"TRADER" SERVICE SHEET

1216

EKCO A239 A.M

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

EMPLOYING 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 14*s* 8*d*. *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)** operates 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.**

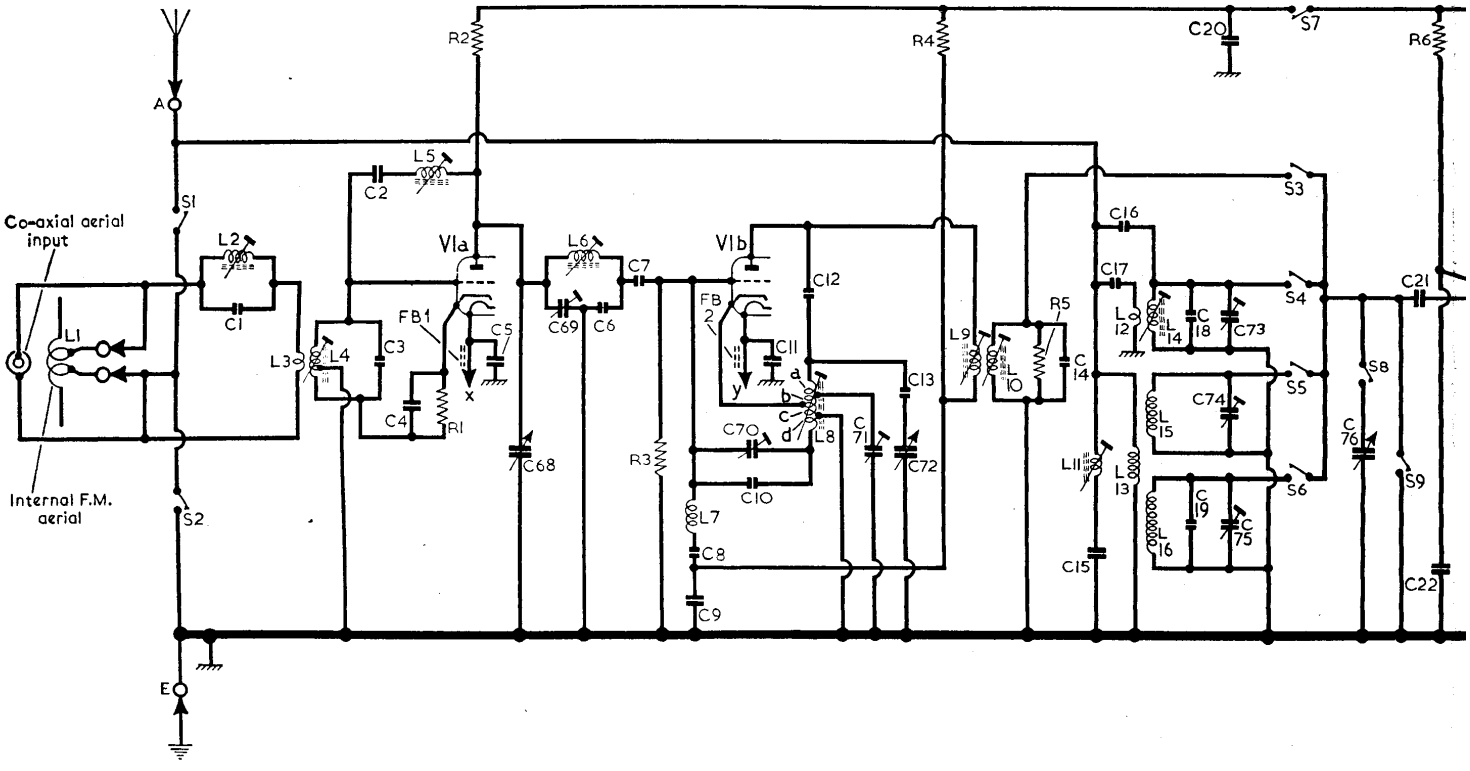
A.M. intermediate frequency 460 kc/s.

