NUMBER 136 **'TRADER' SERVICE SHEETS**

McMICHAEL 135U

A.C./D.C. SUPERHET

TWO speakers are fitted in the McMichael 135U 3-valve (plus rectifier) A.C./D.C. superhet, which is suitable for operation on mains of 200-250 V. As a barretter is fitted no adjustment need be made for mains of different voltages. The receiver is housed in a horizontal cabinet with the controls concealed under the lid, and provision is made for an extension speaker.

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 **C28**; secondary **L5, L6** tuned by **C30**; image suppression by coil **L4.**

First valve is a triode-pentode (**V1, Mazda metallised TP2620**) operating as frequency changer with cathode injection. Triode section forms separate oscillator with anode coils, **L9, L10,** tuned by **C33** 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, Mazda metallised VP1321**), operates as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C35, L12, L13, C36** and **C37, L15, L16, C38.**

Intermediate frequency, 128.5 KC/S.

Diode second detector forms part of double diode output pentode (**V3, Mazda PenDD4020**). Audio frequency component in rectified output is developed across load resistance **R12** and passed via coupling condenser **C14,** manual volume control **R11,** and I.F. stopper **R13** to C.G. of pentode section. Fixed tone correction in pentode anode circuit by condenser **C18**; variable tone control by R.C. filter **R19, C19.** Provision for connection of low-impedance external speaker across secondary of output transformer **T1.** Switch **S8** breaks internal speakers speech coil circuit.

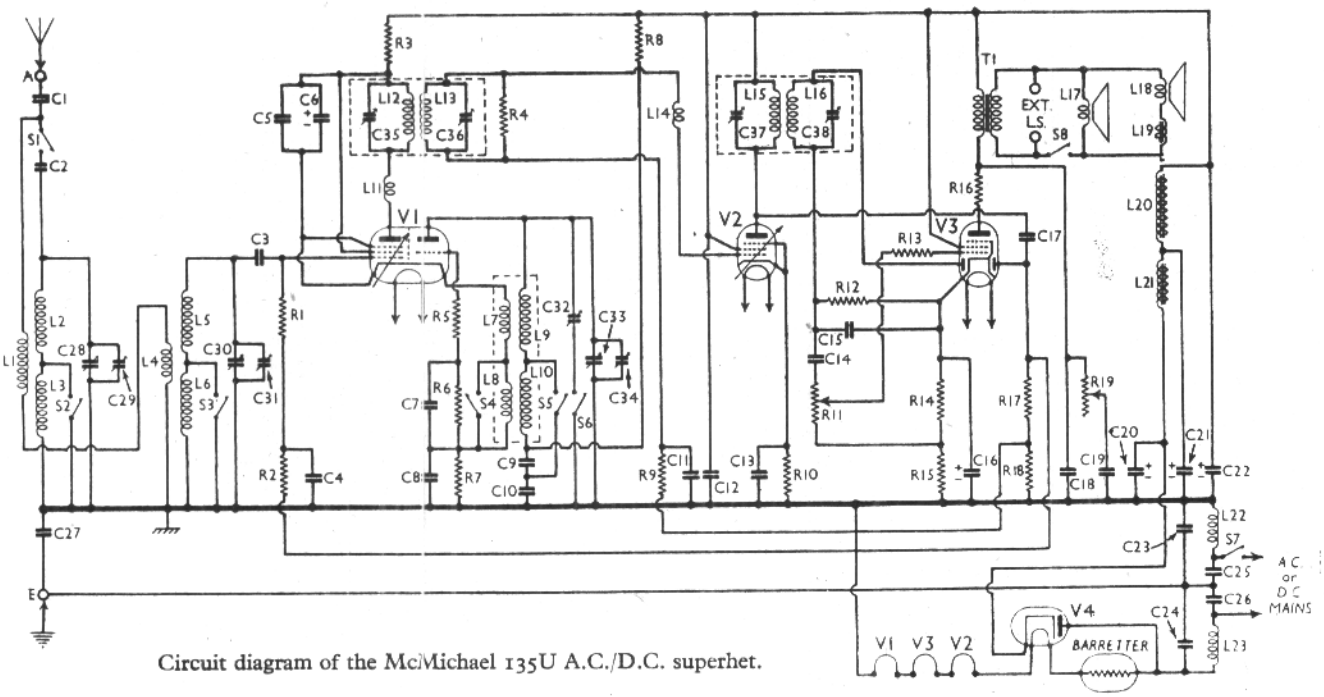
Second diode of **V3,** fed from **V2** anode via **C17** provides D.C. potential which is developed across **R17, R18** and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control. Delay voltage is obtained from drop along cathode resistances **R14, R15.**

