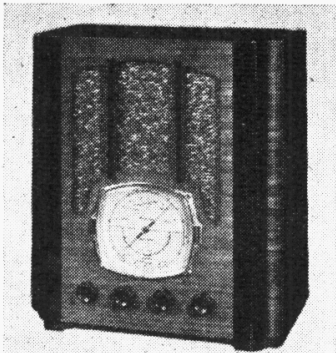


"TRADER" SERVICE SHEET

391

LISSEN 8402

3-BAND AC SUPERHET



The Lissen 8402 Caernarvon 3-band AC superhet, incorporating five valves plus a rectifier.

THE Lissen 8402 (Caernarvon) receiver is a 5-valve (plus rectifier) AC 3-band superhet suitable for mains of 200-250 V, 40-100 C/S, and having a short-wave range of 16-52 m. Provision is made for both a gramophone pick-up and an extension speaker.

Release date : August, 1938.

CIRCUIT DESCRIPTION

Aerial input via coupling coils **L1** (SW), **L2** (MW) and **L3** (LW) to single-tuned circuits **L4**, **C35** (SW), **L5**, **C35** (MW) and **L6**, **C35** (LW) which precede

variable-mu pentode RF amplifying valve (**V1**, Ever Ready metallised **A50P**).

Tuned-secondary RF transformer coupling by **L7**, **C8**, **L10**, **C39** (SW), **L8**, **L11**, **C39** (MW) and **L9**, **L12**, **C39** (LW) between **V1** and triode hexode valve (**V2**, Ever Ready metallised **A36B**) which operates as frequency changer with internal coupling. Triode oscillator grid coils **L13** (SW), **L14** (MW) and **L15** (LW) are tuned by **C40**; parallel trimming by **C43** (SW), **C44** (MW) and **C45** (LW); series tracking by **C14** (SW), **C15**, **C41** (MW) and **C42** (LW). Reaction by coils **L16** (SW), **L17** (MW) and **L18** (LW).

Third valve (**V3**, Ever Ready metallised **A50P**) is a second variable-mu RF pentode, operating as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C46**, **L19**, **L20**, **C47** and **C48**, **L21**, **L22**, **C49**.

Intermediate frequency 473KC/S.

Diode second detector is part of double-diode triode valve (**V4**, Ever Ready metallised **A23A**). Audio frequency component in rectified output is developed across load resistances **R19**, **R20**, that at their junction being passed via AF coupling condenser **C21**, manual volume control **R22** and grid stopper **R23** to CG of triode section, which operates as AF amplifier. Provision for connection of gramophone pick-up between the junction of **R19** and **R20**, and chassis.

Variable tone control by **C22**, **R21** across **R22**.