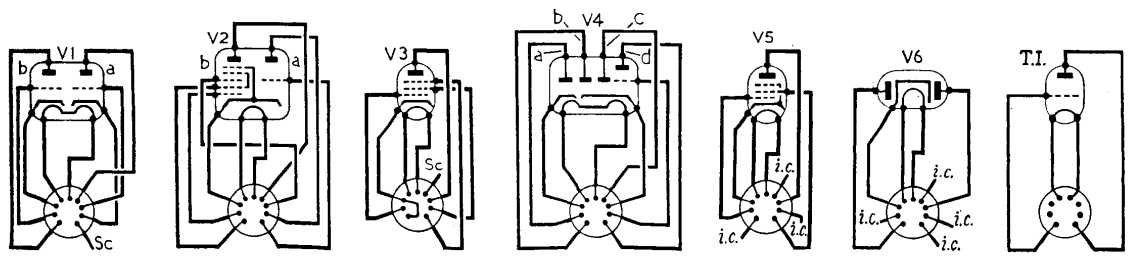
Diode section **c** of triple diode triode valve **(V4, Mullard EABC80)** functions as A.M. signal detector, and the audio frequency component in its rectified output is developed across **R19.** I.F. filtering by **C43, R16** and the capacitance of the leads to chassis. The A.F. signal developed across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





Circuit diagr
under "Gen
rotary units

./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.**

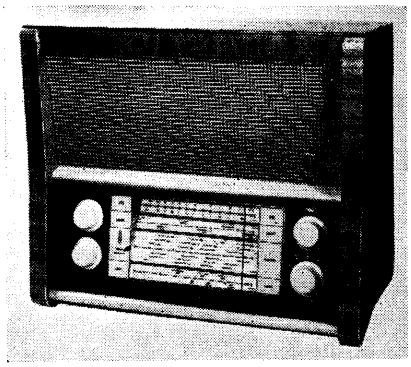
Second valve, section **b** of **V1** is a triode operating as F.M. oscillator/mixer valve with tuned oscillator anode circuit **L8, C13, C72.** Reaction coupling is by means of cathode tapping on section **c** of **L8.** Section **d** of **L8, C70, C10, L7, C8** and **C9** form parts of a bridge neutralizing 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 "flywheel" effect of D.C. reservoir **C47.**



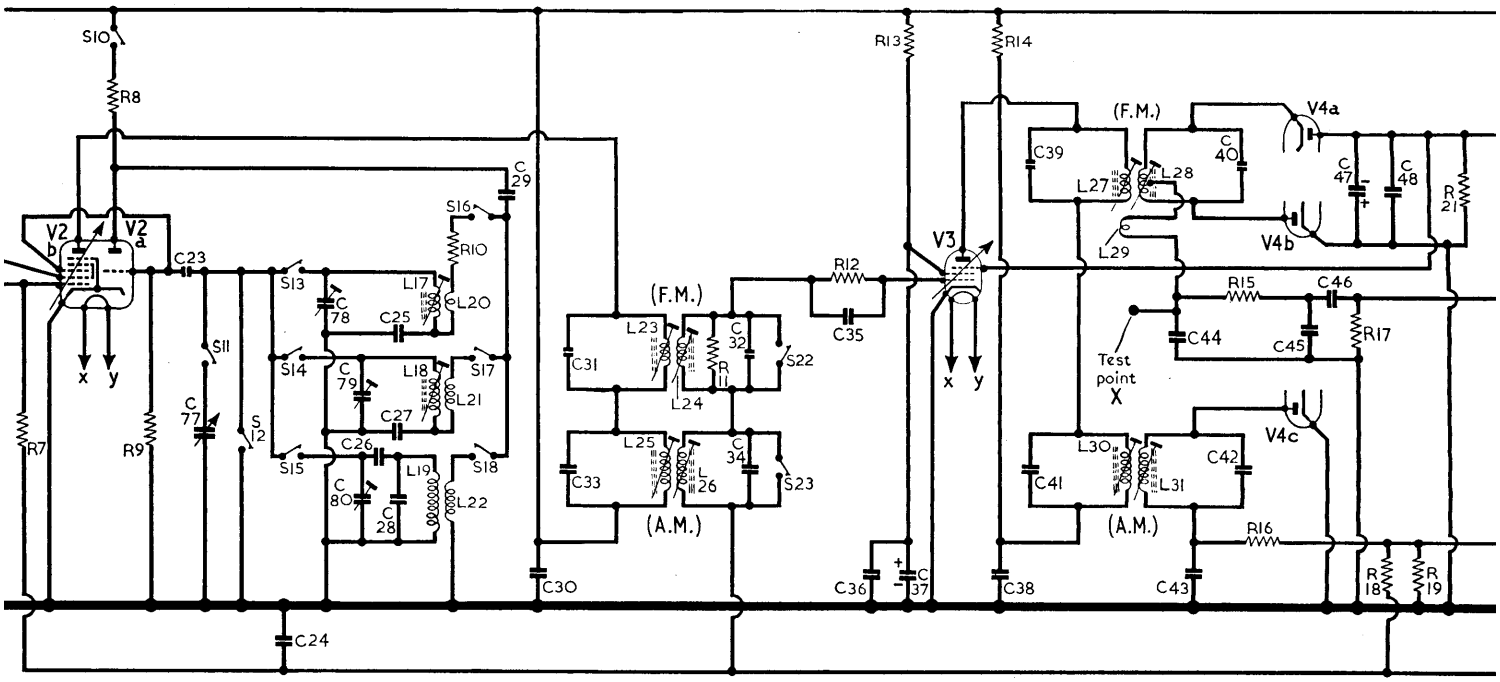
Appearance of the Ekco A239.