When the receiver is used with A.C. mains, H.T. current is supplied by a half-wave rectifying valve (**V4, Mazda U4020**) which, with D.C. supplies, behaves as a resistance of low value. Smoothing by speaker field coil **L20,** iron-cored choke **L21** and dry electrolytic condensers **C20, C21, C22.**

Valve heaters are connected in series together with barretter lamp (**Philips C1**) across mains input circuit. Filter comprising **L22, L23, C23, C24, C25, C26** suppresses mains-borne interference.

	RESISTANCES	Values (Ohms)
R1	V1 pentode C.G. resistance	1,000,000
R2	V1 pentode C.G. decoupling	1,000,000
R3	V1 pent. anode decoupling	5,000
R4	1st I.F. trans. sec. shunt	500,000
R5	V1 osc. harmonic suppressor	1,000
R6	V1 osc. C.G. resistance	50,000
R7	V1 fixed bias resistance	750
R8	V1 osc. anode decoupling	60,000
R9	V2 C.G. decoupling	500,000
R10	V2 fixed bias resistance	150
R11	Manual volume control	500,000
R12	V3 signal diode load	500,000
R13	V3 C.G. I.F. stopper	100,000
R14	V3 G.B. and A.V.C. delay voltage resistances	150
R15*		500
R16	V3 pent. anode stabiliser	50
R17	V3 A.V.C. diode load	500,000
R18		500,000
R19	Variable tone control	100,000

	CONDENSERS	Values (μF)
C1	Aerial series condenser	0·0002
C2	Aerial M.W. coupling	0·00001
C3	V1 pentode C.G. condenser	0·001
C4	V1 pentode C.G. decoupling	0·1
C5	V1 pentode S.G. by-passes	0·1
C6*		2·0
C7	V1 osc. C.G. 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 C.G. decoupling	0·1
C12	V2 S.G. by-pass	0·1
C13	V2 cathode by-pass	0·1
C14	L.F. coupling to V3	0·005
C15	I.F. by-pass	0·0001
C16*	V3 cathode by-pass	25·0
C17	Coupling to V3 A.V.C. diode	0·0001
C18	Fixed tone corrector	0·002
C19	Part variable T.C. filter	0·03
C20*	H.T. smoothing	8·0
C21*		8·0
C22*		8·0



Circuit diagram of the McMichael 135U A.C./D.C. superhet.

	CONDENSERS (*Continued*)	Values (μF)
C23	Parts of mains filter circuit	0·1
C24		0·1
C25		0·1
C26		0·1
C27	Earth blocking condenser ..	0·01
C28†	Band-pass primary tuning ..	—
C29‡	Band-pass primary trimmer ..	—
C30†	Band-pass secondary tuning ..	—
C31‡	Band-pass secondary trimmer	—
C32‡	Oscillator L.W. trimmer	—
C33†	Oscillator tuning	—
C34‡	Oscillator main trimmer ..	—
C35‡	1st I.F. trans. pri. tuning ..	—
C36‡	1st I.F. trans. sec. tuning ..	—
C37‡	2nd I.F. trans. pri. tuning ..	—
C38‡	2nd I.F. trans. sec. tuning ..	—

* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial coupling coil	10·5
L2	Band-pass primary coils	3·0
L3		11·5
L4	Image suppresson coil ..	0·5
L5	Band-pass secondary coils	3·0
L6		11·5
L7	Oscillator coupling coils	1·75
L8		2·0
L9	Oscillator tuning coils	4·0
L10		7·5
L11	V1 pent. anode S.W. choke ..	Very low
L12	1st I.F. trans. Pri. ..	43·0
L13	1st I.F. trans. Sec. ..	43·0
L14	V2 C.G. S.W. choke	Very low
L15	2nd I.F. trans. Pri. ..	43·0
L16	2nd I.F. trans. Sec. ..	43·0
L17	P.M. speaker speech coil ..	2·0
L18	Energised speaker speech coil ..	2·4
L19	Hum neutralising coil	0·1
L20	Speaker field coil	500·0
L21	H.T. smoothing choke ..	225·0
L22	Mains filter chokes ..	18·7
L23		18·7
T1	Output trans. Pri. ..	300·0
	Sec. ..	0·2
S1-S6	Waveband switches	—
S7	Mains switch, ganged R11 ..	—
S8	Internal speaker switch ..	—