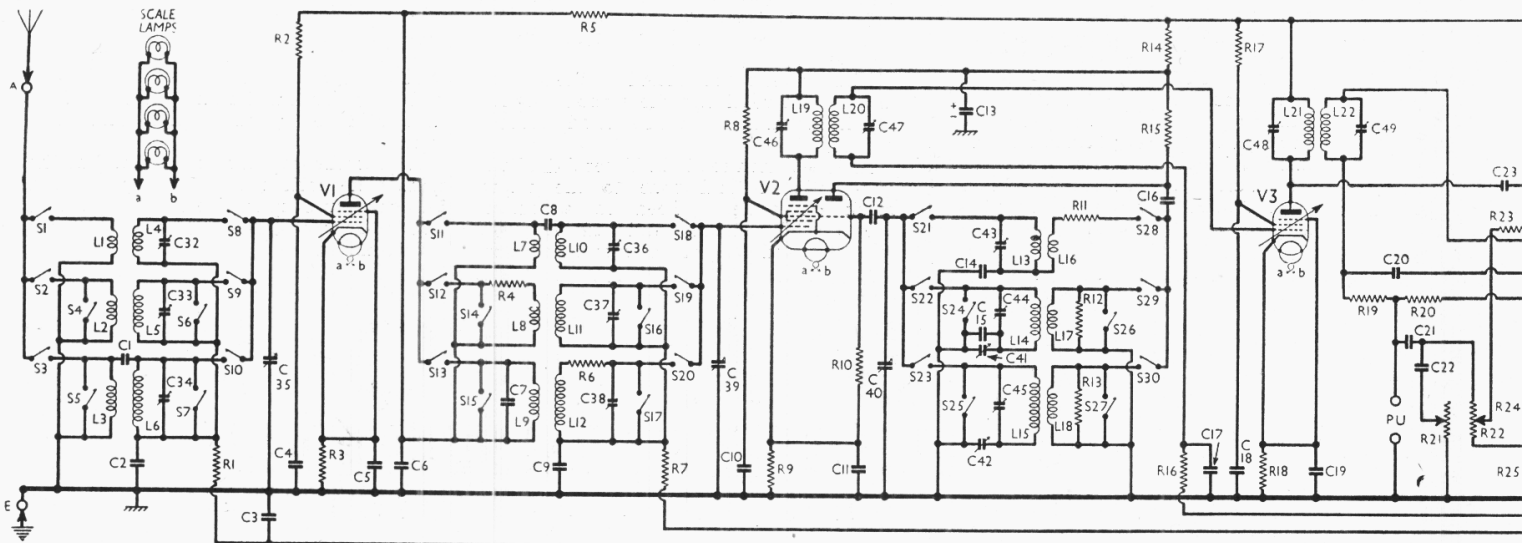
Second diode of **V4**, fed from **V3** anode via **C23**, provides DC potentials which are developed across load resistances **R28**, **R29** and **R30** and fed back through decoupling circuits as GB to RF, FC and IF valves, giving automatic volume control. Delay voltage is obtained from drop along resistances **R24**, **R25** in cathode lead to chassis.

Resistance-capacity coupling by **R27**, **C26** and **R32** between **V4** triode and pentode output valve (**V5**, Ever Ready **A70D**). Negative feed-back by **R33** between **V5** anode and **V4** triode anode. Provision for connection of high impedance external speaker between **V5** anode and HT line.

HT current is supplied by IHC full-wave rectifying valve (**V6**, Ever Ready **A11D**). Smoothing by iron-cored choke **L24** and dry electrolytic condensers **C28**, **C30**. Mains RF filtering by **C31**.

DISMANTLING THE SET

Removing Chassis.—If it is desired to remove the chassis from the cabinet, remove the four control knobs (pull off) and the four bolts (with washers) holding the chassis to the bottom of the cabinet. Now free the speaker leads from the cleat on the cabinet, when the chassis can be withdrawn to the extent of the speaker leads.



Circuit diagram of the Lissen 8402. Note that an RF amplifier stage is used, while the speaker is a permanent magnet type, a separate smoothing choke, **L24**, being employed.

