'TRADER' SERVICE SHEET

196

BUSH SSW37

SUG37 AND RG37

TWO short-wave bands are covered by the Bush SSW37 5-valve (plus rectifier) A.C. 4-band superhet for mains of 200-250 V, 40-100 C/S. The actual ranges are 17-53 (referred to below as S.W.1) and 75-200 (S.W.2) metres. The receiver has an internal plate aerial, provision for a gramophone pick-up and an extension speaker, and a plug and socket arrangement for cutting out the internal speaker.

An identical chassis is fitted in the SUG37 console and the RG37 radio-gramophone and automatic radio-gramophone, but this *Service Sheet* was prepared on the SSW37.

CIRCUIT DESCRIPTION

Aerial input via coupling coils **L1** (S.W.1), **L3** (S.W.2), **L5** (M.W.), **L7** (L.W.) to single tuned circuits **L2, C35** (S.W.1), **L4, C35** (S.W.2), **L6, C35** (M.W.), **L8, C35** (L.W.) which precede variable-mu pentode R.F. amplifier (**V1, Mullard metallised VP4B**).

Tuned-anode couplings by **L9, C40** (S.W.1), **L10, C40** (S.W.2), **L11, C40** (M.W.), **L12, C40** (L.W.) between **V1** and triode hexode valve (**V2, Mullard metallised TH4**) which operates as frequency changer with internal coupling.

Triode oscillator grid coils **L13** (S.W.1), **L15** (S.W.2), **L17** (M.W.), **L19** (L.W.) are tuned by **C41**; parallel trimming by **C42** (S.W.1), **C43** (S.W.2), **C45** (M.W.), **C14, C47** (L.W.); series tracking by **C11** (S.W.1), **C12, C44** (S.W.2), **C13, C46** (M.W.), **C48** (L.W.); oscillator anode reaction coils **L14** (S.W.1), **L16** (S.W.2), **L18** (M.W.), **L20** (L.W.).

Single variable-mu R.F. pentode valve (**V3, Mullard metallised VP4B**) operates as intermediate frequency amplifier with triple-tuned transformer couplings **L21, C49, L22, C50, L23, C51,** and **L24, C52, L25, C53, L26, C54.**

Sensitivity control by switch **S37** and resistance **R19** which enable fixed G.B. applied to **V3** to be varied.

Intermediate frequency 465 KC/S.

Diode second detector is part of double diode triode valve (**V4, Mullard metallised TDD4**). Audio-frequency component in rectified output is developed across **R24** and passed via **C21** and manual volume control **R25** to triode amplifier. Provision for connection of gramophone pick-up in C.G. circuit.

