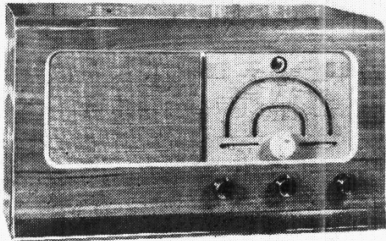


"TRADER" SERVICE SHEET
815

McMICHAEL 471AC

4-BAND SUPERHET



The appearance of the McMichael 471AC Superhet.

A SHORT-WAVE band (Band 1, 13.5-50 m) and a "Trawler" band (Band 2, 50-170 m) are included in the McMichael 471AC, a 4-valve (plus rectifier) 4-band superhet designed to operate from A.C. mains of 200-260 V, 40-100 c/s. The two S.W. bands are

designated S.W.1 and S.W.2 throughout this Service Sheet.

Release date and original price: January, 1947; £20 10s. plus £4 8s. 2d. purchase tax.

CIRCUIT DESCRIPTION

Aerial input via I.F. rejector **L1, C1** and coupling coils **L2** (S.W.1), **L3** (S.W.2), **L4** (M.W.) and **L5** (L.W.) to single-tuned circuits **L6, C42** (S.W.1), **L7, C42** (S.W.2), **L8, C42** (M.W.) and **L9, C42** (L.W.) which precede first valve (**V1, Mullard metallized ECH35**), a triode hexode 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 **C47**. Parallel trimming by **C43** (S.W.1), **C44** (S.W.2), **C45** (M.W.) and **C17, C46** (L.W.); series tracking by **C13** (S.W.1), **C14** (S.W.2), **C15** (M.W.) and **C16** (L.W.). Reaction coupling by grid coils **L10** (S.W.1), **L11** (S.W.2), **L12** (M.W.) and **L13** (L.W.).

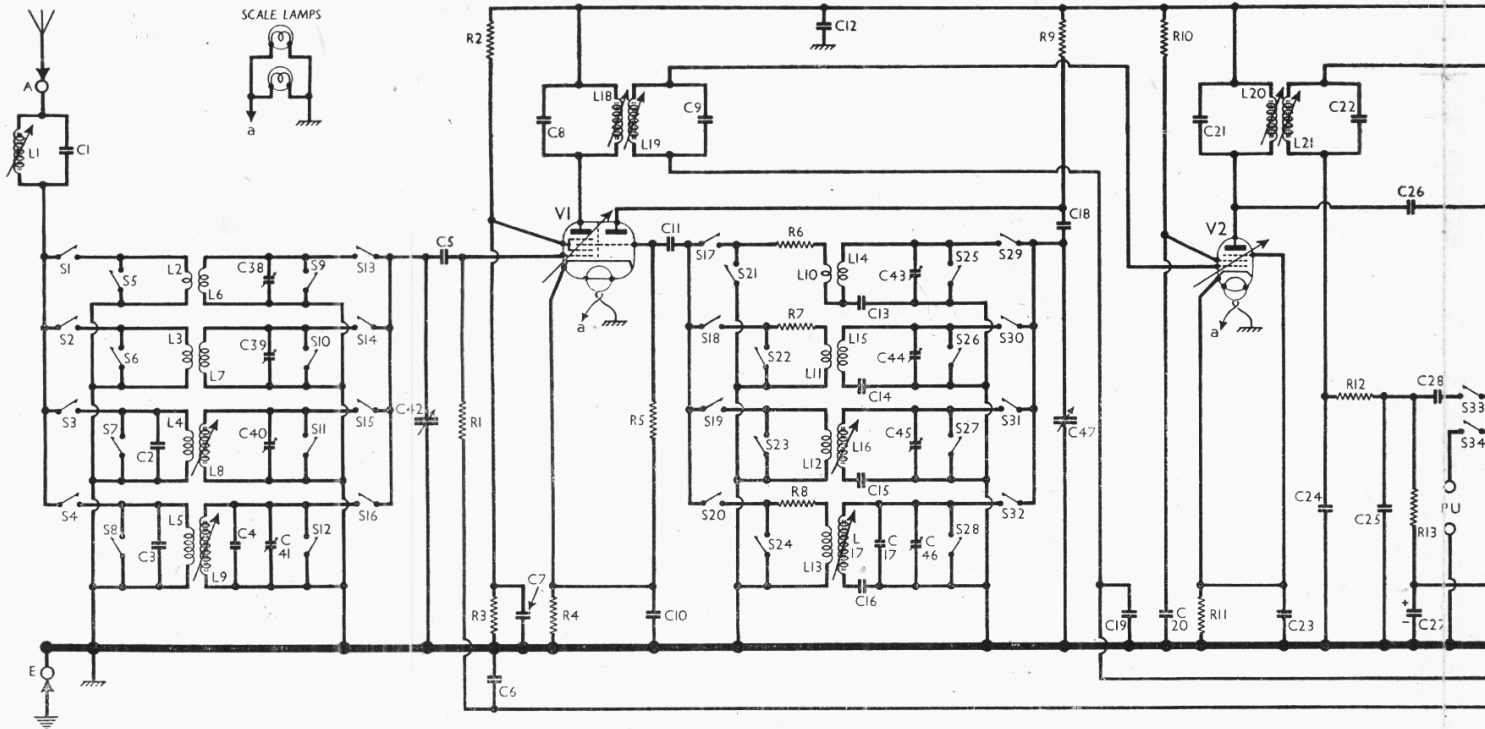
Second valve (**V2, Mullard metallized**