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 neral 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 s on 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

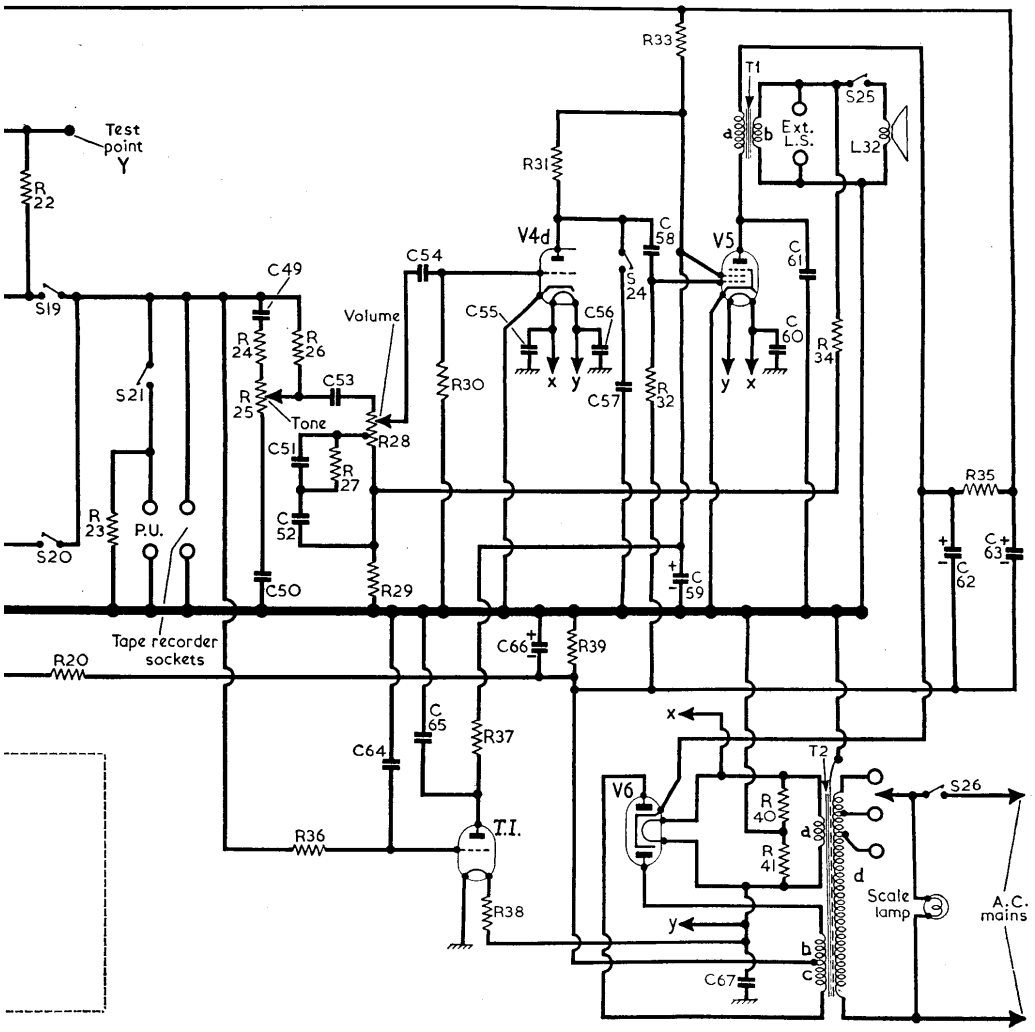
	RESISTORS	Values	Locations
R1	V1a G.B.	220Ω	F3
R2	V1a H.T. feed ...	27kΩ	E3
R3	V1b C.G.	47kΩ	F4
R4	V1b H.T. feed ...	56kΩ	G4
R5	1st F.M. I.F.T. shunt	56kΩ	G4
R6	V2b S.G. feed ...	33kΩ	G4
R7	V2b C.G.	470kΩ	G4
R8	V2a H.T. feed ...	33kΩ	G3
R9	V2a C.G.	47kΩ	G4
R10	S.W. osc. stabilizer	100Ω	G3
R11	2nd F.M. 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