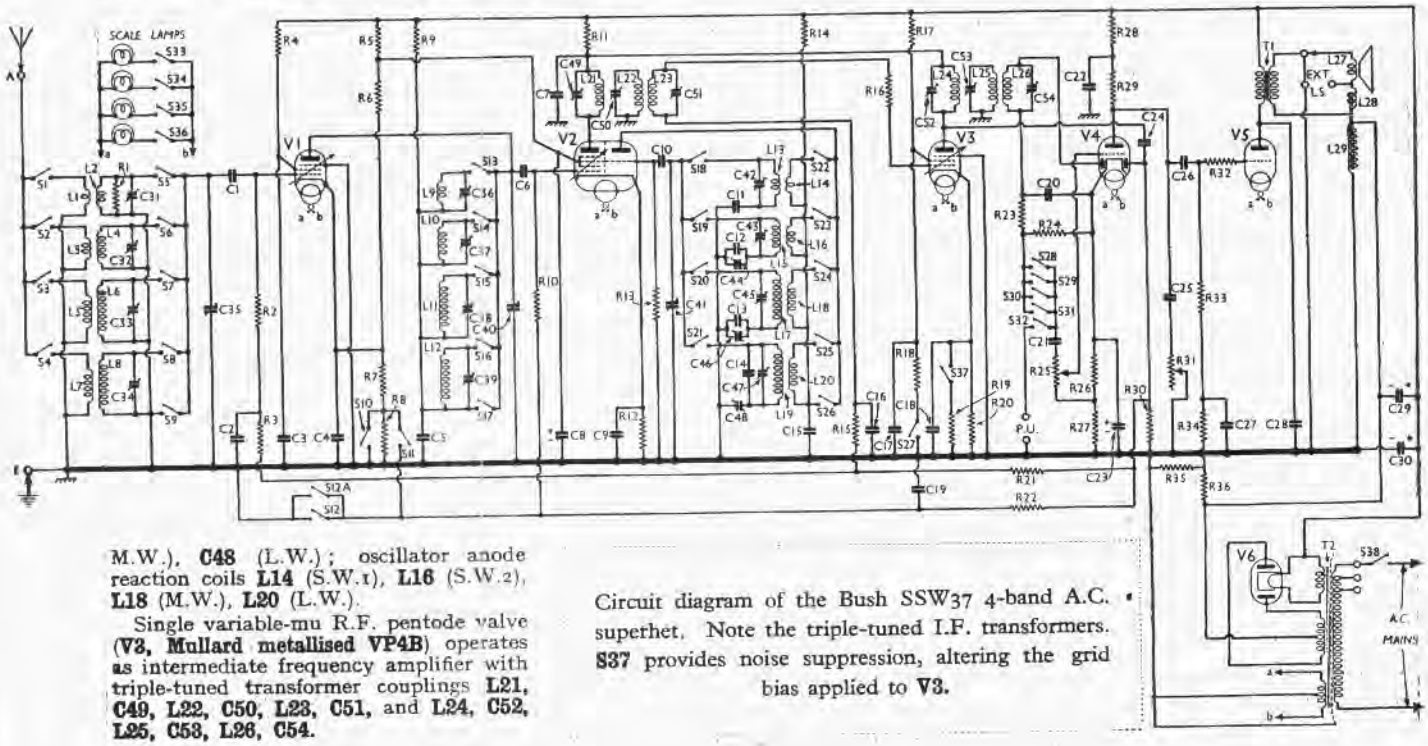
Second diode of **V4,** fed from **V3** anode via **C24,** provides D.C. potential which is developed across **R30** and fed back through decoupling circuits as G.B. to R.F., F.C., and I.F. valves, giving automatic volume control. Delay voltage is obtained from drop along **V4** cathode resistances **R26, R27.**

Resistance-capacity coupling by **R29, C26, R33** between **V4** triode and triode output valve (**V5, Mullard AC044**). Variable tone control by R.C. filter in C.G. circuit. G.B. is obtained from potential divider **R35, R36** across speaker field coil in H.T. negative line. Provision for connection of external low-impedance speaker across secondary of **T1.** Plug and sockets arrangement enables internal speaker speech coil circuit to be broken.

H.T. current is supplied by I.H.C. full-wave rectifying valve (**V6, Mullard IW4/350**). Smoothing by speaker field coil **L29** and dry electrolytic condensers **C29, C30.**