EF39) is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned - primary, tuned-secondary transformer couplings **C8, L18, L19, C9** and **C21, L20, L21, C22**. All the tuning capacitors are fixed, and trimming is effected by varying the positions of the iron-dust cores.

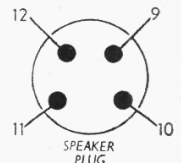
Intermediate frequency 465 kc/s.

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 **R13**, and passed via **C28**, switch **S33**, manual volume control **R14**, feed-back limiter **R15** and grid stopper **R16** to C.G. of triode section, which operates as A.F. amplifier. I.F. filtering by **C24, R12** and **C25** in diode circuit. Provision for the connection of a gramophone pick-up across **R14**, via switch **S34**.

A.F. voltages appearing at **V3** triode anode are stepped down by the capacitive potential divider **C30, C31**, and



Circuit diagram of the McMichael 471AC 4-band superhet. **L1, C1** form the aerial circuit I.F. rejector. The M.W. and L.W. aerial and oscillator coils have adjustable iron-dust cores, as have also the I.F. transformer coils. A short-circuiting switch associated with each of the waveband selector switches shunts each coil that is not in use. The tuning indicator **T.I.** is of the two-speed type. The pins of the octal plug connecting the power unit to the main chassis are indicated by arrows and circles, numbered 1-7, pins 2 and 8 being blank. The 4-pin speaker plug is similarly indicated by connections numbered 9-12, and a diagram of the plug is inset beneath the circuit.



COMPONENTS AND VALUES

If the component numbers given in the following tables are used when ordering replacements, it is advisable to mention that they were taken from this Service Sheet, as these numbers may be different from those in the maker's diagram.

those appearing across **C31** are fed back to **V3** grid circuit, via series resistor **R20**, in opposite phase to the input signal, giving negative feed-back.

Second diode of **V3**, fed from **V2** anode via **C26**, provides D.C. potential which is developed across load resistor **R23** and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control. This potential is also applied as control voltage to cathode-ray tuning indicator. (**T.I. Mullard EM34**). Delay voltage, together with G.B. for triode section, is obtained from the drop along **R17** in **V3** cathode lead to chassis.

Resistance-capacitance coupling by **R19**, **C32** and **R26**, via grid stopper **R27**, between **V3** triode and pentode output valve (**V4**, Mullard **EL33**). Fixed tone correction by **C35**, and three-position tone control by **C33**, **C34**, **S36**, **S37**, 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**.