Radio

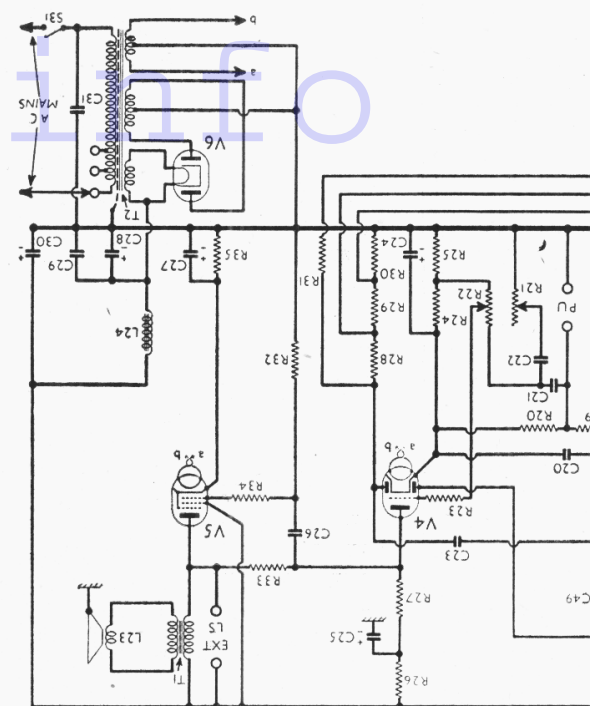
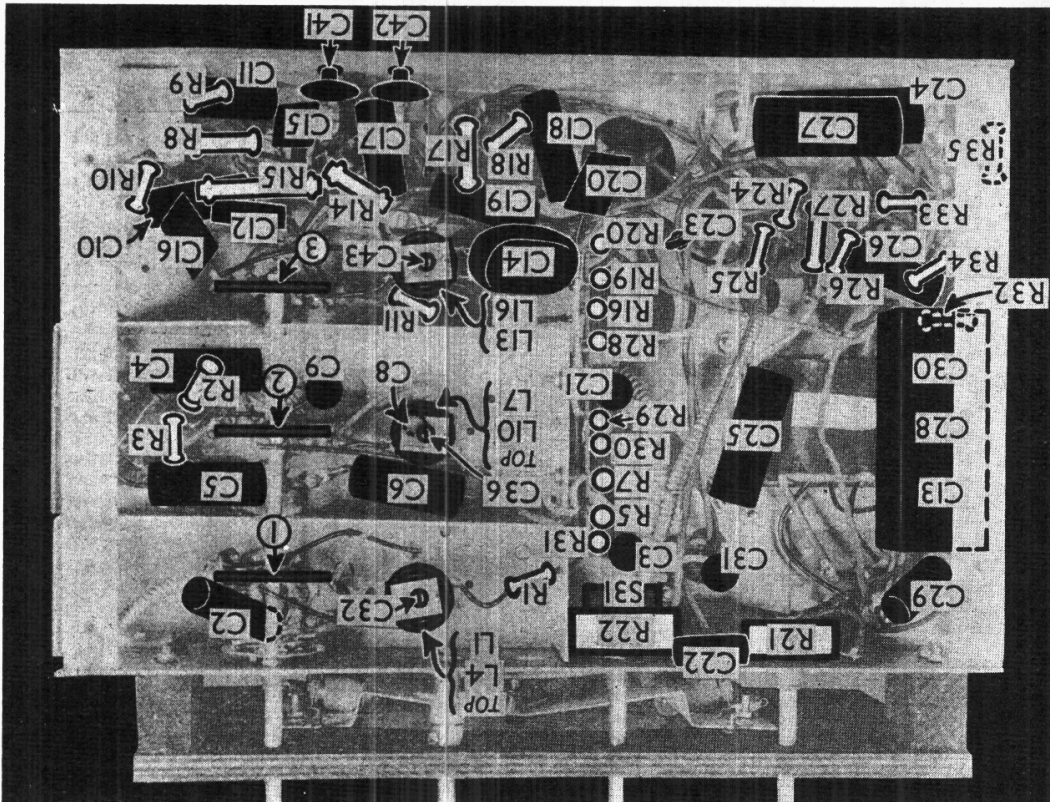
Values (μF)	CONDENSERS
0.00005	C1 Aerial LW coupling
0.005	C2 V1 CG decoupling
0.025	C3 AVC line decoupling
0.01	C4 V1 SG decoupling
0.01	C5 V1 cathode by-pass
0.01	C6 V1 anode decoupling
0.0002	C7 LW RF trans. prt. shunt
0.00005	C8 SW RF trans. coupling
0.005	C9 V2 hexode CG decoupling
0.01	C10 V2 SG decoupling
0.01	C11 V2 cathode by-pass
0.0001	C12 V2 osc. CG condenser
8.0	C13 V1 HT circuit decoupling
0.0033	C14 Osc. circuit SW tracker
0.0004	C15 Osc. circuit MW fixed tracker
0.0003	C16 V1 osc. anode coupling
0.01	C17 V3 CG decoupling
0.01	C18 V3 SG decoupling
0.1	C19 V3 cathode by-pass
0.00005	C20 IF by-pass
0.05	C21 AF coupling to V4 triode

