

"TRADER" SERVICE SHEET

1216

EKCO A239 A.M

4-band (including F.M.) Table M

EMPLYING a compressed internal dipole for F.M. reception, the Ekco A239 is a 5-valve (plus rectifier and cathode ray tuning indicator) A.M./F.M. table receiver designed for operation from A.C. mains of 200-250V, 50-100 c/s. Provision is made for the use of the internal F.M. aerial for A.M. reception. The waveband ranges are A.M., 16-50m, 185-570m, 950-2,150m; F.M., 87.5-100 Mc/s.

Release date and original price: April, 1955; £27 14s 8d. Purchase tax extra.

CIRCUIT DESCRIPTION

A.M. aerial input via coupling coils **L12** (S.W.) and **L13** (M.W. and L.W.) to tuning coils **L14** (S.W.), **L15** (M.W.) and **L16** (L.W.). Additional coupling via **C16** on S.W. Aerial tuning is by **C76** via **S8** which closes on the A.M. bands.

Section **b** of **V2** (Mullard ECH81) oper-

ates as A.M. mixer, and section **a** as oscillator. Oscillator grid coils **L17** (S.W.), **L18** (M.W.) and **L19** (L.W.) are tuned by **C77**, switch **S11** closing on the A.M. bands. Parallel trimming by **C78** (S.W.), **C79** (M.W.) and **C28**, **C80** (L.W.); series tracking by **C25** (S.W.), **C27** (M.W.) and **C26** (L.W.). Reaction coupling from oscillator anode via coils **L20**, **L21**, **L22**. Stabilization on S.W. by **R10**.

V3 (Mullard EF85) is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings **C33**, **L25**, **L26**, **C34** and **C41**, **L30**, **L31**, **C42**.

A.M. intermediate frequency 460 kc/s.

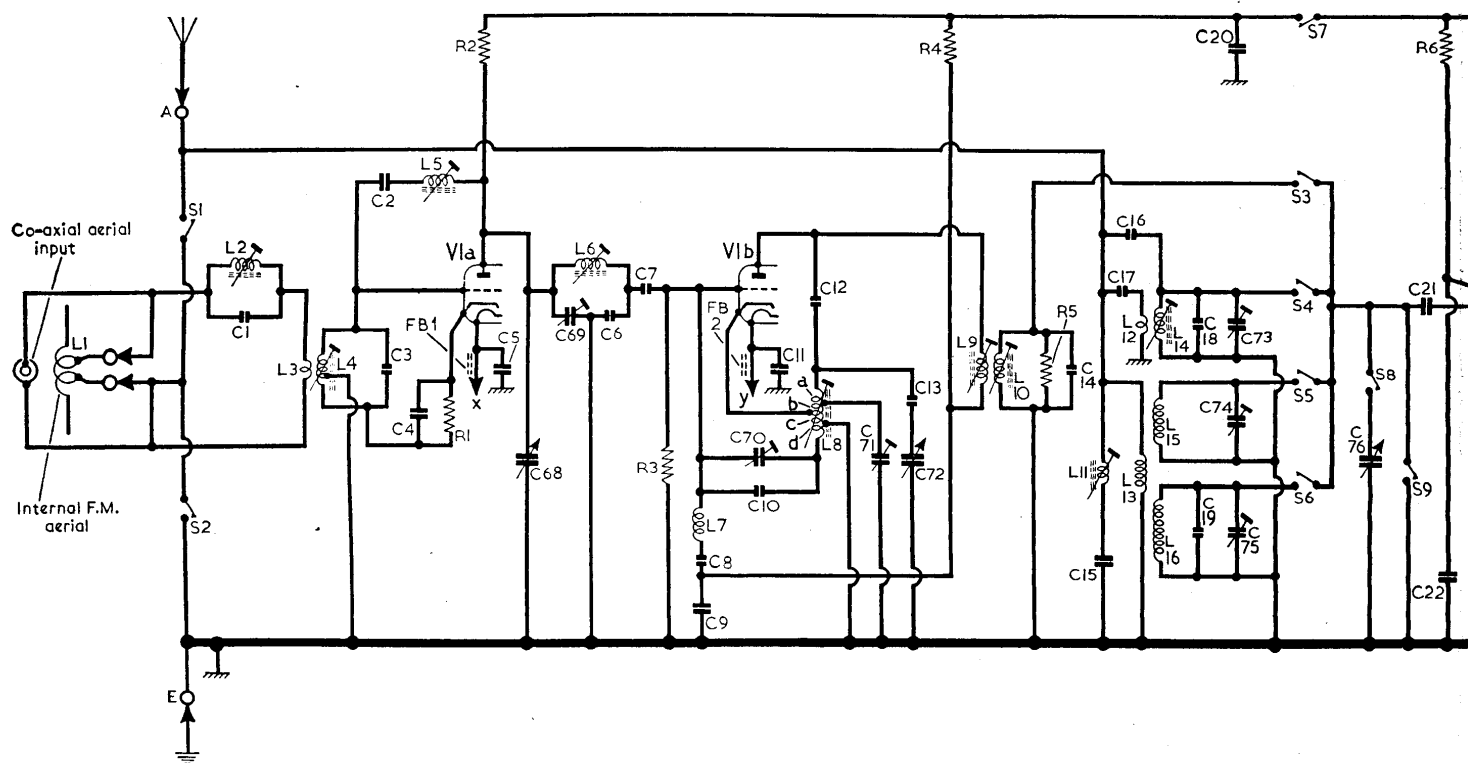
Diode section **c** of triode triode valve (**V4**, Mullard EABC80) functions as A.M. signal detector, and the audio frequency component in its rectified output is developed across **R19**. I.F. filtering by **C43**, **R16** and the capacitance of the leads to chassis. The A.F. signal developed across **R19** is passed via **S20**, which closes

on the A.M. bands, tone control circuit **C49**, **R24**, **R25**, **C50**, **R26**, **C53** and volume control **R28** to grid of triode section **d** of **V4**, which operates as A.F. amplifier.