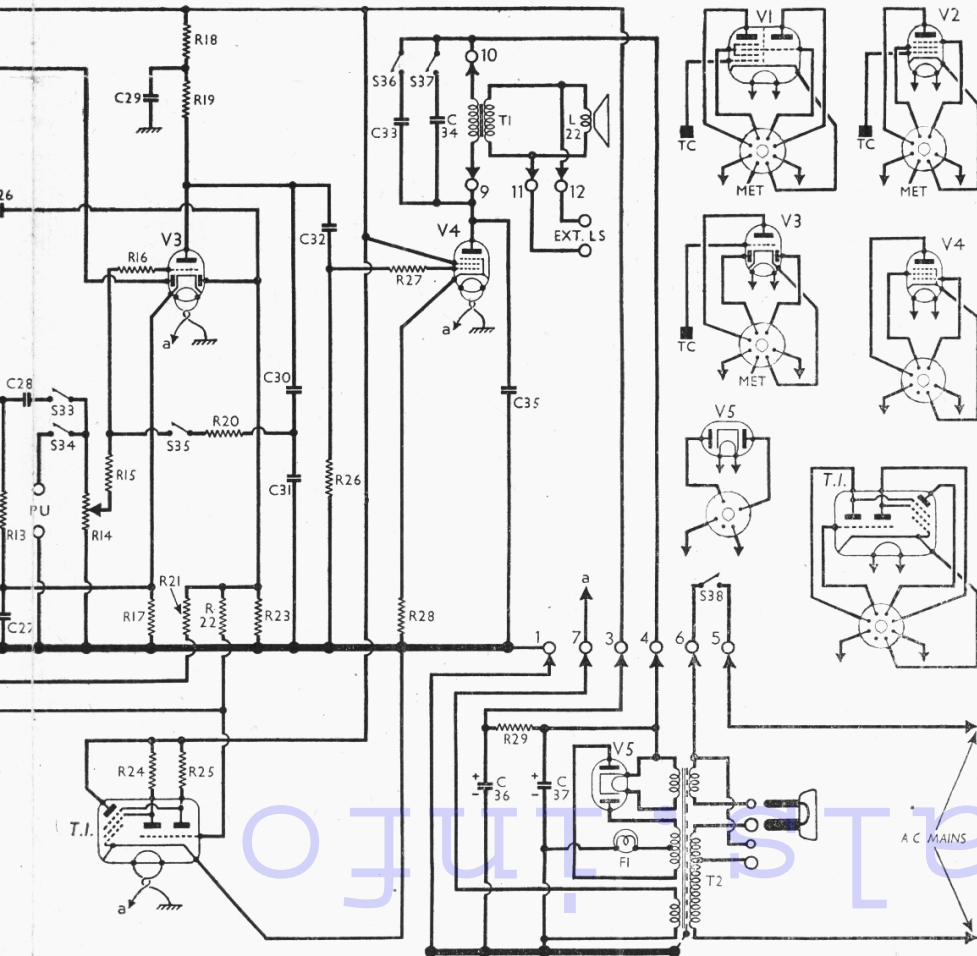
H.T. current is supplied by I.H.C. full-wave rectifying valve (**V5**, Brimar **5Z4G**). Smoothing by resistor **R29** and electrolytic capacitors **C36**, **C37**, but the H.T. supply for **V4** anode is taken directly from the rectifier cathode. H.T. circuit R.F. filtering by **C12**.