Values (ohms)	RESISTANCES
110,000	R1 V1 CG decoupling
25,000	R2 V1 SG HT feed
100	R3 V1 fixed GB resistance
2,100	R4 MW RF trans. prt. damping
10,000	R5 V1 HT feed resistance
100,000	R6 LW RF trans. sec. damping
100	R7 V2 hexode CG decoupling
260,000	R8 V2 SG HT feed
41,000	R9 V2 fixed GB resistance
51,000	R10 V2 osc. CG resistance
200	R11 Osc. SW reaction damping
200	R12 Osc. MW reaction damping
1,500	R13 V2 HT feed resistance
5,100	R14 V2 HT feed resistance
20,000	R15 V3 CG decoupling
260,000	R16 V3 SG HT feed
30,000	R17 V3 fixed GB resistance
450	R18 V4 signal diode load resistances
510,000	R19 V4 triode grid stopper
800	R20 V4 triode gnd stopper
110,000	R21 Manual volume control
500,000	R22 Variable tone control
2,000,000	R23 V4 triode gnd stopper
1,500	R24 V4 triode gnd stopper
1,500	R25 resistances

Values (ohms)	RESISTANCES (continued)
11,000	R26 V4 triode anode decoupling
41,000	R27 V4 triode anode load
260,000	R28 V4 AVC diode load resistances
510,000	R29 V4 AVC line decoupling
510,000	R30 V5 CG resistance
510,000	R31 Negative feedback coupling
250,000	R32 V5 grid stopper
51,000	R33 V5 GB resistance
150	R34 V5 grid stopper
150	R35 V5 GB resistance

COMPONENTS AND VALUES

To free the chassis entirely, unsolder the smoothing choke the leads to the chassis and removing the nuts, lock washers and washers from the four screws holding it to the sub-baffle. When replacing, see that the transformer is on the right; do not forget to replace the black earthing lead on the bottom right-hand screw and connect the green lead to the top tag on the left of the panel and the brown lead to the top tag on the right.



Under-chassis view. Diagrams of the three switch units are in col. 6 over-leaf. Note the three trimmers C82, C86, C48 at the tops of the SW coil units and the two trackers C41, C42, adjustable from the rear of the chassis.

Removing Speaker.—The speaker can be removed from the cabinet by un-

CONDENSERS (Continued)		Values (μ F)
C22	Part of variable tone control	0.002
C23	Coupling to V4 AVC diode	0.00001
C24*	V4 cathode by-pass	50.0
C25*	V4 triode anode decoupling	2.0
C26	V4 triode to V5 AF coupling	0.05
C27*	V5 cathode by-pass	50.0
C28*	HT smoothing condenser	8.0
C29	V6 heater RF by-pass	0.005
C30*	HT smoothing condenser	8.0
C31	Mains RF by-pass	0.005
C32‡	Aerial circuit SW trimmer	0.00002
C33‡	Aerial circuit MW trimmer	0.0001
C34‡	Aerial circuit LW trimmer	0.0001
C35‡	Aerial tuning condenser	0.00054
C36‡	SW RF trans. sec. trimmer	0.00002
C37‡	MW RF trans. sec. trimmer	0.0001
C38‡	LW RF trans. sec. trimmer	0.0001
C39†	RF trans. sec. tuning	0.00054
C40†	Oscillator circuit tuning	0.00054
C41‡	Osc. circuit MW tracker	0.0003
C42‡	Osc. circuit LW tracker	0.0003
C43‡	Osc. circuit SW trimmer	0.00002
C44‡	Osc. circuit MW trimmer	0.0001
C45‡	Osc. circuit LW trimmer	0.0001
C46‡	1st IF trans. pri. tuning	0.0003
C47‡	1st IF trans. sec. tuning	0.0003
C48‡	2nd IF trans. pri. tuning	0.0003
C49‡	2nd IF trans. sec. tuning	0.0003

* Electrolytic. † Variable. ‡ Pre-set.

