

NUMBER NINETY-SIX

'TRADER' SERVICE SHEETS

McMICHAEL 235

3-VALVE (Plus Rectifier) A.C. SUPERHET

A 3-VALVE (plus rectifier) superhet chassis for A.C. mains of 200-250 V, 50-100 c.p.s., is employed in the McMichael 235 receiver. It is housed in a horizontal cabinet and has provision for a gramophone pick-up and an extension speaker. A switch in connection with the extension speaker sockets cuts out the internal speaker when the plug is fully inserted. When the plug is pushed only half-way home, both speakers are in circuit at the same time.

CIRCUIT DESCRIPTION

Aerial input via fixed series condenser C1, M.W. coupling condenser C2 and coupling coil L1 to inductively coupled band-pass filter. Primary L2, L3 tuned by C23; secondary L5, L6 tuned by C25; image suppression by coil L4.

First valve is a triode-pentode (V1, Mazda metallised AC/TP) operating as frequency changer with cathode injection. Triode section forms separate oscillator with anode coils L9, L10 tuned by C28 and coupling coils L7, L8 in common cathode circuit. Tracking by fixed

condensers C9 (L.W.) and C10 (M.W.). Second valve, a variable-mu H.F. pentode (V2, Cossor metallised MVS-Pen), operates as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings L12, L13 and L15, L16.

Intermediate frequency 128.5 KC/S.

Diode second detector forms part of double diode output pentode (V3, Mazda AC2/Pen/DD). Second diode, fed from V2 anode via condenser C17, provides D.C. potential which is developed across load resistances R18, R19 and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control. Delay voltage is obtained from drop along cathode resistances R15, R16.

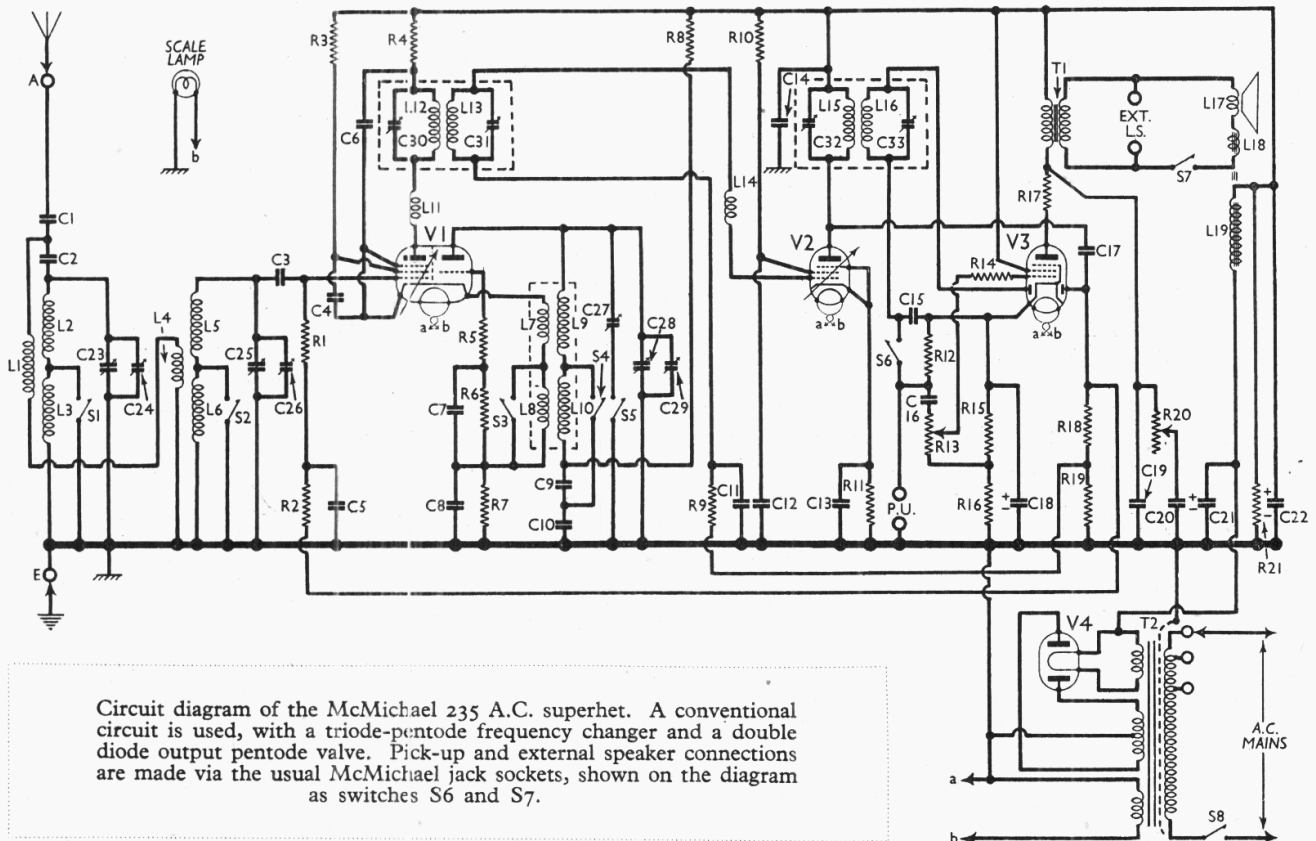
Audio-frequency output from signal diode is developed across load resistance R12 and passed via coupling condenser C16, manual volume control R13 and I.F. stopper R14 to control grid of V3 pentode section. Provision for connection of gramophone pick-up directly in grid