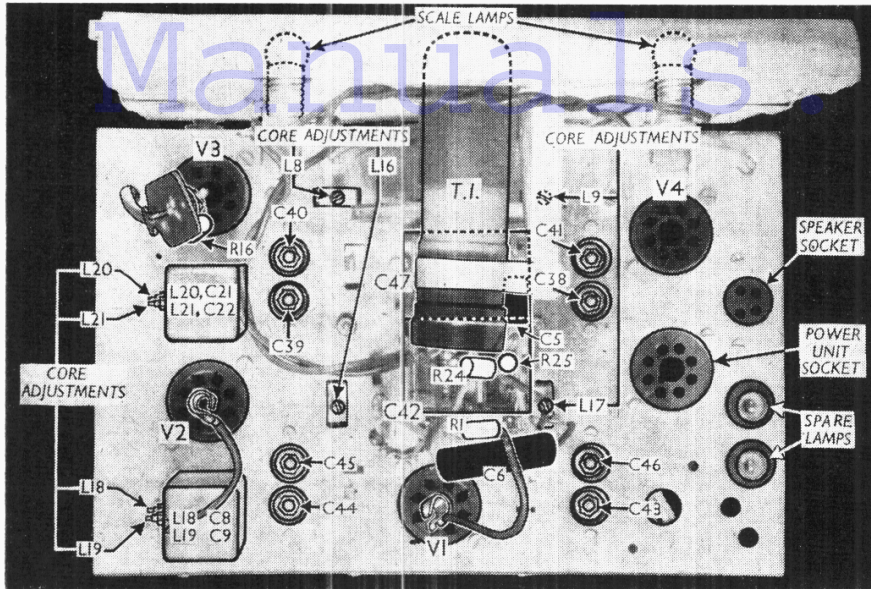
RESISTORS		Values (ohms)
R1	V1 hex. C.G. resistor ...	470,000
R2	V1 S.G. H.T. potential divider resistors ...	22,000
R3	V1 S.G. H.T. potential divider resistors ...	33,000
R4	V1 fixed G.B. resistor ...	220
R5	V1 osc. C.G. resistor ...	47,000
R6	Osc. S.W.1 stabiliser ...	47
R7	Osc. S.W.2 stabiliser ...	470
R8	Osc. L.W. stabiliser ...	2,200
R9	V4 osc. anode H.T. feed ...	27,000
R10	V2 S.G. H.T. feed ...	68,000
R11	V2 fixed G.B. resistor ...	330
R12	I.F. stopper ...	100,000
R13	V3 signal diode load ...	330,000
R14	Manual volume control ...	1,000,000
R15	Feed-back limiter ...	56,000
R16	V3 grid stopper ...	47,000
R17	V3 G.B.; A.V.C. delay ...	1,000
R18	V3 triode H.T. decoupling ...	10,000
R19	V3 triode anode load ...	33,000
R20	Feed-back series resistor ...	1,000,000
R21	V2 C.G. decoupling ...	470,000
R22	A.V.C. line decoupling ...	470,000
R23	V3 A.V.C. diode load ...	470,000
R24	T.I. triode anode load resistors ...	1,000,000
R25	T.I. triode anode load resistors ...	1,000,000
R26	V4 C.G. resistor ...	470,000
R27	V4 grid stopper ...	47,000
R28	V4 G.B. resistor ...	150
R29	H.T. smoothing resistor ...	2,000

CAPACITORS		Values (µF)
C1	I.F. filter tuning ...	0.0005
C2	Aerial M.W. shunt ...	0.00025
C3	Aerial L.W. shunt ...	0.001
C4	Aerial L.W. fixed trimmer ...	0.00002
C5	V1 hex. C.G. capacitor ...	0.0001
C6	V1 hex. C.G. decoupling ...	0.1
C7	V1 S.G. decoupling ...	0.1
C8	1st I.F. transformer tuning capacitors ...	0.0001
C9	1st I.F. transformer tuning capacitors ...	0.0001
C10	V1 cathode by-pass ...	0.1
C11	V1 osc. C.G. capacitor ...	0.0001
C12	H.T. circuit R.F. by-pass ...	0.25
C13	Osc. circ. S.W.1 tracker ...	0.0054
C14	Osc. circ. S.W.2 tracker ...	0.0018
C15	Osc. circ. M.W. tracker ...	0.000538
C16	Osc. circ. L.W. tracker ...	0.00016
C17	Osc. L.W. fixed trimmer ...	0.00005
C18	V1 osc. anode coupling ...	0.0001
C19	V2 S.G. decoupling ...	0.1
C20	V2 S.G. decoupling ...	0.1
C21	2nd I.F. transformer tuning capacitors ...	0.0001
C22	2nd I.F. transformer tuning capacitors ...	0.0001
C23	V2 cathode by-pass ...	0.1
C24	I.F. by-pass capacitors ...	0.0001
C25	I.F. by-pass capacitors ...	0.0001
C26	V3 A.V.C. diode coupling ...	0.0001
C27*	V3 cathode by-pass ...	50.0
C28	A.F. coupling to V3 triode ...	0.01
C29	V3 triode decoupling ...	0.05
C30	Feedback potential divider capacitors ...	0.0005
C31	Feedback potential divider capacitors ...	0.001
C32	A.F. coupling to V4 C.G. ...	0.02
C33	Tone control capacitors ...	0.01
C34	Tone control capacitors ...	0.04
C35	Fixed tone corrector ...	0.005
C36*	H.T. smoothing capacitors ...	32.0
C37*	H.T. smoothing capacitors ...	32.0
C38†	Aerial circ. S.W.1 trimmer ...	0.00004
C39†	Aerial circ. S.W.2 trimmer ...	0.00004
C40†	Aerial circ. M.W. trimmer ...	0.00004
C41†	Aerial circ. L.W. trimmer ...	0.00004
C42†	Aerial circuit tuning ...	—
C43†	Osc. circ. S.W.1 trimmer ...	0.00004
C44†	Osc. circ. S.W.2 trimmer ...	0.00004
C45†	Osc. circ. M.W. trimmer ...	0.00004
C46†	Osc. circ. L.W. trimmer ...	0.00004
C47†	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 ...	2.0
T1	Output trans. { Pri. ...	350.0
	Output trans. { Sec. ...	0.25
T2	Mains trans. { Pri., total ...	27.5
	Mains trans. { Heater sec. ...	0.2
	Mains trans. { Rect. heat. sec. ...	0.15
	Mains trans. { H.T. sec., total ...	440.0
S1-S35	Waveband switches ...	—
S36, S37	Tone control switches ...	—
S38	Mains switch, ganged R14 ...	—