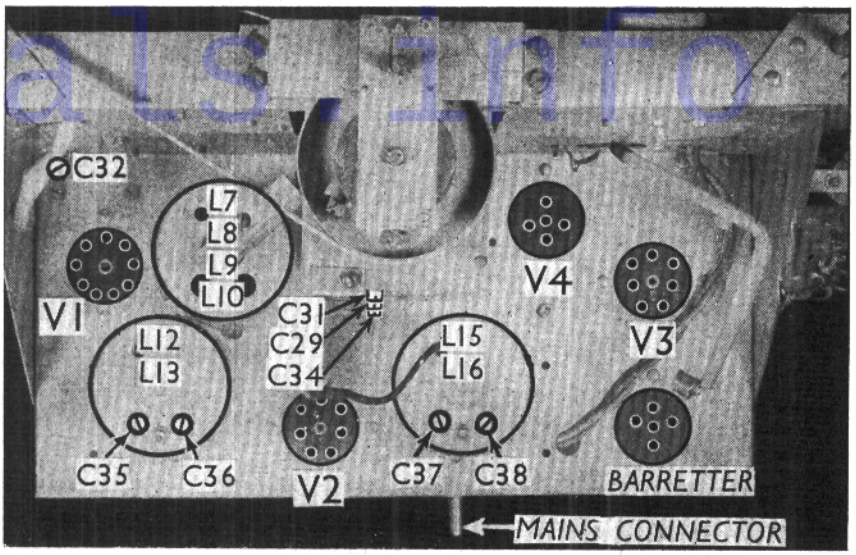
DISMANTLING THE SET

Removing Chassis.—First remove the mains lead, the back (six round-head wood screws) and the four control knobs (pull off). Now remove the front of the tuning scale escutcheon (two coin-slot screws and washers) and remove the glass, scale and pointer (pull off), taking care not to lose the bakelised paper washer.

Next remove the four bolts holding the chassis to the bottom of the cabinet, taking care that the weight of the chassis is not thrown on to the spindle of the scale pointer.

The chassis can now be withdrawn by tilting the back upwards and taking the left end out first. There is sufficient slack on the speaker leads to allow of normal repairs being carried out.

When replacing, do not forget to re-fix the felt washers covering the heads of the chassis bolts, see that the scale pointer is correctly positioned, and note that the knobs are marked with their purpose so that they must be placed on the correct spindles.



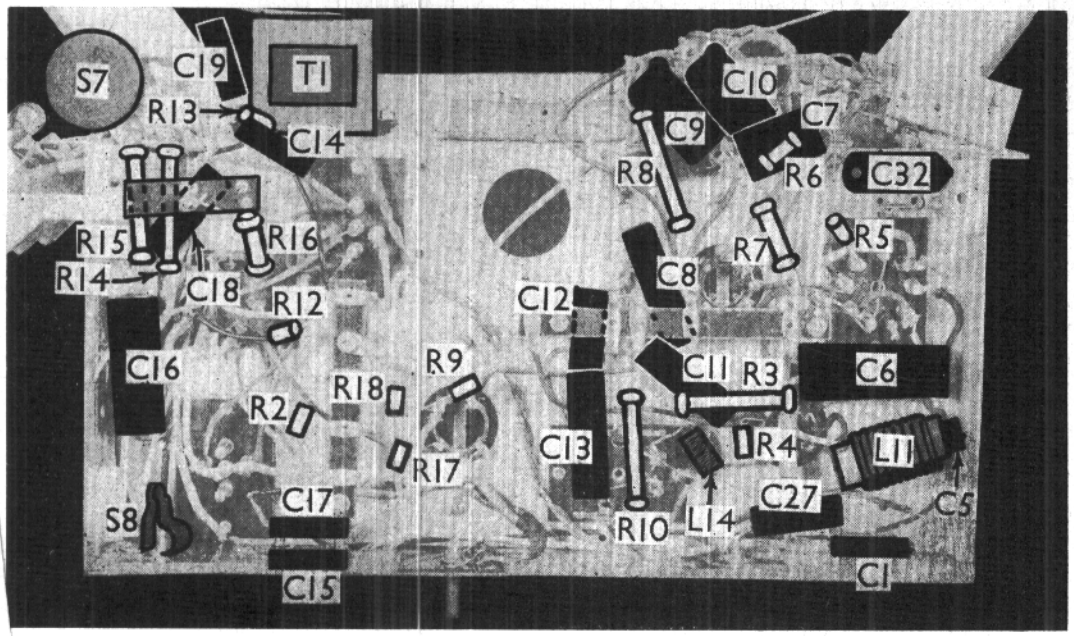
Plan view of the chassis. The tuning condenser trimmers are indicated by arrows. Note the adjusting screw of C32.