D.C. potential developed across **R19** is fed back as bias to **V2b** and **V3** giving automatic gain control on the A.M. bands. A source of standing bias is developed across **R39** in the H.T. negative lead and is fed to the A.G.C. line via **R20**.

Provision is made for the connection of a gramophone pickup across the input circuit to the volume control via **S21**, which closes in the gram position of the waveband control. Provision is also made, via a second pair of sockets, for feeding radio or gramophone signals to a tape recorder.

Resistance-capacitance coupling by **R31**, **C58** and **R32** between **V4d** and pentode output valve (**V5**, Mullard EL84). Grid bias for **V5** is obtained from the voltage drop across **R39**. Tone correction by **C57** (via **S24** which closes on the A.M. bands



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A./F.M. RECEIVER

Model for operation on A.C. mains.

and gram), C61 and by negative feed-back via R29, R34 between T1 secondary winding and V4d grid circuit. Provision is made for the connection of an external low impedance speaker, and an internal speaker muting switch S25 permits the internal speaker to be muted.

H.T. current is supplied by full-wave I.H.C. rectifying valve (V6, Mullard EZ80). H.T. smoothing by R35 and electrolytic capacitors C62, C63.

Operation on F.M.

Co-axial 75Ω F.M. aerial input via I.F. filter L2, C1 and aerial coupling transformer L3, L4 to R.F. amplifier, section a of V1 (Mullard ECC85). Neutralizing by C2, L5.

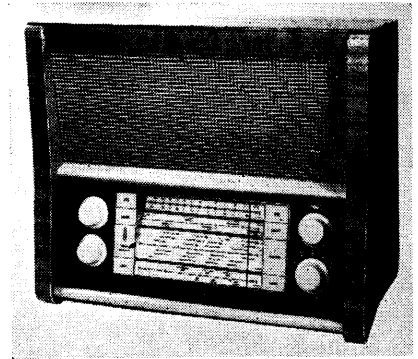
Second valve, section b of V1 is a triode operating as F.M. oscillator/mixer valve with tuned oscillator anode circuit L8, C13, C72. Reaction coupling is by means of cathode tapping on section c of L8. Section d of L8, C70, C10, L7, C8 and C9

form parts of a bridge neutralizing circuit to prevent coupling between the oscillator and aerial circuits and thus reduce oscillator radiation. Oscillator tuning by C72 and R.F. tuning by C68, which are parts of the tuning gang.

The I.F. signal in V1b output is coupled via I.F. transformer L9, L10 to section b of V2, which functions as first F.M. I.F. amplifier when the receiver is switched to F.M., switch S3 being closed.

F.M. Intermediate frequency 10.7 Mc/s
Tuned transformer coupling by C31, L23, L24, C32 and discriminator transformer C39, L27, L28, C40, L29 between V2b, V3 and V4a and b.

Diode sections a and b of V4 operate in a ratio detector discriminator circuit, whose A.F. output is developed across C44 and fed via de-emphasis circuit R15, C45 to the volume control circuit, S19 closing for F.M. operation. Limiting is performed by R12, C35 and by the "fly-wheel" effect of D.C. reservoir C47.