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 S.W.1 C.G. circuit shunt	10,000
R2	V1 C.G. resistance	500,000
R3	V1 C.G. decoupling	1,000,000
R4	V1 S.G. H.T. feed	100,000
R5	V2 hexode S.G.'s H.T. potential divider	20,000
R6		20,000
R7	V1 fixed G.B. resistances	100
R8		5,000
R9	V1 anode decoupling	10,000
R10	V2 hexode C.G. resistance	500,000
R11	V2 hexode anode decoupling	5,000
R12	V2 fixed G.B. resistance	100
R13	V2 osc. C.G. resistance	30,000
R14	V2 osc. anode decoupling	15,000
R15	V3 C.G. decoupling	1,000,000
R16	V3 C.G. stabiliser	250
R17	V3 S.G. H.T. feed	100,000
R18	V3 S.G. circuit bleeder (gram.)	1,000
R19	V3 fixed G.B. resistances	100
R20		10,000
R21	V1 and V3 A.V.C. line decoupling	1,000,000
R22	V2 A.V.C. line decoupling	1,000,000
R23	I.F. stopper	50,000
R24	V4 signal diode load	500,000
R25	Manual volume control	500,000
R26	V4 G.B. and A.V.C. delay voltage resistances	1,000
R27		2,000
R28	V4 triode anode decoupling	10,000
R29	V4 triode anode load	50,000
R30	V4 A.V.C. diode load	1,000,000
R31	Variable tone control	50,000
R32	V5 C.G. I.F. stopper	50,000
R33	V5 C.G. resistance	250,000
R34	V5 C.G. decoupling	500,000
R35	V5 G.B. potential divider	20,000
R36		50,000

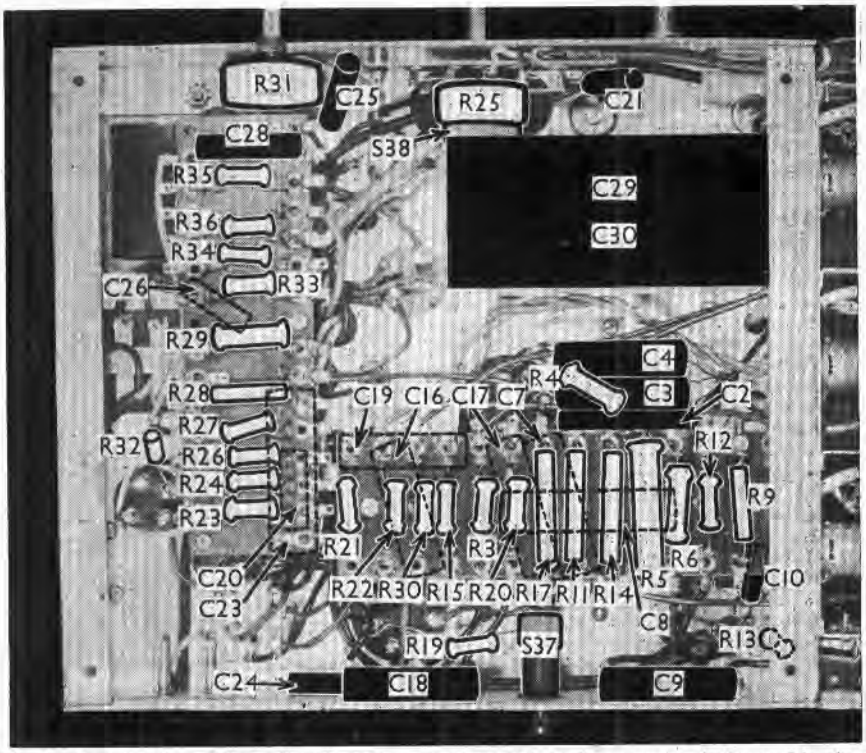


Circuit diagram of the Bush SSW37 4-band A.C. superhet. Note the triple-tuned I.F. transformers. **S37** provides noise suppression, altering the grid bias applied to **V3.**