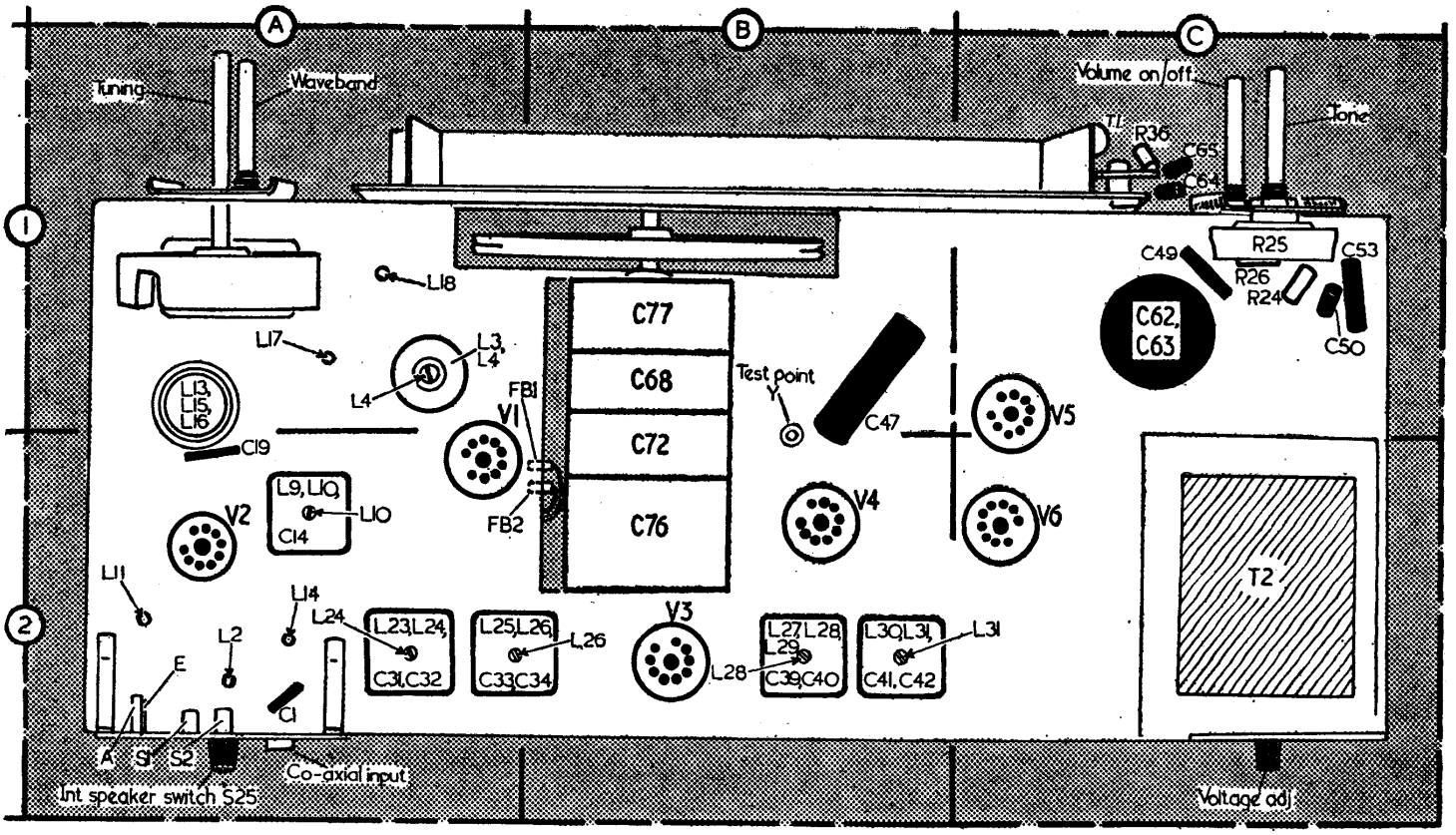
(*Continued next col.*)