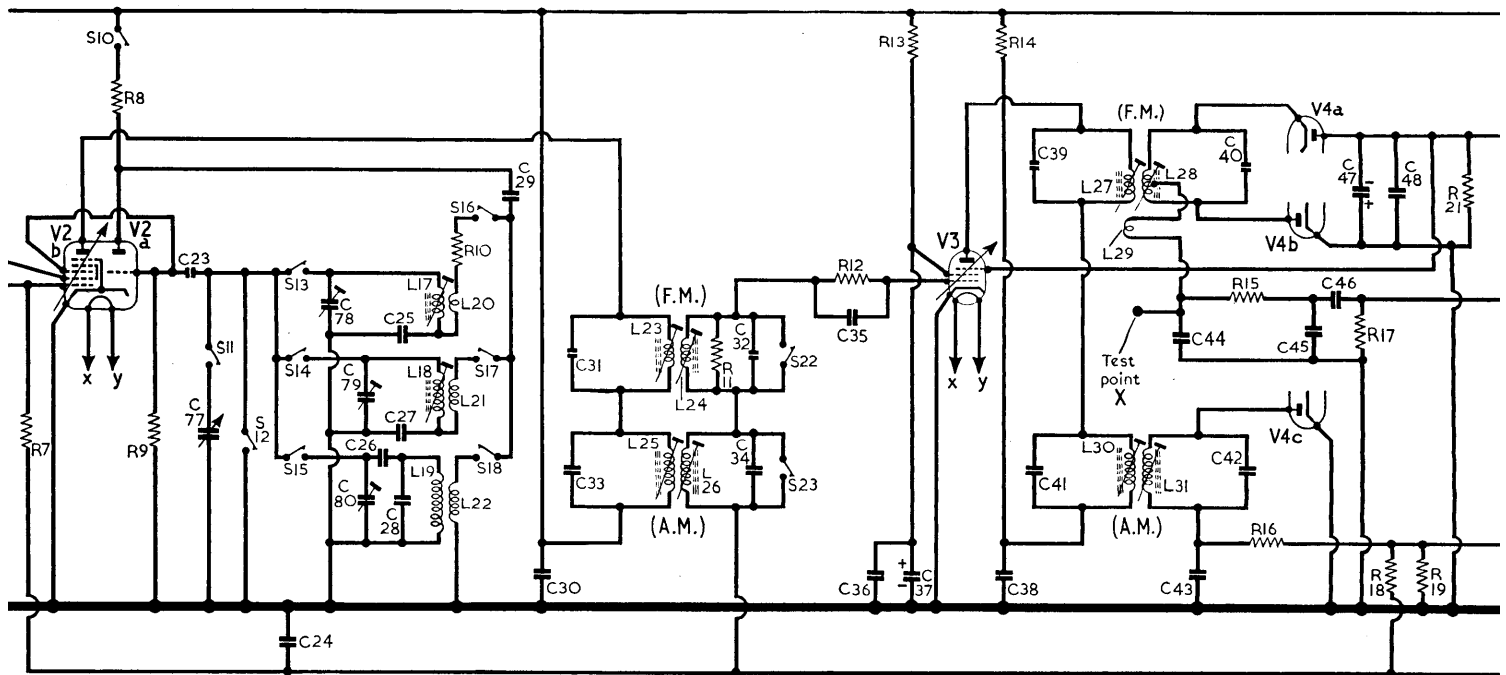
Appearance of the Ekco A239.

GENERAL NOTES

Switches.—S1, S2 are the screw-type aerial switches which are located on the aerial input panel in location reference A2.

When using separate external A.M. and F.M. aerials, the screw should be inserted in the right-hand side hole (S2) and screwed in fully clockwise. This connects the screening of the co-axial F.M. input lead to chassis.

When using an external F.M. dipole only, and no separate A.M. aerial, the



gram of the Ekco A239. S1 and S2 are screw-type switches located on the aerial input panel (chassis location reference A2) which are set as instructed in "General Notes" for the connection of external A.M. and F.M. aerials. Switches S22, S23, S24 form a separate slide-type unit which is ganged to the waveband control. Grid current in R12, C35 in V3 control grid circuit produces a limiting bias on large signals. Negative feed-back from the top of R21 provides a D.C. bias which is applied to the suppressor grid of V3.

screw should be inserted in the left-hand side hole (S1) and tightened. This connects the screening of the F.M. aerial lead to the A.M. aerial input.

When using the internal F.M. aerial and a separate A.M. aerial, the screw may be left in either hole, but should be left unscrewed by at least three turns.

S3-S24 are the waveband/gram switches. **S3-S21** are ganged in three rotary units beneath the chassis. These units are indicated in the underside illustration of the chassis (location reference **G3**) where the numbered arrows indicate the direction in which they are viewed in the detail diagram of the units overleaf. The associated switch table above the diagrams shows the switch operations in the four control settings, starting from the fully anti-clockwise position of the control. A dash indicates open, and **C**, closed. **S22-S24** are also ganged to the waveband switch control but consist of a separate slide type unit in location **F4**. **S23** closes for F.M. operation, and **S22**, **S24** close for A.M. operation.

S25 is the internal speaker muting switch, mounted between the external speaker sockets in location **E4**.

Drive Cord Replacement.—About 4ft of

(Continued col. 1 overleaf)