	CONDENSERS	Values (μF)
C1	V1 C.G. condenser	0·0001
C2	V1 C.G. decoupling	0·1
C3	V1 S.G. by-pass	0·1
C4	V1 cathode by-pass	0·1
C5	V1 anode decoupling	0·1
C6	V2 hexode C.G. condenser	0·0001
C7	V2 hexode anode decoupling	0·1
C8*	V2 hexode S.G.'s by-pass	2·0
C9	V2 cathode by-pass	0·1
C10	V2 osc. C.G. condenser	0·00005
C11	Osc. S.W.1 tracker	0·0043
C12	Osc. S.W.2 tracker	0·0015
C13	Osc. M.W. tracker	0·0004
C14	Osc. L.W. trimmer	0·0001
C15	V1 osc. anode decoupling	0·05
C16	V3 C.G. decoupling	0·1
C17	V3 S.G. by-pass	0·1
C18	V3 cathode by-pass	0·1
C19	V2 A.V.C. line decoupling	0·1
C20	I.F. by-pass	0·0001
C21	A.F. coupling to V4 triode	0·005
C22	V4 triode anode decoupling	0·5
C23*	V4 cathode by-pass	25·0
C24	V4 A.V.C. diode feed	0·0001
C25	Tone control condenser	0·02
C26	V4 to V5 A.F. coupling	0·03
C27	V3 C.G. decoupling	0·5
C28	V5 anode by-pass	0·001
C29*	H.T. smoothing	8·0
C30*	H.T. smoothing	16·0
C31‡	Aerial circuit S.W.1 trimmer	—
C32‡	Aerial circuit S.W.2 trimmer	—
C33‡	Aerial circuit M.W. trimmer	—
C34‡	Aerial circuit L.W. trimmer	—
C35†	Aerial circuit tuning	—
C36‡	V1 anode circuit S.W.1 trimmer	—
C37‡	V1 anode circuit S.W.2 trimmer	—
C38‡	V1 anode circuit M.W. trimmer	—
C39‡	V1 anode circuit L.W. trimmer	—
C40†	V1 anode circuit tuning	—
C41†	Osc. circuit tuning	—
C42‡	Osc. circuit S.W.1 trimmer	—
C43‡	Osc. circuit S.W.2 trimmer	—
C44‡	Osc. circuit S.W.2 tracker	—
C45‡	Osc. circuit M.W. trimmer	—
C46‡	Osc. circuit M.W. tracker	—
C47‡	Osc. circuit L.W. trimmer	—
C48‡	Osc. circuit L.W. tracker	—
C49‡	1st I.F. trans. pri. tuning	—
C50‡	1st I.F. trans. tert. tuning	—
C51‡	1st I.F. trans. sec. tuning	—
C52‡	2nd I.F. trans. pri. tuning	—
C53‡	2nd I.F. trans. tert. tuning	—
C54‡	2nd I.F. trans. sec. tuning	—

* Electrolytic. †Variable. ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial S.W.1 coupling coil	0·15
L2	Aerial S.W.1 tuning coil	Very low
L3	Aerial S.W.2 coupling coil	0·1
L4	Aerial S.W.2 tuning coil	0·25
L5	Aerial M.W. coupling coil	0·6
L6	Aerial M.W. tuning coil	2·3
L7	Aerial L.W. coupling coil	14·0
L8	Aerial L.W. tuning coil	7·25
L9	V1 anode S.W.1 tuning coil	Very low
L10	V1 anode S.W.2 tuning coil	0·25
L11	V1 anode M.W. tuning coil	2·3
L12	V1 anode L.W. tuning coil	7·25
L13	Osc. S.W.1 tuning coil	Very low
L14	Osc. S.W.1 reaction coil	0·15
L15	Osc. S.W.2 tuning coil	0·2
L16	Osc. S.W.2 reaction coil	0·1
L17	Osc. M.W. tuning coil	1·55
L18	Osc. M.W. reaction coil	1·25
L19	Osc. L.W. tuning coil	2·25
L20	Osc. L.W. reaction coil	1·85
L21	1st I.F. trans. Primary	7·0
L22	1st I.F. trans. Tertiary	7·0
L23	1st I.F. trans. Secondary	7·0
L24	2nd I.F. trans. Primary	7·0
L25	2nd I.F. trans. Tertiary	7·0
L26	2nd I.F. trans. Secondary	7·0
L27	Speaker speech coil	1·6
L28	Hum neutralising coil	0·1
L29	Speaker field coil	1500·0
T1	Speaker input trans. Pri.	280·0
	Speaker input trans. Sec.	0·5
T2	Mains trans. Pri. total	20·0
	Mains trans. Heater sec.	0·1
	Mains trans. Rect. heat. sec.	0·1
	Mains trans. H.T. sec. total	350·0
S1-27	Waveband switches	—
S28-32	Radio-gram. change switches	—
S33-36	Scale lamp switches	—
S37	Noise suppression switch	—
S38	Mains switch, ganged R25	—



Under-chassis view. The coil unit section on the right has been omitted, but a side view of it is given below.