	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 ...	470Ω	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, R41	Heater tapping ...	27Ω, 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, C9, C10	F.M. oscillator neutralizing ...	33pF, 470pF, 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, C17	A.M. aerial coup....	6pF, 30pF	G4
C18	S.W. aerial trim ...	22pF	G4
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, C32	2nd F.M. I.F.T. tuning	22pF, 17pF	A2
C33, C34	1st A.M. I.F.T. tuning	100pF, 100pF	A2
C35	V3 C.G.	100pF	F4
C36, C37•	V3 S.G. decoupling	0·01μF, 1μF	F4
C38	H.T. decoupling ...	0·05μF	E4
C39, C40	3rd F.M. I.F.T. tuning	22pF, 30pF	B2
C41, C42	2nd A.M. I.F.T. tuning	350pF, 350pF	B2
C43	A.M. I.F. by-pass...	100pF	E4
C44	A.F. load	300pF	E4
C45	De-emphasis ...	500pF	E4
C46	A.F. coupling ...	0·02μF	E4
C47•	Discriminator reservoir... ...	8μF	B1
C48		0·01μF	E4
C49	Parts tone control	220pF	C1
C50		0·001μF	C1
C51	Tone correctors ...	0·001μF	D3
C52		0·02μF	D3
C53	A.F. coupling ...	0·01μF	C1
C54		0·01μF	E4
C55, C56	Heater by-passes ...	0·01μF	E4
C57	Tone corrector ...	0·002μF	E4
C58	A.F. coupling ...	0·01μF	E3
C59*	H.T. smoothing ...	8μF	D4
C60	Heater by-pass ...	0·001μF	E3
C61	Tone corrector ...	0·005μF	E3
C62, C63	H.T. smoothing ...	50μF, 50μF	C1
C64, C65	T.I. decoupling ...	0·02μF, 0·01μF	C1
C66*	G.B. decoupling ...	100μF	E4
C67	Heater by-pass ...	0·001μF	D4
C68†	F.M. R.F. tuning...	—	B1
C69‡	F.M. R.F. trim ...	30pF	F3
C70‡	F.M. osc. neut. ...	8pF	F4
C71‡	F.M. osc. trim. ...	8pF	F4
C72†	F.M. osc. tuning ...	—	B2
C73‡	S.W. aerial trim. ...	40pF	G4
C74‡	M.W. aerial trim...	40pF	G4
C75‡	L.W. aerial trim. ...	40pF	G4
C76†	A.M. aerial tuning	—	B2
C77†	A.M. osc. tuning ...	—	B1
C78‡	S.W. osc. trim. ...	15pF	G3
C79‡	M.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 ...	—	—
L2	F.M. I.F. filter ...	—	A2
L3	F.M. aerial coils ...	—	A1
L4		—	A1
L5	V1a neutralizing ...	—	F3
L6	F.M. R.F. tuning ...	—	F3
L7	F.M. osc. neut. ...	—	F4
L8	F.M. osc. coil ...	—	F4
L9	1st F.M. Pri. ...	—	A2
L10	I.F.T. Sec. ...	—	A2
L11	A.M. I.F. filter ...	12·0	G4
L12	A.M. aerial coupling coils ...	2·5	G4
L13		50·0	A1
L14	A.M. aerial tuning coils	—	G4
L15		2·5	A1
L16		30·0	A1
L17	A.M. oscillator tuning coils ...	—	G3
L18		3·0	G3
L19		6·0	G3
L20	A.M. oscillator reaction coils ...	—	G3
L21		2·0	G3
L22		3·0	G3
L23	2nd F.M. Pri. ...	—	A2
L24	I.F.T. Sec. ...	—	A2
L25	1st A.M. Pri. ...	6·0	A2
L26	I.F.T. Sec. ...	6·0	A2
L27	F.M. discriminator transformer Pri.	—	B2
L28	Sec.	—	B2
L29	Tert.	—	B2
L30	2nd A.M. Pri. ...	6·0	B2
L31	I.F.T. Sec. ...	6·0	B2
L32	Speech coil ...	2·5	—
T1	O.P. trans. a ...	900·0	E3
	b ...	—	
T2	Mains trans. a ...	—	C2
	b ...	320·0	
	c ...	320·0	
	d, total	34·0	
S1, S2	Aerial switches ...	—	A2
S3-S21	Waveband switches	—	G3
S22-S24	F.M./A.M. switches	—	F4
S25	Speaker switch ...	—	E4
S26	Mains sw., g'd R28	—	D3

