator connected to **V2** control grid and chassis, the outputs at 10.6 Mc/s and 10.8 Mc/s are not less than half that at 10.7 Mc/s. Finally, check that with the generator connected to **V1a** cathode and chassis, the outputs at 10.61 Mc/s and 10.79 Mc/s are not less than half that at 10.7 Mc/s.



Sketch of the gang drive cord system as seen from the front of an upright chassis with the gang at maximum capacitance.



Sketch of the waveband indicator drive as seen from the waveband control side of an upright chassis, with the control switched to F.M.

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