COMPONENTS AND VALUES

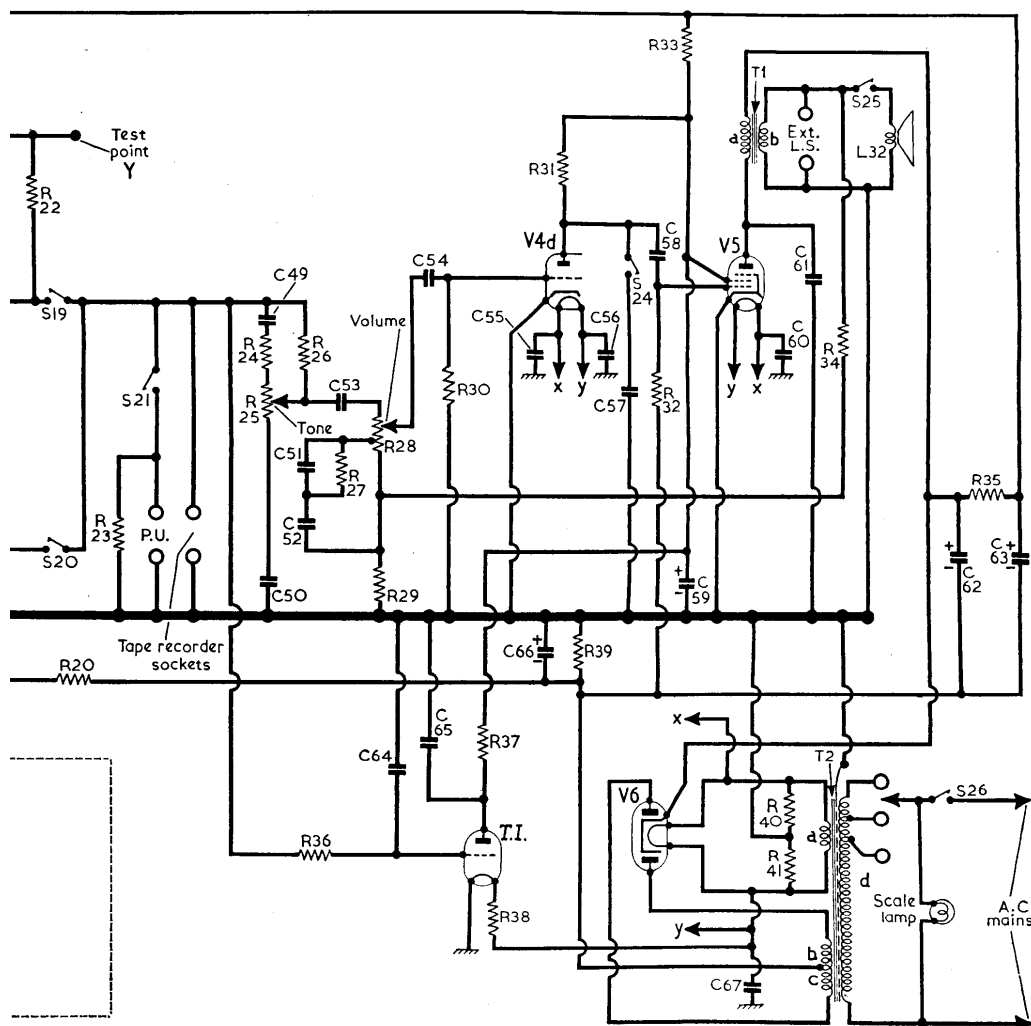
RESISTORS			Values	Locations
R1	V1a G.B. ...	...	220Ω	F3
R2	V1a H.T. feed ...	...	27kΩ	E3
R3	V1b C.G. ...	...	47kΩ	F4
R4	V1b H.T. feed ...	...	56kΩ	G4
R5	1st F.M. I.F.T. shunt ...	...	56kΩ	G4
R6	V2b S.G. feed ...	...	33kΩ	G4
R7	V2b C.G. ...	...	470kΩ	G4
R8	V2a H.T. feed ...	...	33kΩ	G3
R9	V2a C.G. ...	...	47kΩ	G4
R10	S.W. osc. stabilizer	...	100Ω	G3
R11	2nd F.M. I.F.T. shunt ...	...	56kΩ	F4
R12	V3 grid leak ...	...	470kΩ	F4
R13	V3 S.G. feed ...	...	68kΩ	F4
R14	V3 H.T. feed ...	...	2.2kΩ	E4
R15	Part de-emphasis...	...	47kΩ	E4
R16	I.F. stopper	...	47kΩ	E4
R17	Discriminator balancing ...	...	3.3MΩ	E4
R18	A.G.C. decoupling	...	2.2MΩ	E4
R19	A.M. diode load ...	...	220kΩ	E4
R20	G.B. decoupling ...	...	6.8MΩ	E4
R21	D.C. load ...	...	27kΩ	E3
R22	Discriminator balancing ...	...	1MΩ	E4
R23	P.U. shunt ...	...	1MΩ	E4
R24	Part tone control ...	...	220kΩ	C1
R25	Tone control ...	...	1MΩ	C1
R26	Part tone control ...	...	220kΩ	C1
R27	Tone corrector	33kΩ	D3
R28	Volume control	1MΩ	D3
R29	Neg. feed-back	10Ω	D3
R30	V4d C.G.	10MΩ	E4

