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Supplement to The Wireless & Electrical Trader, March 8, 1947

"TRADER" SERVICE SHEET

804

McMICHAEL 471U

4-BAND A.C./D.C. SUPERHET

FOUR wavebands are provided in the McMichael 471U, one of them being a "Trawler" band (50-170m). The other S.W. band, which is designated S.W.1 throughout this *Service Sheet*, covers, 13.5-50m.

The scale panel includes a waveband indicator, and facilities are provided for the connection of an external speaker.

Release date and original price: December, 1946; £18 10s, plus £3 19s 7d purchase tax.

CIRCUIT DESCRIPTION

Aerial input via mains isolating capacitor **C1,** I.F. rejector **L1, C2,** and coupling coils **L2** (S.W.1), **L3** (S.W.2), **L4** (M.W.), and **L5** (L.W.) to single-tuned circuits **L6, C43** (S.W.1), **L7, C43** (S.W.2), **L8, C43** (M.W.) and **L9, C43** (L.W.) which precede triode hexode valve **(V1, Mullard metallized CCH35)** operating as frequency changer with internal coupling.

Triode oscillator anode coils **L14** (S.W.1), **L15** (S.W.2), **L16** (M.W.) and **L17** (L.W.) are tuned by **C48.** Parallel trimming by **C44** (S.W.1), **C45** (S.W.2), **C46** (M.W.) and **C19, C47** (L.W.); series tracking by **C15** (S.W.1), **C16** (S.W.2), **C17** (M.W.) and **C18** (L.W.). Reaction coupling by grid coils **L10** (S.W.1), **L11** (S.W.2), **L12** (M.W.) and **L13** (L.W.).

Second valve **(V2, Mullard metallized EF39)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C10, L18, L19, C11** and **C23, L20, L21, C24.** All the tuning capacitors are fixed, and trimming is effected by varying the positions of the iron-dust cores.

Intermediate frequency 465 kc/s.

Diode second detector is part of double diode triode valve **(V3, Mullard metallized EBC33).** Audio frequency component in rectified output is developed across load resistor **R15,** and passed via A.F. coupling capacitor **C29,** manual volume control **R16** and grid stopper **R17** to C.G. of triode section, which operates as A.F. amplifier. I.F. filtering by **C26, R14, C27** in diode circuit.