DISMANTLING THE SET

Removing Chassis.—To remove the chassis from the cabinet, remove the five control knobs (recessed grub screws) and the four bolts (with washers) holding the chassis to the bottom of the cabinet, and free the speaker leads from the two cleats holding them to the side of the cabinet. The chassis can now be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

To free the chassis entirely, unsolder the leads from the chassis to the speaker and *when replacing*, connect them as follows, numbering the tags from bottom to top: —1, blue; 2, red; 5, yellow; 6, black.

Removing Speaker.—To remove the speaker unsolder the leads and remove the nuts and washers from the four screws holding it to the sub-baffle. *When replacing*, see that the transformer is on the right and connect the leads from chassis as above and the leads from the extension speaker panel as follows:—3, brown; 4, green; 6, black.

VALVE ANALYSIS

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 VP4B	250	0·9	170	0·3
V2 TH4	215	4·2	80	6·7
V3 VP4B	215	4·6	95	1·7
V4 TDD4	105	2·4	—	—
V5 ACO44	260	34·0	—	—
V6 IW4/350	305	—	—	—

Oscillator anode 160 V, 8·3 mA. Each anode, A.C.

Valve voltages and currents given in the table above are those measured in our receiver when it was operating on mains of 230 V, using the 240 V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the medium band and the volume and sensitivity controls were at maximum

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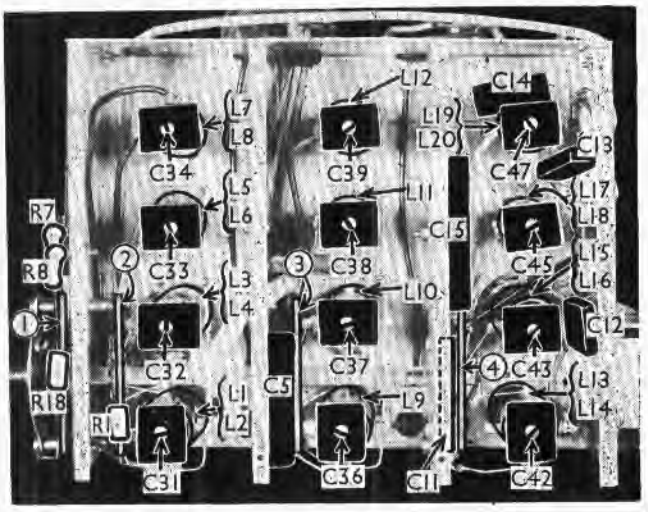


View of the right end of the chassis, with the metal cover over the coil unit removed to show the various components.

BUSH SSW37—*Continued*

(the latter in the "Normal" position), but there was no signal input.

Voltages were measured on the 1,200 V scale of an Avometer, with chassis as negative.

GENERAL NOTES

Switches.—**S1-S36** are the wavechange, scale-lamp and pick-up switches, ganged in four rotary units located inside and in front of the coil unit. The units are indicated in our under-chassis view, and are shown in detail in diagrams on this page, where they are seen looking at the underside of the chassis, in the directions of the arrows in the under-chassis view.

Actually, contact plates are fitted to all four rotors, for inter-switch shorting. The extra switches thus formed are not shown in our circuit diagram, since they do not perform fundamental switching operations, and would add too much complication. The only exceptions are the switches **S11** and **S12A** which are shown in the first unit.

The table below gives the switch positions for the five control settings, starting from fully anti-clockwise. O indicates open, and C closed.