Plan view of the chassis. R16 is mounted on the top cap connector of V3. The power unit socket, speaker connecting socket and the two spare lamps are seen in a group on the right. All the alignment adjustments, with the exception of L1, are indicated in this illustration.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 225 V, with the plug in the 230 V position on the mains transformer. 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 ECH35	213	2.2	90	2.8
	110	3.0		
V2 EF39	213	6.1	96	1.75
V3 EBC33	107	2.4	—	—
V4 EL33	250	37.0	213	4.0
V5 5Z4G	236†	—	—	—
T.I. EM34	27	0.18	(Pin 3)	—
	22	0.2	(Pin 6)	—
	213	0.33	(Pin 5)	—

† Each anode, A.C.

GENERAL NOTES

Switches.—S1-S35 are the waveband and radio/gram change-over switches, ganged in three rotary units beneath the chassis. These units are indicated by arrows and numbers in circles in our under-chassis view, and shown in detail in the diagrams in col. 5, where they are drawn as seen from the rear of an inverted chassis.

The table (col. 4) gives the switch positions for the five control settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and C, closed.

S36, S37 are the tone control switches, in a 3-position unit beneath the chassis,

shown in detail in the diagram in col. 3 as seen from the rear of an inverted chassis. Starting from the fully anti-clockwise position of the control knob, the settings are: Treble (both switches open); Normal (S36 closed); Bass (S37 closed).

Scale Lamps.—These are two Osram M.E.S. types, with small, clear, spherical bulbs, rated at 6.5 V, 0.3 A. A similar lamp is used as fuse F1. Two spare lamps are carried in two rubber grommets on the chassis deck.

External Speaker.—Two sockets are provided at the back of the chassis for the connection of a low impedance (2-4 Ω) external speaker.

Speaker Plug.—The primary and secondary connections of the output transformer T1, which is mounted on the speaker, are terminated at a 4-pin plug which fits a socket on the chassis deck, the pins being identified by numbers in the circuit. A diagram of the plug, viewed from the free ends of the pins, in inset beneath the circuit. The lead colours in our sample were: 1, brown/white; 2, red; 3, black; 4, white.

Power Unit.—This contains the mains transformer T2, rectifier V5, electrolytic unit C36, C37, R29, fuse F1 and the connecting leads. Connection with the main chassis is effected via an 8-pin plug which fits an octal holder on the chassis deck. The lead colours on our plug were: 1, black; 3, red; 4, blue; 5, green; 6, white; 7, yellow. Pins 2 and 8 were blank. The pin numbers are shown at the points of intersection in the circuit diagram. A photograph showing a three-quarter view of the underside of the unit appears in the next column.

Resistor R29.—This is a wire-wound vitreous enamelled unit mounted directly between the appropriate tags of the electrolytic unit. It forms part of the smooth-

ing circuit, and is rated at 2,000 Ω, 6 watts.