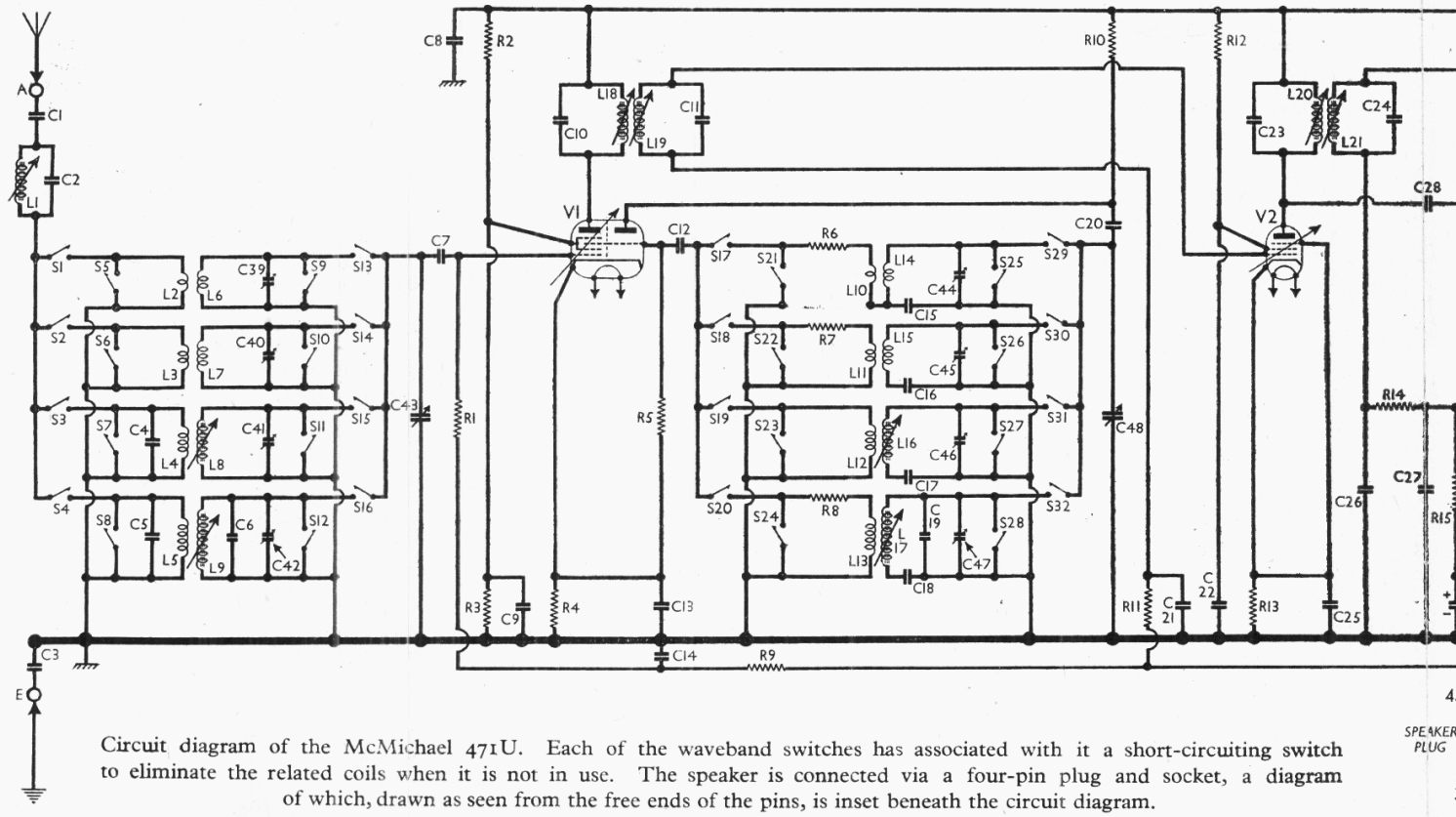
Second diode of **V3,** fed from **L20** via **C28,** provides D.C. potentials which are developed across load resistor **R21** and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control. Delay voltage, together with G.B. for triode section, is obtained from the drop along **R18** in **V3** cathode lead to chassis.

Resistance-capacitance coupling by **R20, C32** and **R22,** via grid stopper **R23,** between **V3** triode and pentode output valve **(V4, Mullard CL33).** Fixed tone correction by **C35,** and three-position tone control by **C33, C34** via switches **S33, S34** in anode circuit.

Provision is made for the connection of a low-impedance external speaker across the secondary winding of the internal speaker input transformer **T1.**

When the receiver is operated from A.C. mains, H.T. current is supplied by half-wave rectifying valve **(V5, Mullard CY31)** which, with D.C. mains, behaves as a low resistance. Smoothing is effected by resistor **R25** and electrolytic capacitors **C36, C37,** but the H.T. supply for **V4** anode is obtained direct from the cathode of the rectifier.

Valve heaters, together with scale lamps and adjustable ballast resistor **R27,** are connected in series across mains supply. Mains R.F. filtering by **C38,** and earth socket-isolation by **C3.**



Circuit diagram of the McMichael 471U. Each of the waveband switches has associated with it a short-circuiting switch to eliminate the related coils when it is not in use. The speaker is connected via a four-pin plug and socket, a diagram of which, drawn as seen from the free ends of the pins, is inset beneath the circuit diagram.

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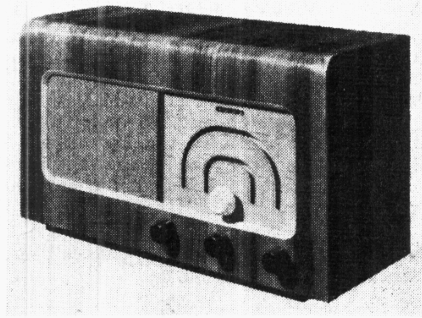
COMPONENTS AND VALUES

When ordering spares it is advisable, if the component numbers given in these tables are used, to mention that they were taken from this Service Sheet.