General Notes—*Continued*

good quality flax fishing line, plaited and waxed, together with about 3½ft 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	V
V1 ECC85* a	117	4·9	—	—	1·2
b	62	3·7	—	—	—
V2 ECH81 a	105	7·7	—	—	—
b	275	7·6	88	4·4	—
V3 EF85 ...	243	12·0	92	2·3	—
V4 EABC80 a-c	—	—	—	—	—
d	65	0·8	—	—	—
V5 EL84 ...	257	37·0	242	4·2	—
V6 EZ80 ...	282†	—	—	—	295‡
T.I. DM70 ...	43	—	—	—	—

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

CIRCUIT ALIGNMENT

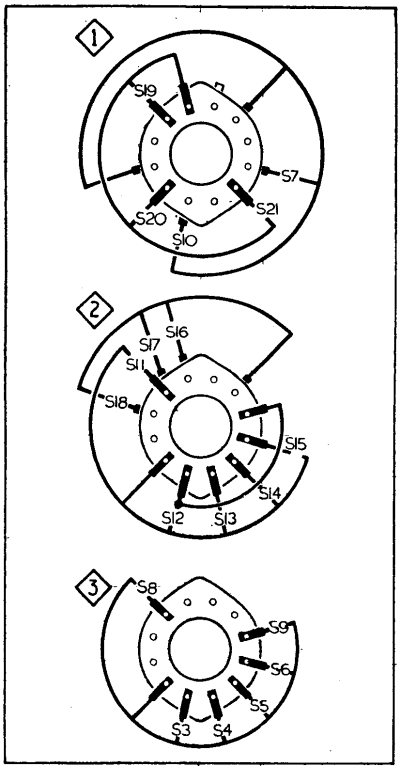
Remove chassis from cabinet and support it on its mains transformer end on the bench. The tuning scale should also be removed from the cabinet after releasing its seven securing clips, and should be placed in position over the control spindles.

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

(*Continued col.* 5)

Switch Table

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



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

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 47kΩ 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 (deviated 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.

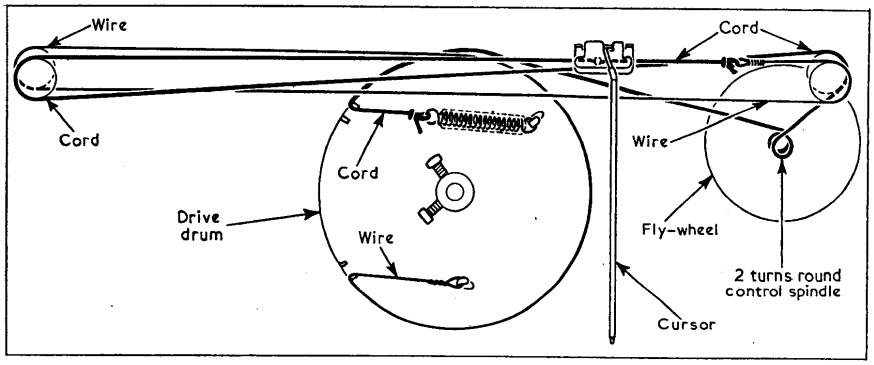
Tune receiver to 98 Mc/s, and feeding in a 98 Mc/s signal, adjust **C71** (F4) for maximum output, selecting the first peak obtained from the minimum capacitance setting. Check that the image signal is received at 119.4 Mc/s.

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.