Capacitors C36, C37.—These are two dry electrolytics in a tubular metal container mounted on the power unit. Of the three tags on its base, the yellow one is the positive of C36, which is rated at

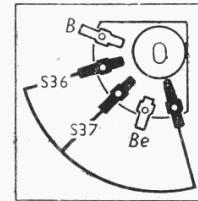


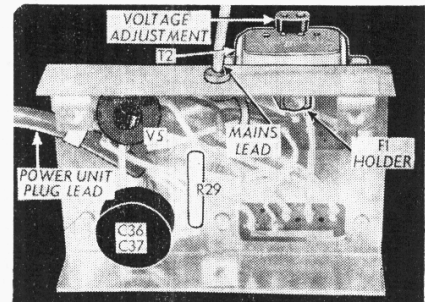
Diagram of the tone control switch unit, as seen from the rear of an inverted chassis.

350 V D.C. working, and the red one is that of C37 (marked "Reservoir"); the black tag is the common negative connection. Both sections are rated at 32 μF.

Fuse Lamp F1.—This is a lamp of the same type as is used to illuminate the scale, connected in series with the H.T. secondary winding centre-tap lead to chassis. It is not truly a fuse, since it is intended to glow brightly if a short-circuit occurs on the H.T. line, whereas it may glow dimly under normal conditions. If it should blow, it may be replaced by one of the spare scale lamps.

DISMANTLING THE SET

Removing Chassis.—Remove the four control knobs (recessed grub screws); withdraw the speaker and power unit plugs from their sockets on the chassis deck;



Three-quarter underside view of the power unit. The fuse lamp F1 is mounted on the deck just behind the mains transformer T2.

remove the two large hexagon head screws (with metal washers) securing the chassis to the base of the cabinet, and withdraw the chassis from the cabinet.

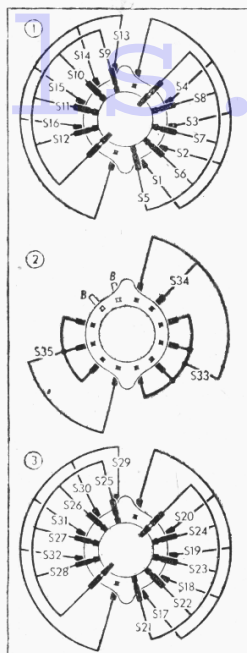
Removing Power Unit.—Withdraw the power unit plug from its socket on the chassis deck;

remove the three large hexagon head screws (with metal washers) securing the power unit to the base of the cabinet, and slide it out.

Removing Speaker.—Withdraw the connecting plug from its socket on the chassis deck;

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

Diagrams of the three waveband switch units are seen on the right, drawn as they appear when viewed from the rear of an inverted chassis. **B** indicates a blank tag. On the left is the associated switch table.



maximum output, reducing the input 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 S.W.1 (Band 1), tune to 13.3 m (170 m mark on Band 3 scale), feed in a 13.3 m (22.5 Mc/s) signal, and adjust **C43**, then **C38**, for maximum output.

S.W.2.—Switch set to S.W.2 (Band 2), tune to 48 m (170 m mark on Band 3 scale), feed in a 48 m (6.25 Mc/s) signal, and adjust **C44**, then **C39**, 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 **C45**, then **C40**, 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 results.

L.W.—Switch set to L.W. (Band 4), tune to 750 m (170 m mark on Band 3 scale), feed in a 750 m (400 kc/s) signal, and adjust **C46**, then **C41**, 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 results.

remove the four nuts (with lock washers) 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.

CIRCUIT ALIGNMENT

I.F. Stages.—Connect signal generator leads via a 0.1 μ F capacitor to control grid (top cap) of **V1** and chassis, turn the gang and volume control to maximum, and the tone control fully anticlockwise. 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

Under-chassis view, in which the waveband switch units are indicated by numbers in circles (1, 2 and 3) and arrows which indicate the direction in which they are viewed in the diagrams in col. 5 above, where they are shown in detail. A diagram of the tone control switch unit **S36**, **S37** appears at the top of col. 3.