OTHER COMPONENTS (Continued)		Approx. Values (ohms)
L4	Aerial SW tuning coil	Very low
L5	Aerial MW tuning coil	2.5
L6	Aerial LW tuning coil	43.0
L7	SW RF trans. pri.	7.9
L8	MW RF trans. pri.	2.2
L9	LW RF trans. pri.	137.0
L10	SW RF trans. sec.	Very low
L11	MW RF trans. sec.	2.4
L12	LW RF trans. sec.	45.0
L13	Osc. circuit SW tuning coil	Very low
L14	Osc. circuit MW tuning coil	1.7
L15	Osc. circuit LW tuning coil	5.0
L16	Oscillator SW reaction	0.3
L17	Oscillator MW reaction	2.9
L18	Oscillator LW reaction	9.6
L19	1st IF trans. { Pri... Sec...	6.7
L20		6.7
L21	2nd IF trans. { Pri... Sec...	6.7
L22		6.7
L23	Speaker speech coil	2.3
L24	HT smoothing choke	230.0
T1	Speaker input { Pri... trans. Sec...	650.0
		0.3
	T2 Mains { Pri., total ... Heater sec. ... trans. Rect. heat. sec. ... HT sec., total ...	23.5
		0.05
		0.1
		240.0
Sr-S30	Waveband switches	—
S31	Mains switch, ganged R22	—

length on the medium band, and the volume control was at maximum, but there was no signal input.

Voltages were measured on the 400 V scale of a model 7 Universal Avometer, chassis being negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)	
V1 A50P ..	162	6.4	118	2.2	
V2 A36B	218	1.3	68	3.6	
	Oscillator				
	96				5.9
V3 A50P	270	6.2	180	2.2	
V4 A23A ..	116	3.2	—	—	
V5 A70D	248	32.0	270	4.8	
V6 A11D ..	252†	—	—	—	

† Each anode, A.C.

GENERAL NOTES

Switches.—S1-S30 are the wavechange switches, in three rotary units beneath the chassis. These are indicated in our under-chassis view, and shown in detail in the diagrams in col. 6, where they are drawn as seen looking from the rear of the underside of the chassis. The table (col. 5) gives the switch positions for the three control settings, starting from fully anti-clockwise. A dash indicates open, and C closed.