	RESISTORS	Values (ohms)
R1	V1 hex. C.G. resistor ...	470,000
R2	V1 S.G. H.T. potential	22,000
R3	divider resistors ...	33,000
R4	V1 fixed G.B. resistor ...	220
R5	V1 osc. C.G. resistor ...	47,000
R6	Osc. S.W.1 stabiliser ...	47
R7	Osc. S.W.2 stabiliser ...	470
R8	Osc. L.W. stabiliser ...	2,200
R9	V1 hex. C.G. decoupling...	470,000
R10	V1 osc. anode H.T. feed...	22,000
R11	V2 C.G. decoupling ...	470,000
R12	V2 S.G. H.T. feed ...	68,000
R13	V2 fixed G.B. resistor ...	330
R14	I.F. stopper	100,000
R15	V3 signal diode load ...	330,000
R16	Manual volume control ...	1,000,000
R17	V3 triode grid stopper ...	47,000
R18	V3 G.B.; A.V.C. delay ...	1,000
R19	V3 triode H.T. decoupling	10,000
R20	V3 triode anode load ...	33,000
R21	V3 A.V.C. diode load ...	470,000
R22	V4 C.G. resistor	470,000
R23	V4 C.G. stopper	47,000
R24	V4 G.B. resistor... ...	150
R25	H.T. smoothing resistor...	2,000
R26	V4 anode surge limiter ...	125
R27	Heater ballast resistor ...	812

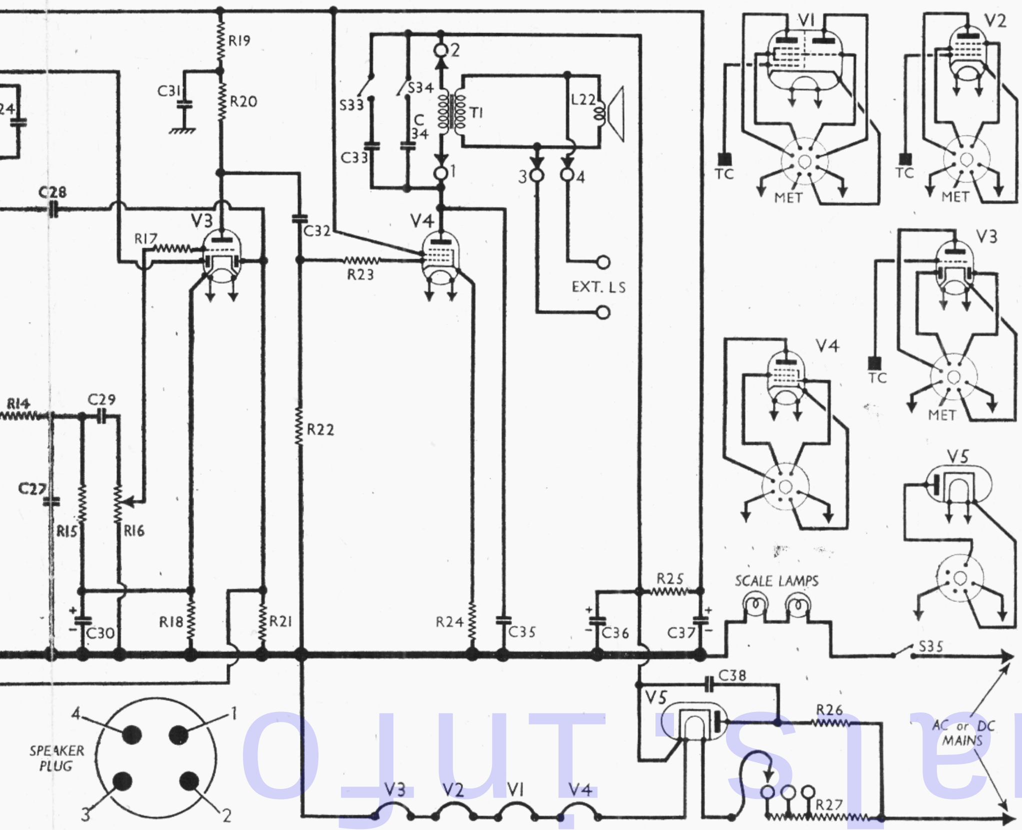
* Tapped at 100 Ω + 100 Ω + 612 Ω from V5 heater.