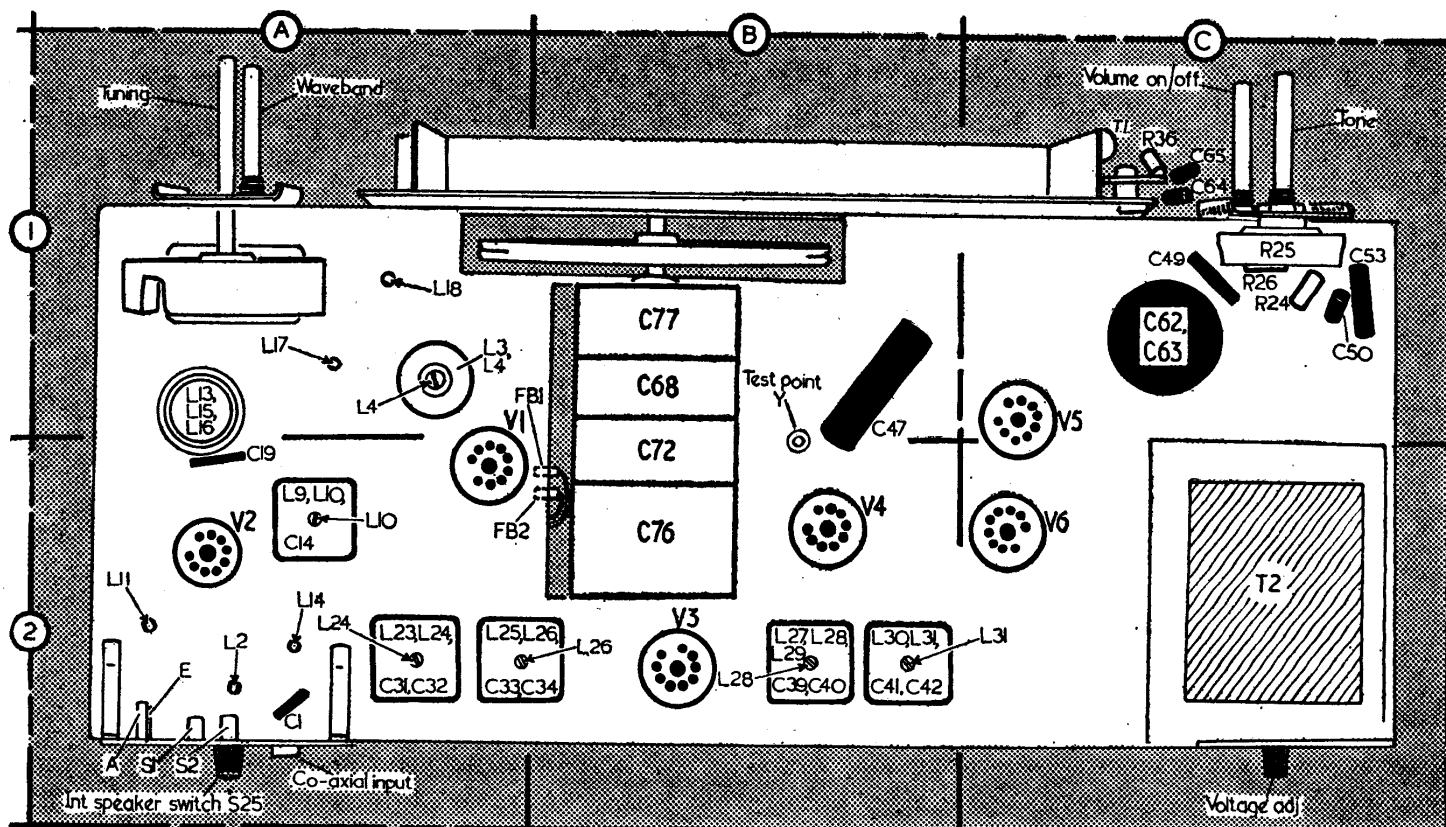
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RESISTORS (Continued)			Values	Locations
R31	V4d anode load	220kΩ	E3
R32	V5 C.G.	680kΩ	E4
R33	H.T. feed ...	...	4.7kΩ	D3
R34	Neg. feed-back ...	...	470kΩ	E3
R35	H.T. smoothing ...	...	820Ω	D3
R36	T.I. decoupling ...	...	3.3MΩ	C1
R37	T.I. H.T. feed ...	...	1MΩ	D3
R38	T.I. heater ballast	...	82Ω	D3
R39	Common G.B. ...	...	100Ω	D3
R40	Heater tapping ...	...	27Ω	D4
R41		...	33Ω	D4

CAPACITORS			Values	Locations
C1	F.M. I.F. filter tun.	...	22pF	A2
C2	V1a neutralizing ...	...	0.001μF	F3
C3	F.M. aerial tuning	...	6pF	F3
C4	V1a cath. by-pass...	...	0.01μF	F3
C5	Heater by-pass ...	...	0.01μF	F3
C6	F.M. R.F. trim ...	...	17pF	F4
C7	V1b C.G. ...	...	33pF	F4
C8	V1b C.G. ...	...	33pF	F4
C9	F.M. oscillator neutralizing ...	...	470pF	F4
C10	F.M. oscillator neutralizing ...	...	6.8pF	F4
C11	Heater by-pass ...	...	0.01μF	F4
C12	F.M. osc. coup.	...	22pF	F4
C13	F.M. osc. tracker ...	...	20pF	F4
C14	1st F.M. I.F.T. tun.	...	22pF	A2
C15	A.M. I.F. filter tun.	...	100pF	G4
C16	A.M. aerial coup.	...	6pF	G4
C17	A.M. aerial coup.	...	30pF	G4
C18	S.W. aerial trim ...	...	22pF	A2
C19	L.W. aerial trim ...	...	68pF	A2
C20	H.T. by-pass ...	...	0.01μF	G3
C21	V2b C.G. ...	...	100pF	G4
C22	V2b S.G. decoupling	...	0.01μF	G4
C23	V2a osc. C.G. ...	...	68pF	G4
C24	A.G.C. decoupling	...	0.05μF	G4
C25	S.W. osc. tracker ...	...	0.01μF	G3
C26	L.W. osc. tracker...	...	400pF	G3
C27	M.W. osc. tracker...	...	540pF	F3
C28	L.W. osc. trimmer	...	280pF	F3
C29	A.M. osc. coupling	...	0.001μF	G3
C30	H.T. by-pass ...	...	0.01μF	F4
C31	2nd F.M. I.F.T. tuning ...	...	22pF	A2
C32	1st A.M. I.F.T. tuning ...	...	17pF	A2
C33	1st A.M. I.F.T. tuning ...	...	100pF	A2
C34	V3 C.G. ...	...	100pF	A2
C35	V3 C.G. ...	...	100pF	F4
C36	V3 S.G. decoupling	...	0.01μF	F4
C37	H.T. decoupling ...	...	1μF	F4
C38	3rd F.M. I.F.T. tuning ...	...	0.05μF	E4
C39	2nd A.M. I.F.T. tuning ...	...	32pF	B2
C40	2nd A.M. I.F.T. tuning ...	...	30pF	B2
C41	A.M. I.F. by-pass...	...	350pF	B2
C42	A.F. load ...	...	350pF	B2
C43	A.F. load ...	...	100pF	E4
C44	De-emphasis ...	...	300pF	E4
C45	A.F. coupling ...	...	500pF	E4
C46	A.F. coupling ...	...	0.02μF	E4
C47	Discriminator reservoir...	...	8μF	B1
C48	Parts tone control	...	0.01μF	E4
C49	Tone correctors ...	...	220pF	C1
C50	Tone correctors ...	...	0.001μF	C1
C51	A.F. coupling ...	...	0.01μF	D3
C52	A.F. coupling ...	...	0.02μF	D3
C53	Heater by-passes ...	...	0.01μF	C1
C54	Heater by-passes ...	...	0.01μF	E4
C55	Tone corrector ...	...	0.01μF	E4
C56	A.F. coupling ...	...	0.002μF	E4
C57	A.F. coupling ...	...	0.01μF	E3
C58	H.T. smoothing ...	...	8μF	D4
C59	Heater by-pass ...	...	0.001μF	E3
C60	Tone corrector ...	...	0.005μF	E3
C61	H.T. smoothing ...	...	50μF	C1
C62	H.T. smoothing ...	...	50μF	C1
C63	T.I. decoupling ...	...	0.01μF	C1
C64	T.I. decoupling ...	...	0.02μF	C1
C65	G.B. decoupling ...	...	0.01μF	E4
C66	Heater by-pass ...	...	100μF	D4
C67	F.M. R.F. tuning...	...	0.001μF	B1
C68	F.M. R.F. trim ...	...	30pF	F3
C69	F.M. osc. neut. ...	...	8pF	F4
C70	F.M. osc. trim. ...	...	8pF	F4
C71	F.M. osc. tuning ...	...	—	B2
C72	S.W. aerial trim. ...	...	40pF	G4
C73	M.W. aerial trim. ...	...	40pF	G4
C74	L.W. aerial trim. ...	...	40pF	G4
C75	A.M. aerial tuning	...	—	B2
C76	A.M. osc. tuning ...	...	—	B1
C77	S.W. osc. trim. ...	...	15pF	G3
C78	M.W. osc. trim. ...	...	40pF	G3
C79	L.W. osc. trim. ...	...	40pF	G3
C80	L.W. osc. trim. ...	...	40pF	G3