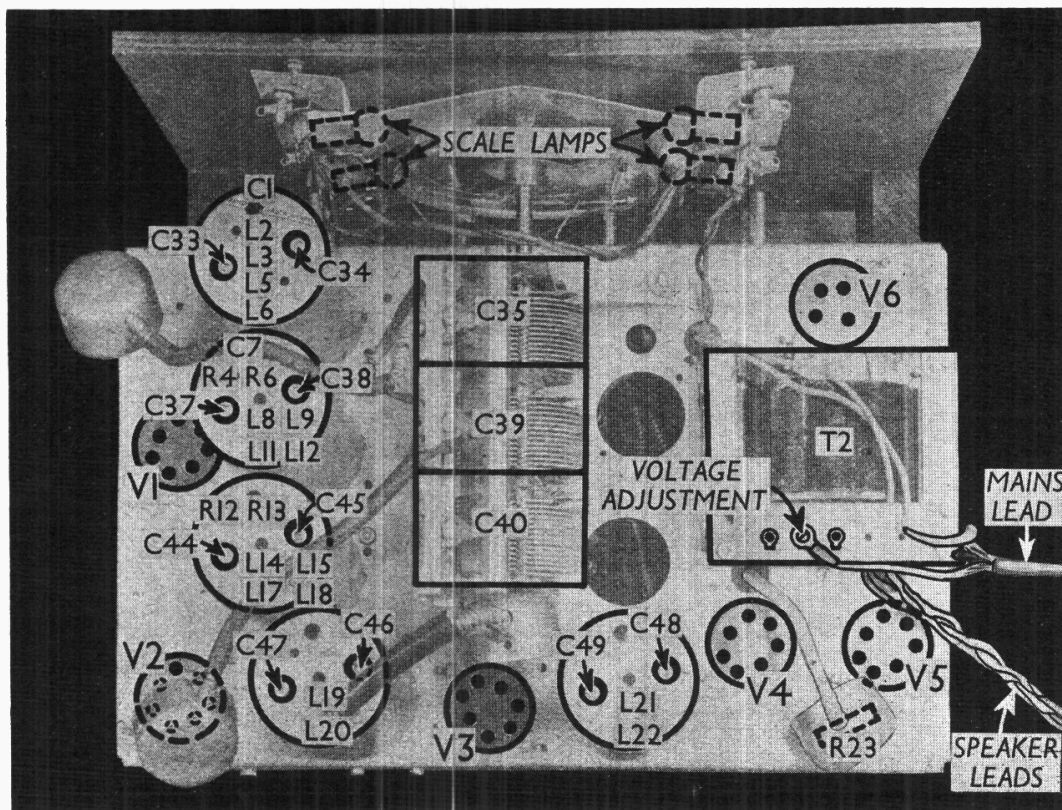
S31 is the QMB mains switch, ganged with the volume control R22.

Coils.—The SW coils L1, L4; L7, L10 and L13, L16 are in three unscreened tubular units beneath the chassis, close to the switch units. The remaining coils and the IF transformers are in five screened units on the chassis deck, with their associated trimmers and, in some cases, additional components.

VALVE ANALYSIS

Valve voltages and currents given in the table (col. 3) are those measured in our receiver when it was operating on mains of 226 V, using the 216-235 V tapping on the mains transformer. The receiver was tuned to the lowest wave-

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial SW coupling coil	2.0
L2	Aerial MW coupling coil	10.4
L3	Aerial LW coupling coil	140.0



Plan view of the chassis. Note that the three RF and oscillator coil units contain certain additional components, apart from their trimmers. L24 does not occur in any chassis pictures, as it is mounted on the speaker sub-baffle. R23 is inside the top cap connector of V4.

TABLE AND DIAGRAMS OF THE SWITCH UNITS

L24 is the smoothing choke, mounted on the speaker sub-baffle, and therefore not shown in our chassis pictures.

Scale Lamps.—These are four Ever Ready MES types, rated at 5.5 V, 0.3 A.

External Speaker.—Two sockets are provided at the rear of the chassis for a high impedance (10,000 Ω) external speaker.

Condensers C13, C28, C30.—These are three 8 μF dry electrolytics in a single carton beneath the chassis, having a common negative (black) lead. The red lead emerging with the black one (connected to one Ext. LS socket) is the positive of **C30**.

Of the other two red leads, that to **V6** holder is the positive of **C28**, while that to the **L19, L20** unit is the positive of **C13**.

Resistance R23.—This is inside the top cap connector of **V4**.

► **Condenser C8.**—This is inside the **L7, L10** coil unit.

Resistance R18.—This is 450 Ω in our chassis, but 250 Ω in the makers' diagram.

Pre-set Condensers.—Apart from those in the five coil units on the chassis deck, there is one trimmer mounted on each SW coil unit beneath the chassis, and two variable trackers adjustable from the rear of the chassis.