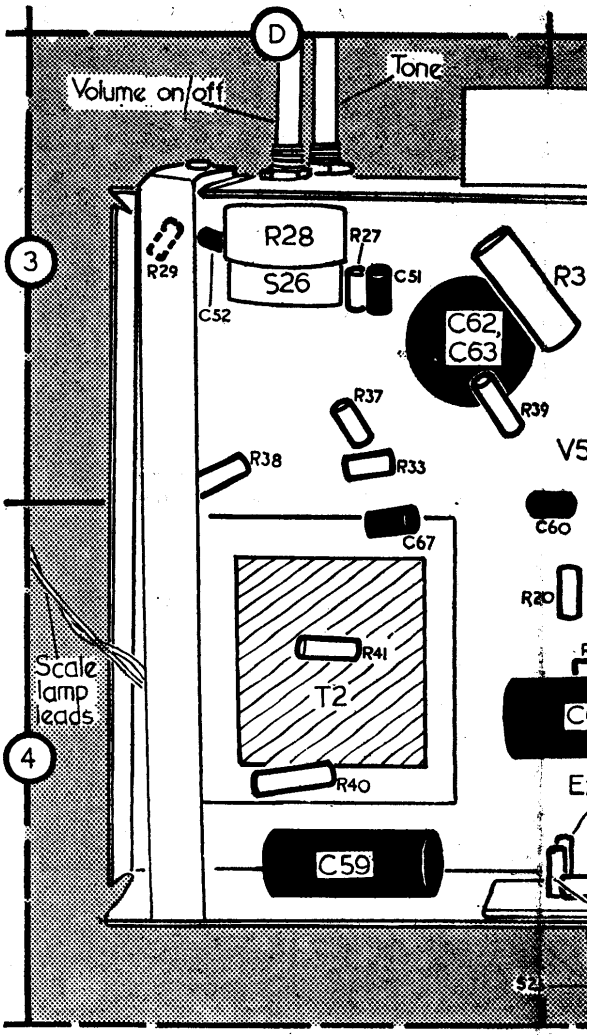
Retune receiver to 98 Mc/s, feed in a 98 Mc/s signal and adjust **C69** (F3) for maximum output, rocking the gang slightly if "pulling" is experienced.

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.**



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



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

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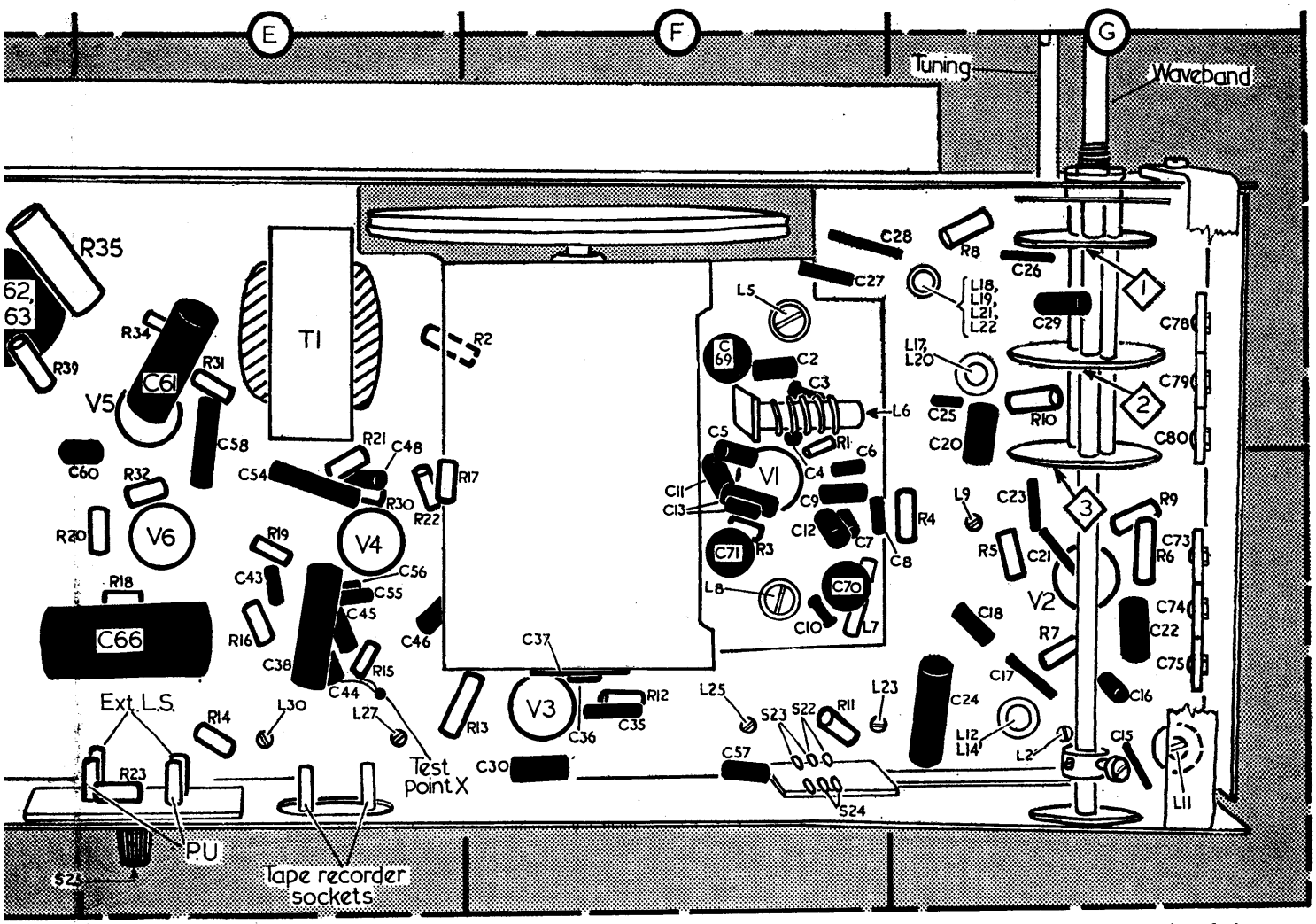