	CAPACITORS	Values (μF)
C1	Aerial isolator	0·005
C2	I.F. filter tuning	0·0005
C3	Earth isolator	0·02
C4	Aerial M.W. shunt ..	0·00025
C5	Aerial L.W. shunt ..	0·001
C6	Aerial L.W. fixed trimmer	0·00002
C7	V1 hex. C.G. capacitor ...	0·0001
C8	H.T. circuit R.F. by-pass	0·25
C9	V1 S.G. decoupling ...	0·1
C10	1st I.F. transformer tuning	0·0001
C11	capacitors	0·0001
C12	V1 osc. C.G. capacitor ...	0·0001
C13	V1 cathode by-pass ...	0·1
C14	V1 hex. C.G. decoupling...	0·1
C15	Osc. circ. S.W.1 tracker...	0·0054
C16	Osc. circ. S.W.2 tracker...	0·0018
C17	Osc. circ. M.W. tracker...	0·000538
C18	Osc. circ. L.W. tracker...	0·00016
C19	Osc. L.W. fixed trimmer...	0·00005
C20	V1 osc. anode coupling ...	0·0001
C21	V2 C.G. decoupling ...	0·1
C22	V2 S.G. decoupling ...	0·1
C23	2nd I.F. transformer tun-	0·0001
C24	ing capacitors	0·0001
C25	V2 cathode by-pass ...	0·1
C26	I.F. by-pass capacitors ...	0·0001
C27		0·0001
C28	V3 A.V.C. diode coupling	0·0001
C29	A.F. coupling to V3 triode	0·01
	(continued next column)	

	CAPACITORS *(continued)*	Values (μF)
C30*	V3 cathode by-pass ...	50·0
C31	V3 triode decoupling ...	0·5
C32	A.F. coupling to V4 C.G....	0·02
C33	Tone control capacitors ...	0·01
C34		0·04
C35	Fixed tone corrector ...	0·005
C36*	H.T. smoothing capacitors	32·0
C37*		32·0
C38	Mains R.F. by-pass capacitor	0·01
C39‡	Aerial circ. S.W.1 trimmer	0·00004
C40‡	Aerial circ. S.W.2 trimmer	0·00004
C41‡	Aerial circ. M.W. trimmer	0·00004
C42‡	Aerial circ. L.W. trimmer	0·00004
C43†	Aerial circuit tuning ...	—
C44‡	Osc. circ. S.W.1 trimmer...	0·00004
C45‡	Osc. circ. S.W.2 trimmer...	0·00004
C46‡	Osc. circ. M.W. trimmer...	0·00004
C47‡	Osc. circ. L.W. trimmer ...	0·00004
C48†	Oscillator circuit tuning...	—

* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	I.F. rejector coil	4·5
L2	Aerial S.W.1 coupling coil	0·5
L3	Aerial S.W.2 coupling coil	1·25
L4	Aerial M.W. coupling coil...	15·0
L5	Aerial L.W. coupling coil...	24·0
L6	Aerial S.W.1 tuning coil ...	0·05
L7	Aerial S.W.2 tuning coil ...	0·4
L8	Aerial M.W. tuning coil ...	2·75
L9	Aerial L.W. tuning coil ...	18·5
L10	Osc. S.W.1 reaction coil ...	0·4
L11	Osc. S.W.2 reaction coil ...	1·4
L12	Osc. M.W. reaction coil ...	1·75
L13	Osc. L.W. reaction coil ...	4·0
L14	Osc. S.W.1 tuning coil ...	0·05
L15	Osc. S.W.2 tuning coil ...	0·35
L16	Osc. M.W. tuning coil ...	1·8
L17	Osc. L.W. tuning coil ...	7·5
L18	1st I.F. trans. Pri. ...	10·0
L19	1st I.F. trans. Sec. ...	10·0
L20	2nd I.F. trans. Pri. ...	10·0
L21	2nd I.F. trans. Sec. ...	10·0
L22	Speaker speech coil ...	1·9
T1	Output trans. Pri.	300·0
	Output trans. Sec.	0·3
S1-S32	Waveband switches ...	—
S33, S34	Tone control switches ...	—
S35	Mains switch, ganged R16	—