circuit; switch S6 prevents radio breakthrough. Fixed tone correction in anode circuit by C19; variable tone control by R.C. filter R20, C20. Provision for connection of external low-impedance speaker across secondary of output transformer T1. Switch S7 breaks internal speaker speech coil circuit.

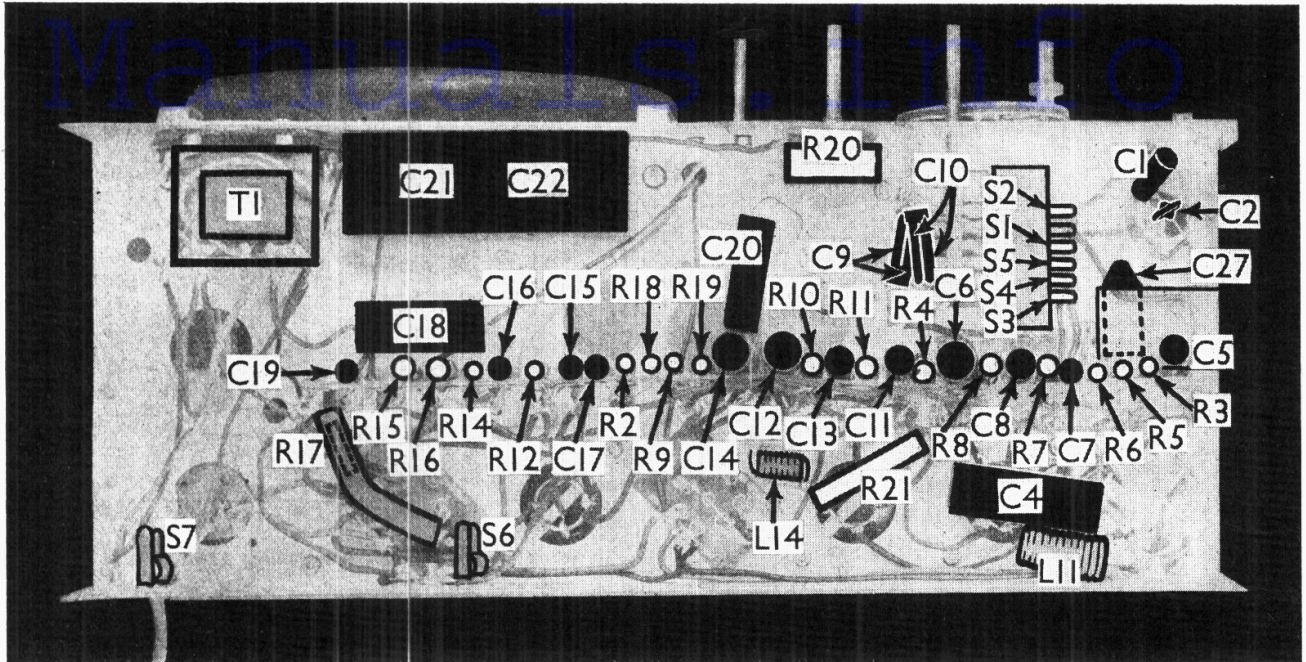
H.T. current is supplied by full-wave rectifying valve (V4, Cossor 442BU). Smoothing by speaker field coil L19 and dry electrolytic condensers C21, C22.