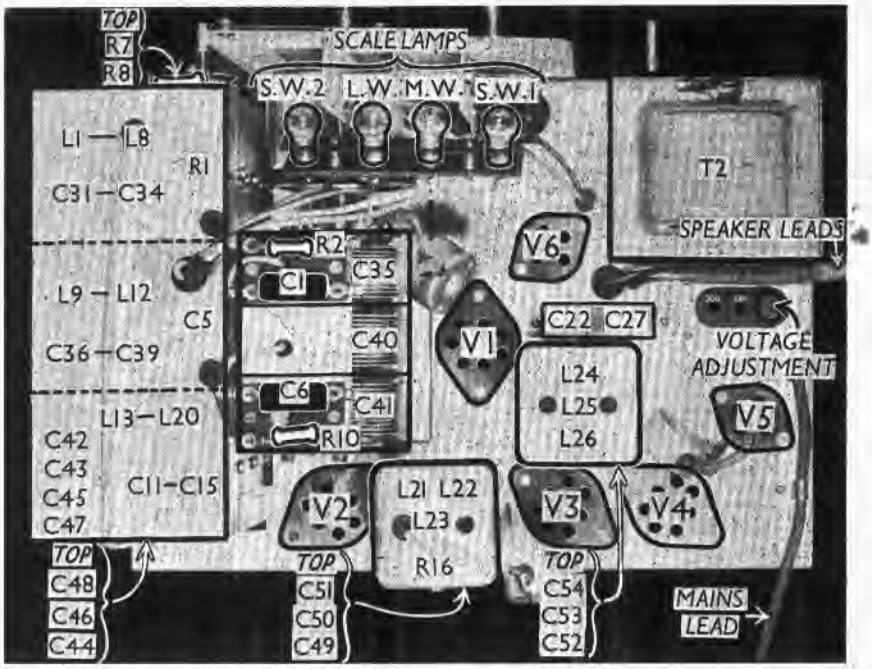
Switch	L.W.	M.W.	S.W.2	S.W.1	Gram.
S1	O	O	O	C	O
S2	O	O	C	O	O
S3	O	C	O	O	O
S4	C	O	O	O	O
S5	O	O	O	C	O
S6	O	O	C	O	O
S7	O	C	O	O	O
S8	C	O	O	O	O
S9	O	O	O	O	C
S10	O	O	O	C	O
S11	O	O	O	O	C
S12	O	O	C	O	O
S12A	O	O	O	C	O
S13	O	O	O	C	O
S14	O	O	C	O	O
S15	O	C	O	O	O
S16	C	O	O	O	O
S17	O	O	O	O	C
S18	O	O	O	C	O
S19	O	O	C	O	O
S20	O	C	O	O	O
S21	C	O	O	O	O
S22	O	O	O	C	O
S23	O	O	C	O	O
S24	O	C	O	O	O
S25	C	O	O	O	O
S26	O	O	O	O	C
S27	O	O	O	O	C
S28	O	O	O	C	O
S29	O	O	C	O	O
S30	O	C	O	O	O
S31	C	O	O	O	O
S32	O	O	O	O	C
S33	O	O	O	C	O
S34	O	O	C	O	O
S35	O	C	O	O	O
S36	C	O	O	O	O

S37 is the Q.M.B. suppressor switch, at the rear of the chassis, which is closed when the knob is depressed.

S38 is the Q.M.B. mains switch, ganged with the volume control **R25.**

Coils.—All the R.F. and oscillator coils are in a three-compartment screened unit, from which the side cover-plate is removable. This has been done in our side-chassis view to show the positions of the coils, trimmers and other components included in the unit. The first section (on the left) contains **L1-L8** in four pairs; the second section, **L9-L12** and the third, **L13-L20** in four pairs. Each pair, or single coil, is on a separate tubular former, with a trimmer at its front (looking at the side of the chassis).

The three variable trackers **C44, C46** and **C48** are in the oscillator (right hand) section of the unit, but are adjusted from the back of the chassis, and their positions from top to bottom are indicated in our plan chassis view.