* Electrolytic. † Variable. ‡ Pre-set.
§ Two 10pF capacitors in parallel.





Plan illustration of the chassis showing the two F.M. sections of the gang C68, C72 in location references B1, B2.

OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	F.M. int. dipole ...	—	A2
L2	F.M. I.F. filter ...	—	A1
L3	F.M. aerial coils ...	—	A1
L4		—	F3
L5	V1a neutralizing ...	—	F3
L6	F.M. R.F. tuning ...	—	F4
L7	F.M. osc. neut. ...	—	F4
L8	F.M. osc. coil ...	—	A2
L9	1st F.M. { Pri. ...	—	A2
L10	1st F.M. { Sec. ...	—	A2
L11	A.M. I.F. filter ...	12-0	G4
L12	A.M. aerial coupling coils ...	2-5	G4
L13	A.M. aerial tuning coils ...	50-0	A1
L14		—	G4
L15	A.M. oscillator tuning coils ...	2-5	A1
L16		30-0	A1
L17	A.M. oscillator tuning coils ...	3-0	G3
L18		6-0	G3
L19	A.M. oscillator reaction coils ...	—	G3
L20		2-0	G3
L21	2nd F.M. { Pri. ...	—	A2
L22		—	A2
L23	1st A.M. { Pri. ...	6-0	A2
L24	1st A.M. { Sec. ...	6-0	A2
L25	F.M. dis- criminator transformer Tert.	—	B2
L26	2nd A.M. { Pri. ...	—	B2
L27		6-0	B2
L28	2nd A.M. { Sec. ...	—	B2
L29	Speech coil ...	2-5	B2
L30	O.P. trans. { a ...	900-0	E3
L31		—	E3
L32	Mains trans. { a ...	320-0	C2
L33		320-0	C2
L34	Aerial switches ...	34-0	A2
L35		—	A2
L36	Waveband switches ...	—	G3
L37	F.M./A.M. switches ...	—	F4
L38	Speaker switch ...	—	E4
L39	Mains sw., g'd R28	—	D3

General Notes—Continued

good quality flax fishing line, plaited and waxed, together with about 3½ ft of 7-strand steel wire, are required for a new drive cord. The drive wire should be

made up with a soldered loop at each end to measure 34 inches overall. One end of the drive cord should be tied to it and, starting with the gang at maximum capacitance, should be run as shown in the sketch of the drive cord system at the foot of columns 4 and 5.

Scale Lamp.—This is a 250V, 15W 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 27Ω resistor was connected in series with the lead from V1b grid and C70, C10, L7. R4 was 4.7kΩ. R5 and R11 were omitted. C16, C20, C36, C56, C60 and C67 were omitted.

Valve Replacements.—V2 and V3 can generally be replaced without the need for realignment of the associated tuning circuits. However, realignment of the R.F. and oscillator circuits may be necessary if V1 is replaced, particularly if the receiver is operated in an area of low signal strength.