To free the chassis entirely, disconnect the leads to the speaker from the terminal panel on the chassis. *When replacing* connect as follow :—F, yellow, 1, black ; 2, blue ; 3, blank ; 4, green ; F, red.

Removing Speakers.—Each speaker can be removed by disconnecting the leads and removing the four round-head screws holding it to the sub-baffle. If it is desired to remove both speakers, the whole assembly, including the electrolytic condensers and the smoothing choke, can be withdrawn by removing the four countersunk-head wood screws holding it to the front of the cabinet.

When replacing, see that the large speaker is on the right with the terminal panel on the left, and that the small speaker is on the left with the panel on the right. The leads should be connected

(*Continued overleaf*)



Under-chassis view. L11 and L14 are small chokes, L11 being wound over C5. C32 is adjusted through a hole in the chassis deck. S8 is the internal speaker's jack switch.

McMICHAEL 135 U (*Continued*)

as follow, numbering each of the terminal panels from bottom to top: Large speaker: 1, yellow/red to tag 2 of small speaker; 2, yellow/red to tag 3 of small speaker. Small speaker: 1, yellow from receiver and red of one electrolytic; 2, yellow/red to tag 1 of large speaker and blue lead from receiver; 3, yellow/red to tag 2 of large speaker and grey from receiver; 4, yellow/red to smoothing choke.

This tag on the choke also goes to the second red lead from the electrolytic, while the other choke tag goes to the third red lead from the electrolytic and the brown lead from the receiver. The green lead from the set goes to the frame of the choke and the black lead from the electrolytic block.

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 230 V. The receiver was tuned to the lowest wavelength on the medium band and the volume control was at maximum, but there was no signal input.

Valve	Anode Volts	Anode Current (mA)	Screen Volts	Screen Current (mA)
V1 TP2620*	160	4·4	160	1·3
V2 VP1321	195	8·4	195	2·6
V3 Pen. DD4020	185	31·0	195	6·2
V4 U4020 †	—	—	—	—

* Osc. anode 85V, 1·5 mA.
† Cathode to chassis, 230 V D.C.

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

GENERAL NOTES

Switches.—S1-S6 are the waveband switches, in a single unit, indicated in our front chassis view. The table below gives the switch positions for the two control settings, O indicating open, and C, closed.

SWITCH	M.W.	L.W.
S1	C	O
S2	C	O
S3	C	O
S4	C	O
S5	C	O
S6	O	C

S7 is the Q.M.B. mains switch, ganged with the volume control, **R11.** **S8** is the internal speakers jack switch, at the rear of the chassis, which opens when the external speaker plug is pushed fully in.

Coils.—The signal frequency coils **L1-L6** are shown in our front chassis view. They are on a tubular former, and are not screened. **L7-L10,** the oscillator coils, are in a screened unit on the chassis deck, which also carries the two screened I.F. transformers, **L12, L13** and **L15, L16.** The two S.W. chokes, **L11** and **L14** are seen in the under-chassis view, **L11** being wound over the tubular condenser **C5.**

The mains filter chokes, **L22** and **L23,** are mounted, with their associated condensers, on brackets at the left side of the chassis, and are indicated in our front chassis view.

External Speaker.—Provision is made at the rear of the chassis for a low resistance (1 O) external speaker. If the plug is inserted a short distance, both speakers operate, but when it is pushed in fully, **S8** opens, and the internal speakers are cut out.