COMPONENTS AND VALUES

Resistances		Values (ohms)
R1	V1 pent. cont. grid resistance	1,000,000
R2	V1 pent. cont. grid decoupling	1,000,000
R3	V1 pent. S.G. H.T. feed	25,000
R4	V1 pent. anode decoupling	10,000
R5	V1 osc. harmonic suppressor	1,000
R6	V1 osc. grid resistance	50,000
R7	V1 fixed G.B. resistance	1,000
R8	V1 osc. anode decoupling	60,000
R9	V2 cont. grid decoupling	500,000
R10	V2 S.G. H.T. feed	60,000
R11	V2 fixed G.B. resistance	250
R12	V3 signal diode load	500,000
R13	Manual volume control	500,000
R14	V3 cont. grid I.F. stopper	100,000
R15	V3 G.B. and A.V.C. delay	150
R16	voltage resistances	350
R17	V3 anode circuit stabiliser	50
R18	V3 A.V.C. diode load	500,000
R19		500,000
R20	Variable tone control	100,000
R21	Speaker field coil bleeder	40,000



Circuit diagram of the McMichael 235 A.C. superhet. A conventional circuit is used, with a triode-pentode frequency changer and a double diode output pentode valve. Pick-up and external speaker connections are made via the usual McMichael jack sockets, shown on the diagram as switches S6 and S7.



Under-chassis view. L11 and L14 are small H.F. chokes. S6 and S7 are the pick-up and internal speaker switches. C9 and C10 each consist of two condensers in parallel. C2 is a small disc-type condenser.

Condensers	Values (μF)
C1	Aerial series condenser ... 0.0002
C2	Aerial M.W. coupling ... 0.00001
C3	V1 pent. cont. grid condenser ... 0.001
C4	V1 pent. S.G. by-pass ... 0.5
C5	V1 pent. cont. grid decoupling ... 0.1
C6	V1 pent. anode decoupling ... 0.1
C7	V1 osc. grid condenser ... 0.0002
C8	V1 cathode by-pass ... 0.1
C9	Oscillator L.W. tracker ... 0.001258
C10	Oscillator M.W. tracker ... 0.0023
C11	V2 cont. grid decoupling ... 0.1
C12	V2 S.G. by-pass ... 0.1
C13	V2 cathode by-pass ... 0.1
C14	V2 anode decoupling ... 0.1
C15	I.F. by-pass ... 0.0001
C16	L.F. coupling to V3 ... 0.005
C17	Coupling to V3 A.V.C. diode ... 0.0001
C18*	V3 cathode by-pass ... 35.0
C19	Fixed tone corrector ... 0.002
C20	Part of tone cont. filter ... 0.03
C21*	H.T. smoothing
C22*	
C23†	Band-pass primary tuning ...
C24†	Band-pass primary trimmer ...
C25†	Band-pass secondary tuning ...
C26†	Band-pass secondary trimmer ...
C27†	Oscillator L.W. trimmer ...
C28†	Oscillator main trimmer ...
C29†	Oscillator tuning ...
C30†	1st I.F. trans. pri. tuning ...
C31†	1st I.F. trans. sec. tuning ...
C32†	2nd I.F. trans. pri. tuning ...
C33†	2nd I.F. trans. sec. tuning ...

* Electrolytic † Variable ‡ Pre-set.