F.M. I.F. Transformer Replacement.—If the first or second F.M. I.F. transformers L9, L10 and L23, L24 are replaced and if no alignment equipment is available, they can be aligned on an F.M. transmission by adjusting their cores for maximum sound output. The receiver should then be tuned through the received signal and a check made by means of the tuning indicator to see that the response is reasonably symmetrical on both sides of the tuning point.

If the discriminator transformer is replaced this can also be set up on a transmission by carefully tuning the primary for maximum sound output as above, and then carefully tuning the secondary to the strongest of the three tuning points found on screwing the core through its range.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured on our sample receiver when it was operating from A.C. mains of 230V. 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		Screen		Cath.
	V	mA	V	mA	
V1 ECC85* { a	117	4.9	—	—	1.2
V1 ECC85* { b	62	3.7	—	—	—
V2 ECH81 { a	105	7.7	—	—	—
V2 ECH81 { b	105	7.6	88	4.4	—
V3 EF85	243	12.0	92	2.3	—
V4 EABC80 { a-c	65	0.8	—	—	—
V5 EL84	257	37.0	242	4.2	—
V6 EZ80	282†	—	—	—	295†
T.L. DM70	43	—	—	—	—

* Switched to F.M. † A.C. reading, each anode.
‡ Cathode current 76.5 mA.

CIRCUIT ALIGNMENT

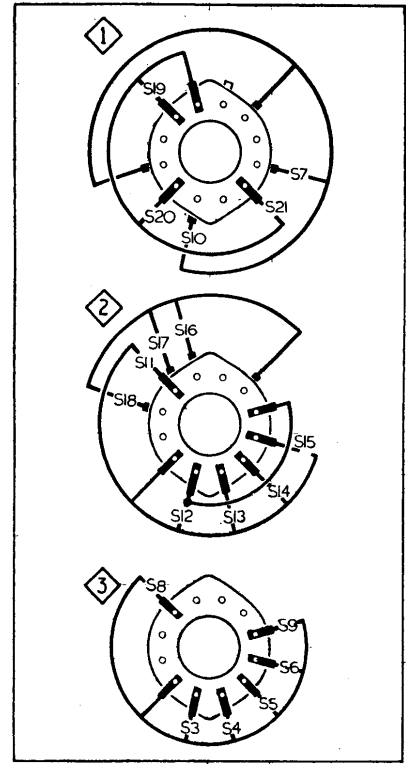
Remove chassis from cabinet and support it on its mains transformer end on the bench. The tuning scale should also be removed from the cabinet after releasing its seven securing clips, and should be placed in position over the control spindles.

Equipment Required.—An A.M. signal generator covering the range of 140 kc/s to 18 Mc/s and an F.M. signal generator covering the F.M. intermediate frequency of 10.7 Mc/s and the frequency range of

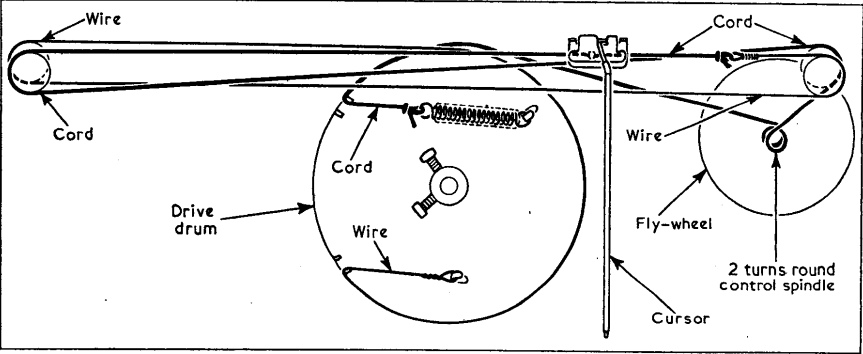
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Switch Table

Switches	F.M.	S.W.	M.W.	L.W.	Gram.
S3	o	—	—	—	—
S4	—	o	—	—	—
S5	—	—	o	—	—
S6	—	—	—	o	—
S7	o	—	—	—	—
S8	—	o	—	—	—
S9	—	—	o	—	—
S10	—	—	—	o	—
S11	—	—	—	—	o
S12	o	—	—	—	—
S13	—	o	—	—	—
S14	—	—	o	—	—
S15	—	—	—	o	—
S16	—	o	—	—	—
S17	—	—	o	—	—
S18	—	—	—	o	—
S19	o	—	—	—	—
S20	—	o	—	—	—
S21	—	—	o	—	—



Diagrams of the waveband switch units, viewed from the rear of an inverted chassis as indicated in the under-chassis view.



Sketch of tuning drive system. Lengths of cord and wire are given in "General Notes".

Circuit Alignment—continued

86-100 Mc/s, with a deviation of at least ± 100 kc/s. Alternatively an A.M. signal generator may be used for both A.M. and F.M. alignment, and separate instructions for the F.M. adjustments using an A.M. generator are given under "F.M. Alignment using A.M. Generator." A Multi-range voltmeter for use as output meter; a 20,000 ohms-per-volt valve voltmeter for use in setting up the oscillator neutralizing circuit; a 47k Ω damping resistor and a 150pF capacitor.