Choke L21.—This is mounted between the two speakers.

Condensers C20, C21, C22.—These are three 8μF dry electrolytics in a single unit, mounted between the two speakers. The black lead is the common negative, and there are three red (positive) leads. That emerging from the case of the unit nearest to the black lead is the positive of **C20,** the central red lead is the positive of **C21,** and the outer red lead is the positive of **C22.**

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

CIRCUIT ALIGNMENT

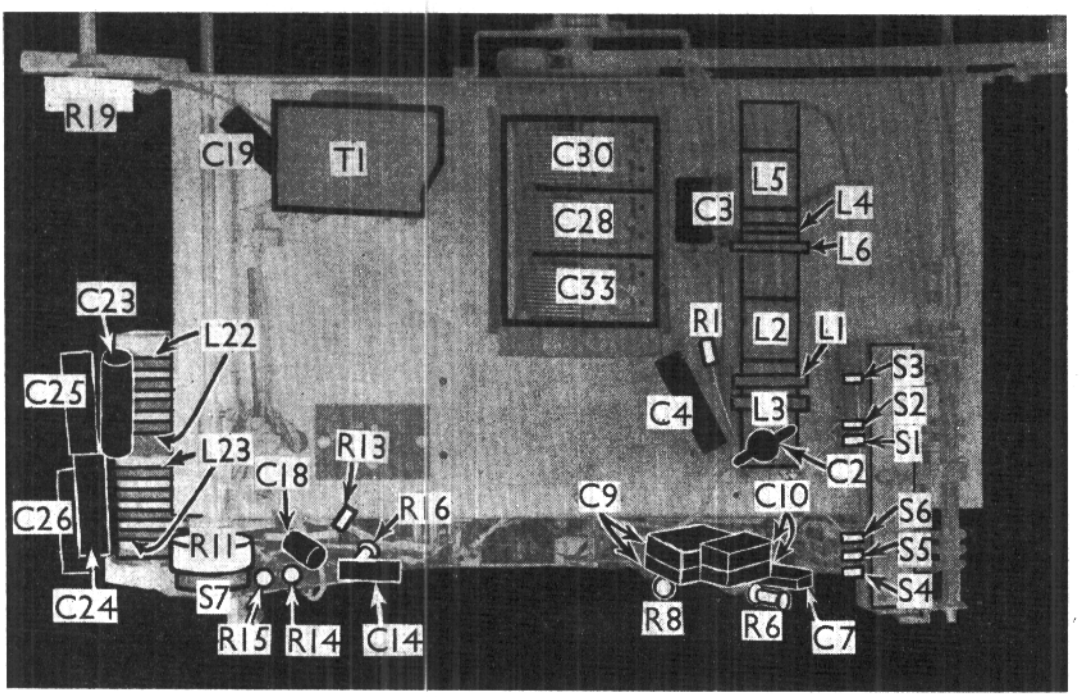
I.F. Stages.—For an output meter, use a 0-12 V A.C. voltmeter across the external speaker sockets. Switch receiver to M.W., and connect across **C33** a 0.1 μF condenser to swamp out the local oscillation. Remove the connection to the top cap of **V1,** and connect the signal generator between top cap and chassis. Set generator to 128.5 KC/S, and adjust **C38, C37, C36, C35,** in that order, for maximum output. Keep the input low to avoid A.V.C. action. Finally, remove swamp condenser.

H.F. and Oscillator Stages.—Turn the tuning knob fully anti-clockwise, and ascertain that the gang rotor is fully out of mesh. If the pointer does not indicate 200 m., hold the vanes fully out, and push the pointer round until 200 m. is indicated.

Inject a 200 m. signal between the top cap of **V1** and chassis, and adjust **C34** for maximum output. There will be two tuning points. Adjust to that at which the trimmer screw is in the slacker position.

Remove signal generator, replace normal top cap connection, and inject a 214 m. signal into A and E sockets. Tune receiver to this signal. Adjust **C29** and **C31** for maximum output.

Switch set to L.W., and set pointer to 1,000 m. on the scale. Inject a 1,000 m. signal into A and E sockets, and adjust **C32** for maximum output.



Front chassis view. The wavechange switches are indicated on the right, while the mains filter components are on the left. C9 and C10 each consist of two fixed condensers in parallel. C2 is a small coupling condenser.