CIRCUIT ALIGNMENT

IF Stages.—Short-circuit the **C40** section of the gang, and switch set to MW. Connect signal generator to control grid (top cap) of **V2**, via a 0.1 μF condenser, and chassis.

Feed in a 473 KC/S signal, and adjust **C49, C48, C47** and **C46**, in that order, for maximum output. Check these settings, then remove the short from the **C40** section of the gang.

RF and Oscillator Stages.—With the gang at maximum, the pointer should

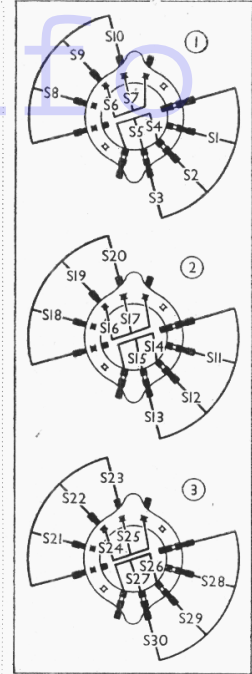
IMPORTANT CORRECTION

IF of K.B.720 is 130 KC/S

In Service Sheet 389 the IF of the K.B.720 was given as 464 KC/S, the figure appearing in the makers' manual. We now understand that this was an error, and the correct value is **130 KC/S**. Please make this correction in your copy of Service Sheet 389.

Switch	LW	MW	SW
S1	—	—	C
S2	—	C	—
S3	C	—	—
S4	—	—	C
S5	—	C	C
S6	—	—	C
S7	—	C	C
S8	—	—	C
S9	—	C	—
S10	C	—	—
S11	—	—	C
S12	—	C	—
S13	C	—	—
S14	—	—	C
S15	—	C	C
S16	—	—	C
S17	—	C	C
S18	—	—	C
S19	—	C	—
S20	C	—	—
S21	—	—	C
S22	—	C	—
S23	C	—	—
S24	—	—	C
S25	—	C	C
S26	—	—	C
S27	—	C	C
S28	—	—	C
S29	—	C	—
S30	C	—	—

Diagrams of the three wavechange switch units, as seen from the rear of the underside of the chassis.



Feed in a 500 m (600 KC/S) signal, tune it in, and adjust **C41** for maximum output, while rocking the gang for optimum results.

Re-adjust **C44, C37** and **C33** at 214 m if necessary. Finally, see that the pointer is at the 500 m mark when receiving the 500 m signal, and if not make a final slight adjustment to the tracker **C41**.

SW.—Switch set to SW, and tune to 15 MC/S on scale. Unscrew **C43** fully, and feed in a 15 MC/S (20 m) signal. Screw in **C43**, and adjust accurately to the first peak reached from the fully unscrewed position. Then adjust **C36** and **C32** for maximum output. Feed in a 6 MC/S (50 m) signal, and tune it in.

Adjust the top turn of **L13**, and at the same time rock the gang very slightly, for optimum output. Return to 15 MC/S, and re-adjust **C43, C36** and **C32** for maximum output.

cover the horizontal line on the scale. Connect signal generator, via a suitable dummy aerial, to the **A** and **E** sockets.

LW.—Switch set to LW, set **C42** about two-thirds in, and tune to 1,000 m on scale. Feed in a 1,000 m (300 KC/S) signal, and adjust **C45**, then **C38** and **C34**, for maximum output. Feed in a 1,700 m (176 KC/S) signal, tune it in, and adjust **C42** for maximum output while rocking the gang for optimum results. Re-adjust **C45, C38** and **C34** at 1,000 m if necessary.

Finally, see that pointer is at the 1,700 m mark when receiving the 1,700 m signal, and if not, make a final slight adjustment to **C42**.

MW.—Switch set to MW, set **C41** about two-thirds in, and tune to the 214 m mark on scale. Feed in a 214 m (1,400 KC/S) signal, and adjust **C44**, then **C37** and **C33**, for maximum output.

S A V O Y

POTENTIOMETERS

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