Plan chassis view. The coil unit on the left is shown in detail on page VII.

The I.F. transformers, **L21-L23** and **L24-L26**, are in two screened units on the chassis deck, and the trimmers are adjusted through holes in the back of the cans, their position from top to bottom being indicated in the plan chassis view.

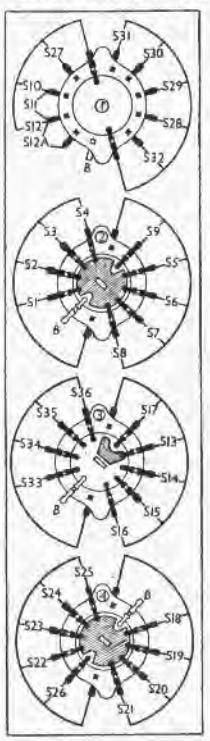
Scale Lamps.—These are four Ever-Ready 6·2 V, 0·3 A. M.E.S. types, switched into circuit on the various wavebands by **S33-S36**, in the main switch unit.

External Speaker.—Two sockets are provided on a panel fitted to the top of the back of the cabinet for a low impedance (2O) external speaker. A plug and socket device serves to disconnect the internal speaker when required.

Condensers C22, C27.—These are two 0·5 μF paper types in a single metal cased unit on the chassis deck. The case is common to one side of each condenser. The other connections are to tags projecting through holes in the chassis deck. That going to the junction of **R28, R29** belongs to **C22**, and that to the junction of **R33, R34**, to **C27.**

Condensers C29, C30.—These are two dry electrolytics in a single carton beneath the chassis, having a common positive (red) lead. The brown lead is the negative of **C29** (8μF) and the black lead the negative of **C30** (16μF).

Chassis Divergency.—In some early models, **R27** was omitted, the bottom ends of **R25** and **R26** going direct to chassis.



Switch diagrams, looking at the underside of the chassis in the directions of the arrows in the under-chassis view. The switches formed by the metal plates on the rotors of units 2 to 4 are omitted for clarity.

CIRCUIT ALIGNMENT

With the gang fully meshed, the pointer should read 550 and 2,000 m.

I.F. Stages.—Switch set to L.W., turn gang to maximum, and feed a 465 KC/S signal to control grid (top cap) of **V2** and chassis. Adjust **C54, C53, C52, C51, C50,** and **C49** for maximum output, keeping the input as low as possible.

R.F. and Oscillator Stages.—S.W.1.—Switch set to S.W.1, and feed an 18m. signal into **A** and **E** sockets via a dummy aerial. Tune to 18m. on scale, and adjust **C42** for maximum output. The peak involving the least trimmer capacity is the correct one. Then adjust **C31** and **C36** for maximum output.

S.W.2.—Switch set to S.W.2, feed in an 80 m. signal, tune to 80 m. on scale, and adjust **C43** for maximum output, using the peak requiring least trimmer capacity. Then adjust **C32** and **C37** for maximum output.

Feed in a 150 m. signal, tune in this signal, and adjust **C44** for maximum output, and until the scale calibration seems correct. Re-check at 80 m.

M.W.—Feed in a 200 m. signal, tune to 200 m. on scale, and adjust **C45** for maximum output, using the peak requiring least trimmer capacity. Then adjust **C33** and **C38** on a 300 m. signal, for maximum output.

Feed in a 500 m. signal and adjust **C46** for maximum output, and until the scale calibration seems correct. Re-check at 300 m.

L.W.—Switch set to L.W., and proceed as for M.W., adjusting **C47** at 1,000 m., **C34** and **C39** at 1,500 m., and **C48** at 1,800 m.

Dummy Aerials.—For M.W. and L.W., use an inductance of 20 μH, a capacity of 0·0002 μF and a resistance of 15 O in series. For the S.W. bands, a 400 O non-inductive resistance is suitable.

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