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VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on A.C. mains of 215 V, using the 200-220 V tapping on the heater ballast resistor. The receiver was tuned to the lowest wavelength on the M.W. 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 Avometer, chassis being the negative connection.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 CCH35	165	1·8	75	1·5
	Oscillator			
	96	2·9		
V2 EF39	165	3·8	72	1·3
V3 EBC33	83	1·8	—	—
V4 CL33	197	37·0	165	4·2
V5 CY31†	—	—	—	—

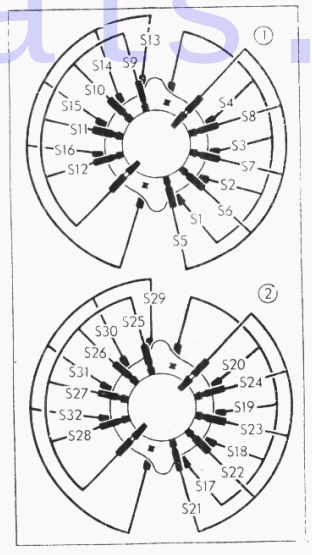
† Cathode to chassis, 207 V, D.C.

DISMANTLING THE SET

Removing Chassis.—Remove the four control knobs (recessed grub screws);
withdraw the speaker plug from its socket on the chassis deck;
from the underside of the cabinet remove the plywood strip (two countersunk head wood screws);
if the two chassis fixing screws (with large metal washers) are now removed, the chassis may be withdrawn from the cabinet.

When replacing, do not forget to fit the plywood strip over the chassis-fixing screws.

SWITCH DIAGRAMS AND TABLE

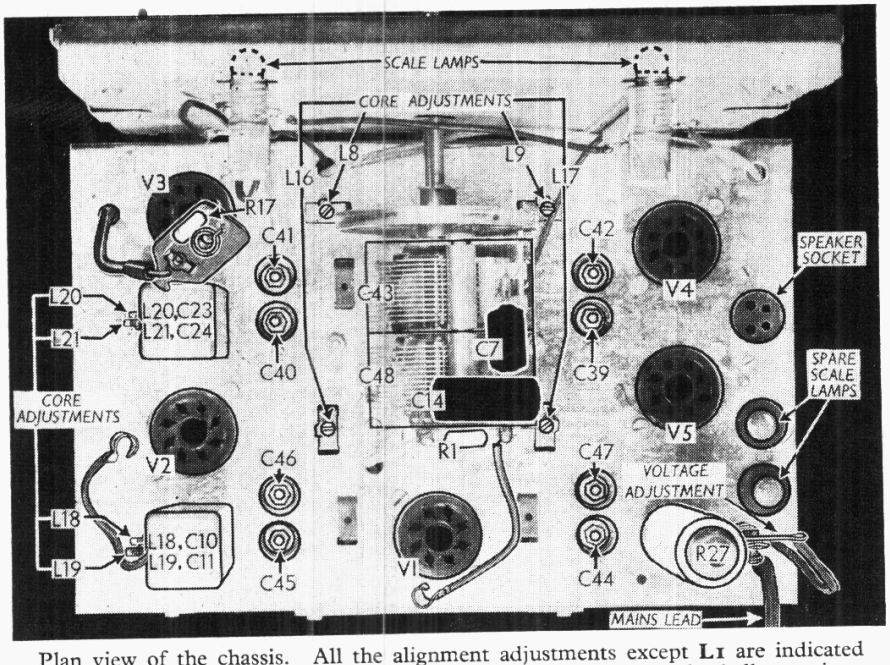


Diagrams of the two waveband switch units, drawn as seen when viewed from the rear of an inverted chassis.

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

Removing Speaker.—Withdraw the connecting plug from its socket on the chassis deck;
remove the nuts (with lock washers) from the four bolts holding the speaker to the sub-baffle.

When replacing, the transformer should be at the top, and if the leads have been unsoldered they should be reconnected as follows, numbering the tags from left to right when viewed from the rear: 1, white; 2, brown and white; 3, red; 4, black.



Plan view of the chassis. All the alignment adjustments except **L1** are indicated here. The two spare scale lamps are seen on the right, near the ballast resistor **R27**. **R17** is mounted on the top cap connector of **V3**.