Other Components (contd.)	Approx. Values (ohms)
L9	Oscillator tuning coils ... 4.0
L10	... 8.0
L11	V1 pent. anode S.W. choke ... Very low
L12	1st I.F. transformer { Pri... 43.0
L13	
L14	V2 cont. grid S.W. choke ... Very low
L15	2nd I.F. transformer { Pri... 43.0
L16	
L17	Speaker speech coil ... 2.0
L18	Hum neutralising coil ... 0.1
L19	Speaker field coil ... 2,500.0
T1	Output trans. { Pri. total ... 600.0
	Heater sec. ... 0.25
	Rect. fil. sec. ... 25.0
T2	Mains trans. { Rect. fil. sec. ... 0.05
	H.T. sec. total ... 600.0
S1-S5	Waveband switches ...
S6	Gram. pick-up switch ...
S7	Internal speaker switch ...
S8	Mains switch, ganged R13 ...

the screws (with nuts and lock washers) from those on the sides and the screw (with lock washer) from that at the back. When replacing, see that the transformer is on the right and connect as follow, numbering the tags from bottom to top:— 1, black; 2, green; 3, yellow; 4, two red leads.

VALVE ANALYSIS

Valve voltages and currents given in the table below were measured with the receiver operating on mains of 225 V, using the 220 V tapping on the mains transformer. The volume control was at maximum and the receiver was tuned to the lowest wavelength on the M.W. band, but there was no signal input.

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

Valve	Anode Volts	Anode Current (mA)	Screen Volts	Screen Current (mA)
V1 AC/TP*	195	5.0	195	1.3
V2 MVS/Pen	260	7.7	120	1.7
V3 AC/2Pen/DD	240	31.0	260	6.6
V4 442BU	365†	—	—	—

* Osc. anode 95 V, 2.0 mA.

† Each anode, A.C.

DISMANTLING THE SET

Removing Chassis.—If it is desired to remove the chassis from the cabinet, remove the four control knobs (pull off), taking care not to lose the springs, and the four bolts (with washers) holding the chassis to the bottom of the cabinet. Tilt the chassis up to clear the spigots for the cabinet back and withdraw it, tilting it still more to prevent the coil and tuning dial from fouling the top of the cabinet. The chassis also carries the speaker so that the receiver can be tested as a whole.

When replacing, note that the control knobs are marked with their purpose, so that they must be replaced on the correct spindles.

Removing Speaker.—The speaker is held in place on the chassis by three brackets and can be freed by removing

Other Components	Approx. Values (ohms)	
L1	Aerial coupling coil ... 11.0	
L2	Band-pass primary ... 3.5	
L3		12.0
L4		0.5
L5	Band-pass secondary ... 3.5	
L6		12.0
L7	Oscillator coupling coils ... 1.75	
L8		2.5

GENERAL NOTES

Switches.—S1-S5 are the waveband switches, ganged in a single unit beneath the chassis. The unit actually contains six switches, but one of these (between S2 and S1) is short-circuited, and is not used. The table (page VIII) gives the switch

(Continued overleaf)

McMICHAEL 235 (Continued)

positions for the M.W. and L.W. bands O indicating open, and C, closed.

Switch	M.W.	L.W.
S1	C	O
S2	C	O
S3	C	O
S4	C	O
S5	O	C

S6 is the pick-up jack switch, which is normally closed, but opens when the pick-up plug is inserted. **S7** is a similar switch for cutting out the internal speaker when an external speaker plug is fully inserted. These are both mounted at the rear of the chassis.

S8 is the Q.M.B. mains switch, ganged with the volume control, **R13**.

Coils.—The signal frequency coils, **L1-L6**, are wound on a tubular former mounted on the chassis deck, and are unscreened. All the coils are indicated in our plan chassis view. The oscillator coils, **L7-L10**, and the two I.F. units are screened, and are also on the chassis deck. **L11** and **L14** are two small H.F. chokes, formed of single coils of insulated wire, mounted beneath the chassis.

Scale Lamp.—This is an Osram M.E.S. type, rated at 6.2 V, 0.3 A.

External Speaker.—This should be of the low resistance type (about 2 Ω). When its plug is fully inserted into the sockets at the rear of the chassis, the internal speaker is disconnected.

Components R1, C3.—In early models these may be mounted on the front strip holding the signal frequency coil unit, and not as shown in our plan chassis view.

Condensers C23-C26.—In early models **C23, C24, and C25, C26** may be transposed in the ganged unit.

Condenser C7.—This may be a flat mica type, instead of a tubular one.

Trimmer C27.—This is adjusted through a hole in the chassis deck.

Resistance R17.—This is inside a piece of Empire sleeving.

Condensers C9, C10.—These each comprise two fixed condensers in parallel.