F.M. Alignment using F.M. Generator

I.F. Stages.—Switch receiver to F.M. and turn gang to maximum capacitance. Connect multi-range meter on A.C. voltage range across T1 primary winding. Connect output of F.M. signal generator, via a 150pF capacitor in the live lead, across L24. Feed in a 10.7Mc/s signal deviated by ± 25 kc/s and adjust the cores of L27 (location reference E4) and L28 (B2) for maximum output.

Connect output of A.M. signal generator in place of F.M. generator leads across L24. Feed in a 30% modulated 10.7 Mc/s signal and readjust the core of L28 (B2) for minimum output. Reconnect F.M. signal generator in place of A.M. generator, and feeding in a 10.7 Mc/s signal deviated by ± 100 kc/s, readjust the core of L27 (E4) for maximum output. Then finally readjust the core of L28 (B2) for minimum distortion.

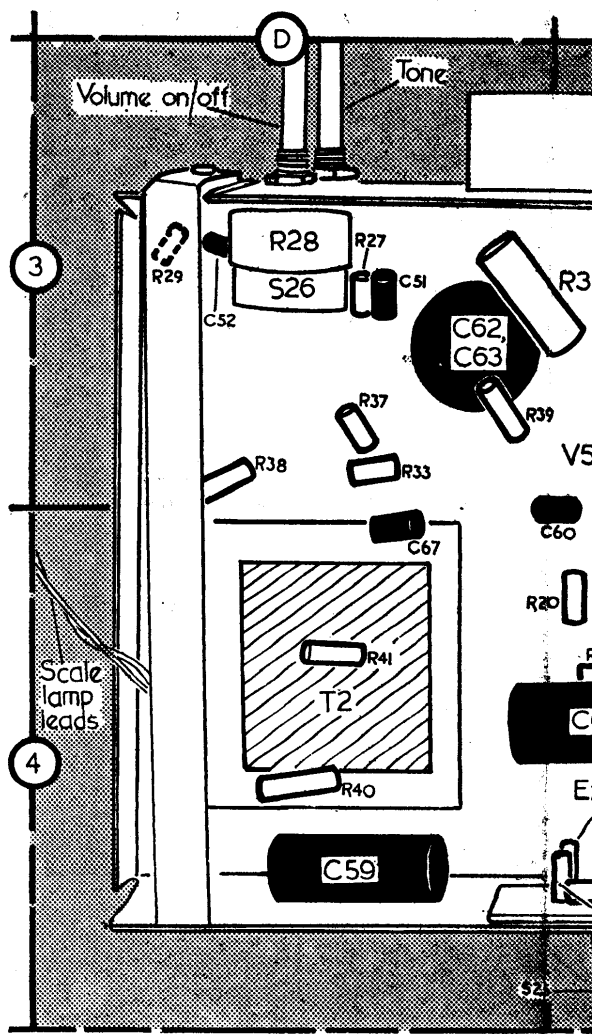
Set F.M. generator deviation to ± 5 kc/s and check that the output at 10.6 Mc/s and 10.8 Mc/s is no more than 6db (2:1) down on the output at 10.7 Mc/s.

Transfer F.M. generator leads to L10. Feed in a 10.7 Mc/s signal, deviated by ± 25 kc/s and adjust the cores of L23 (F4) and L24 (A2) for max. output. Repeat the bandwidth check given in the previous paragraph, readjusting the cores of L23 and L24 if necessary to obtain a symmetrical response. Transfer signal generator leads to L3 and adjust the cores of L9 (G4) and L10 (A2) for maximum output. Check bandwidth as before.

Finally, transfer F.M. generator leads to F.M. aerial socket and adjust the core of L2 (G4) for minimum output.

R.F. and Oscillator Stages.—Check that with the gang at maximum capacitance, the cursor coincides with the high wavelength ends of the tuning scales.

With receiver switched to F.M., tune to 90 Mc/s and feed a 90 Mc/s signal (devi-



Underside illustration of chassis. S22, S23, S24 (l)

ated by ± 25 kc/s) to the F.M. aerial socket. Adjust L8 (F4) for maximum output, selecting the first peak obtained on screwing the core out from its farthest-in position. As a check that the correct peak has been chosen, the receiver should be tuned to 111.4 Mc/s where the image signal should be received.

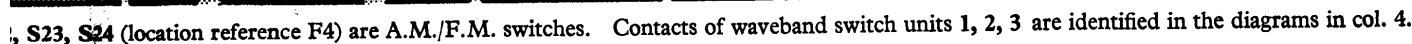
Tune receiver to 98 Mc/s, and feeding in a 98 Mc/s signal, adjust C71 (F4) for maximum output, selecting the first peak obtained from the minimum capacitance setting. Check that the image signal is received at 119.4 Mc/s.

Retune receiver to 90 Mc/s, feed in a 90 Mc/s signal and adjust the core of L6 (F3) for maximum output, rocking the gang slightly if "pulling" is experienced.

Retune receiver to 98 Mc/s, feed in a 98 Mc/s signal and adjust C69 (F3) for maximum output, rocking the gang slightly if "pulling" is experienced.

Tune receiver to 94 Mc/s, feed in a 94 Mc/s signal and adjust the core of L4 (A1) for maximum output.

Disconnect R2 from the H.T. line and connect it to the junction of R20, R39.



Tune receiver to 42.87m, feed in a 42.87m (7 Mc/s) signal and adjust **L14** (A2) for maximum output. Tune receiver to 18.75m, feed in an 18.75m (16 Mc/s) signal and adjust **C73** (G4) for maximum output.