GENERAL NOTES

Switches.—S1-S32 are the waveband switches, ganged in two rotary units beneath the chassis. These are indicated in our under-chassis view by numbers in circles and arrows, and shown in detail in the diagrams in col. 2, where they are drawn as seen when viewed from the rear of an inverted chassis.

The table above gives the switch positions for the four control settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and **C**, closed.

S33, S34 are the tone control switches in a three-position rotary unit beneath the chassis. This is indicated in our under-chassis view, and shown in detail in the diagram in col. 5, where it is shown as seen when viewed from the rear of the chassis. In the fully anti-clockwise position of the control knob, both switches are open; in the next position, **S33** closes; in the clockwise position, **S33** opens and **S34** closes.

S35 is the Q.M.B. mains switch, ganged with the manual volume control **R16.**

Coils.—L1 is the aerial I.F. rejector coil, mounted on the rear chassis member with **C2.** The aerial coils **L2-L9** are in four unscreened tubular units beneath the chassis, and the oscillator coils **L10-L17** are in four similar units, the two sets being grouped round their associated sections of the waveband switch assembly and separated by a metal screen. The four core adjustments are indicated in our plan view of the chassis, together with the eight associated trimmers.

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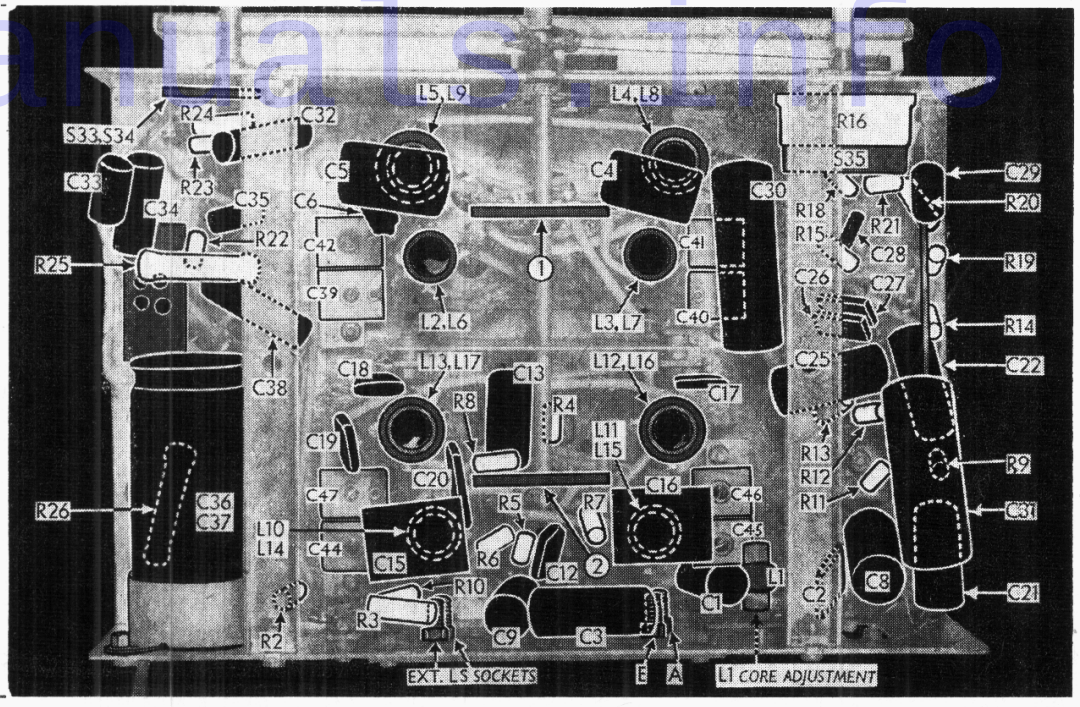

Under-chassis view. Diagrams showing the tone control switch unit (**S33**, **S34**) and waveband switch units (indicated here by numbers 1 and 2 in circles) appear in cols. 2 and 5, where they are seen in detail. **R25** and **R26** are both wire-wound enamelled resistors.

The I.F. transformers are in two screened units on the chassis deck with their associated tuning capacitors. Their core adjustments are identified in our plan view of the chassis.