Condenser C2.—This is a low capacity disc type.

Condensers C21, C22.—These are two 8 μF dry electrolytics in a single unit with a common negative (black) lead. The red lead to the red speaker lead is the positive of **C21**, and the other red lead, to the black speaker lead, is the positive of **C22**.

along its cord until when the drive is against the stop, the pointer is at 200 m. With the moving vanes at minimum also, tighten up the grub screws in the drive collar.

Set the receiver to M.W. and turn the tuning knob until the pointer indicates 214 m. (short red line on M.W. scale). Inject a 214 m. (1,400 KC/S) signal into A and E sockets and adjust **C29** for maximum output. Two tuning points may be found, the correct one being that for which **C29** is in the slacker position (least capacity). Reduce the signal input, and adjust **C26** and **C24** for maximum output.

Set the receiver to L.W., with pointer indicating 1,000 m. (300 KC/S), and inject a 1,000 m. signal into A and E sockets. Adjust **C27** for maximum output. Return to the M.W. band, tune to 214 m., inject a 214 m. signal, and re-trim **C29** if necessary.

CIRCUIT ALIGNMENT

Adjusting I.F. Stages.—Switch receiver to M.W. and connect across the oscillator tuning condenser (**C28**) a 0.1 μF fixed condenser to swamp out the local oscillation. Remove connection to top cap of **V1**, and connect the output from an oscillator between top cap of **V1** and chassis. Connect up a suitable output meter (e.g., a 12 V A.C. voltmeter across external speaker sockets).

Tune oscillator to 128.5 KC/S, and adjust **C33, C32, C31, C30**, in this order, for maximum output. Keep the input low to avoid A.V.C. action.

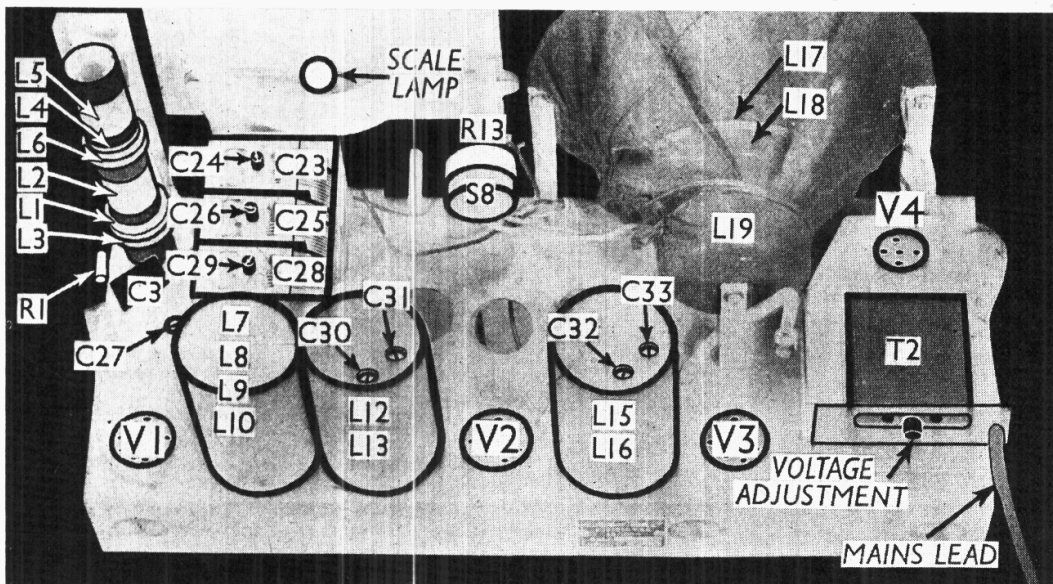
Adjusting H.F. and Oscillator Circuits.—If the condenser drive and pointer have been accidentally displaced relative to the condenser, loosen the two grub screws in the drive collar to free the condenser spindle. Push the moving vanes fully out to minimum. Rotate the tuning knob until the pointer is over the 200 m. mark. The drive should now also be at the minimum stop. If not, ease the pointer

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Plan view of the chassis. All the signal frequency coils are in the unscreened unit on the left, and are individually marked. R1 and C3 may be in different positions in some chassis, while C23, C24 and C25, C26 may be transposed.