, S23, S24 (location reference F4) are A.M./F.M. switches. Contacts of waveband switch units 1, 2, 3 are identified in the diagrams in col. 4.

Adjust the core of **L5** (F3) for minimum output. Reconnect **R2** to the H.T. line.

Connect valve voltmeter on its lowest range across the F.M. aerial socket and adjust **C70** (F4) for minimum oscillator voltage measured on meter. Repeat the adjustments to **L8, C71, L6** and **C69.**

F.M. Alignment using A.M. Generator

I.F. Stages.—Switch receiver to F.M. and turn gang to maximum capacitance. Connect two matched 100kΩ resistors across **C47** (between test point Y, location reference B1, and chassis). Connect valve voltmeter between junction **C44, R15** (test point X, location reference E4) and the junction of the two 100kΩ resistors. Connect multi-range meter across **C47** and switch to low-voltage D.C. range.

Connect output of A.M. signal generator, via a 150pF capacitor in the live lead, across **L24.** Feed in a 10.7 Mc/s unmodulated signal and adjust the cores of **L27** (E4) and **L28** (B2) for maximum output on multi-range meter. Readjust **L28** for minimum response on valve voltmeter. Disconnect resistors and valve voltmeter.

All Preceding Stages.—Adjust the cores and other pre-set trimmers as described under "F.M. Alignment using F.M. Generator," feeding in an unmodulated 10.7 Mc/s signal and using the multi-range meter connected across **C47.**

A.M. Alignment

I.F. Stages.—Switch receiver to M.W. and turn gang to maximum capacitance. Connect output of signal generator across **C76** (location reference B2). Connect 47kΩ damping resistor across **L30,** feed in a 460 kc/s (652.1m) signal and adjust the core of **L31** (B2) for maximum output.

Remove damping resistor from **L30** and connect it across **L26.** Adjust the core of **L30** (E4) for maximum output. Transfer damping resistor to **L30,** and adjust the core of **L26** (A2) for maximum output. Transfer damping resistor to **L26,** and adjust the core of **L25** (F4) for maximum output. If the cores are readjusted, repeat the complete sequence of operations.

I.F. Filter.—Transfer signal generator leads to A.M. aerial and earth sockets, feed in a 460 kc/s signal and adjust the core of **L11** (A2) 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.

L.W.—Switch receiver to L.W. and tune to 1,000m. Feed in a 1,000m (300 kc/s) signal and adjust **C80** (G3) and **C75** (G4) for maximum output. Repeat these adjustments until no further improvement results.

M.W.—Switch receiver to M.W. and tune to 250m. Feed in a 250m (1,200 kc/s) signal and adjust **C79** (G3) for maximum output. Tune receiver to 500m, feed in a 500m (600 kc/s) signal and adjust the core of **L18** (A1) for maximum output.

Tune receiver to 231m, feed in a 231m (1,300 kc/s) signal and adjust **C74** (G4) for maximum output. Repeat these adjustments until calibration is correct.

S.W.—Switch receiver to S.W. and tune to 42.87m. Feed in a 42.87m (7 Mc/s) signal and adjust **L17** (A1) for maximum output, choosing the first peak on screwing the core in from its farthest-out position.

Tune receiver to 18.75m, feed in an 18.75m (16 Mc/s) signal and adjust **C78** (G3) to the first peak from the minimum capacitance setting of the trimmer.

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.