Scale Lamps.—These are two Osram M.E.S. types, with small spherical bulbs, rated at 6.5 V, 0.3 A. They are connected in series with the mains lead to chassis, where they carry both H.T. and heater current and provide a certain degree of protection against overload. Two spare lamps are held in rubber grommets on the chassis deck. See also "Chassis Divergency" in next column.

External Speaker.—Two sockets are provided on an insulated panel at the rear of the chassis for the connection of a low-impedance (about 2-4 Ω) external speaker.

Speaker Connecting Plug. — As the speaker has a permanent magnet, two connections only are needed to connect it to the receiver, but two further connections are required to connect the speech coil secondary of the input transformer **T1** to the external speaker sockets.

These four connections are effected via a four-pin plug and socket, the connections being indicated in the circuit diagram, together with a diagram inset beneath the circuit showing the pins when viewed from their free ends. The lead colours are as follows: 1, brown-white; 2, red; 3, black; 4, white.

Resistors R25, R26. — These are two wire-wound vitreous enamelled resistors beneath the chassis. **R25** (2,000 Ω) is connected between the two positive tags of the electrolytic unit **C36, C37**. **R26** (125 Ω) is situated between this unit and the underside of the chassis deck, where it is shown in our illustration by broken lines.

Capacitors C36, C37.—These are two dry electrolytics in a tubular metal container on the chassis deck. Of the three tags on its base, the red one is the positive of **C36** (marked "Reservoir"), and the yellow one is the positive of **C37**, which is rated at 350 V D.C. working; the black tag is the common negative connection. Both sections are rated at 32 μF.

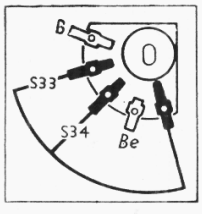

Diagram of the tone control switch unit, drawn as seen from the rear of an inverted chassis.

Chassis Divergency.—In later chassis, the scale lamp circuit may be shunted by a 100 Ω resistor to reduce the surge current when the receiver is switched on. This resistor is rated at 7 watts, and is wire-wound.

CIRCUIT ALIGNMENT

I.F. Stages.—Connect signal generator leads via a 0.1 μF capacitor to control grid (top cap) of **V1** and chassis, turn the gang and the volume control to maximum, and the tone control fully anti-clockwise. Feed in a 465 kc/s (645.16 m) signal, slacken the lock-nuts, and adjust the cores of **L18, L19, L20** and **L21** for maximum output, reducing the input signal as the circuits come into line. Tighten lock-nuts.

R.F. and Oscillator Stages.—Transfer signal generator leads to **A** and **E** sockets, via a suitable dummy aerial. With the gang at maximum, the pointer should be horizontal, and it should be directly behind the mark at the high-wavelength end of the M.W. band scale.

I.F. Filter.—Switch set to M.W., feed in a 465 kc/s (645.16 m) signal, and adjust the core of **L1** for minimum output.

S.W.1.—Switch set to Band 1, tune to 13.3 m (170 m mark on M.W. scale), feed in a 13.3 m (22.5 Mc/s) signal, and adjust **C44,** then **C39,** for maximum output.

S.W.2.—Switch set to Band 2, tune to 48 m (170 m mark on M.W. scale), feed in a 48 m (6.25 Mc/s) signal, and adjust **C45,** then **C40,** for maximum output.

M.W.—Switch set to M.W. (Band 3), tune to 170 m on scale, feed in a 170 m (1,765 kc/s) signal, and adjust **C46,** then **C41,** for maximum output. Tune to 526 m (spot on scale), feed in a 526 m (570 kc/s) signal, and adjust the cores of **L16** and **L8** for maximum output. Repeat the 170 m and 526 m adjustments until no improvement can be obtained.

L.W.—Switch set to L.W. (Band 4), tune to 750 m (170 m mark on M.W. scale), feed in a 750 m (400 kc/s) signal, and adjust **C47,** then **C42,** for maximum output. Tune to 2,000 m on scale, feed in a 2,000 m (150 kc/s) signal, and adjust the cores of **L17** and **L9** for maximum output. Repeat the 750 m and 2,000 m adjustments until no improvement can be obtained.

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